

Final Program

Fortieth Annual Meeting

International Neuropsychological Society

February 15-18, 2012
 Montréal, Québec, Canada

WEDNESDAY, FEBRUARY 15, 2012

9:00 AM–12:00 PM

Wednesday Morning Continuing Education Courses
 Refer to CE Schedule for Location

12:00–4:00 PM

Students of INS (SINS) Workshop: Writing Successful Grants in Neuropsychology
Speakers: Mark Aloia, Rob Paul Verdun

1. ALOIA, MS

Students of INS (SINS) Workshop: Writing Successful Grants in Neuropsychology

1:00–4:00 PM

Wednesday Afternoon Continuing Education Courses
 Refer to CE Schedule for Location

4:15–5:45 PM

Poster Session 1: Cognitive Rehabilitation/MS and Demyelination/Memory/Cross-cultural
Salons Fontaine A and B

Cross Cultural

1. ANDERSON, EC

Written Expression Performance of Bilingual versus Monolingual College Students

2. BENNETT, J

The Relationship Between Phonemic Fluency and IQ in Hispanic Bilingual Students

3. CROSSLEY, M

The Northern Cultural Assessment of Memory (N-CAM): Normative Data from an Inner-city Clinic Supports Efficacy and Validity of a Cognitive Screen for Aboriginal Adults

4. JENKINS, JR

Bilingual Proficiency and Contextual Memory Performance in a Hispanic Adult Sample

5. JOSHI, R

Real-World Validity of Cross-Cultural Neuropsychological Testing: Cognitive Functioning and Occupational Level in India

6. LAU, KM

Set-shifting, mental flexibility, and bicultural stress among Chinese American adults

7. MARTINEZ REYES, DA

Monolingual and Multilingual Performance Differences on Tests of Unstructured Visuoconstruction Ability and Contextual Memory

8. RABIN, LA

Trends in the Neuropsychological Assessment of Ethnic Minorities: A Survey of Neuropsychologists in the U.S. and Canada

9. RITCHIE, D

Selection Criteria for Clinical Neuropsychology Internships

10. SAEZ, P

The Impact of Sociocultural and Neurological Variables on Nonverbal Neuropsychological Test Performance Among Latino/a Epilepsy Patients

11. SCOTT, BM

Determination of Suspect Effort: Primarily Spanish-Speaking TBI Patients and the Test of Memory Malingering

12. THAMES, A

Neuroimaging & neuropsychological assessment among African Americans: The impact of literacy

Cognitive Intervention/Rehabilitation

13. BELCHIOR, P

The Association of a Multidimensional Construct of Useful Field of View With Standardized Visuospatial and Non-Visuospatial Measures

14. BOGDANOVA, Y

Trial of Cognitive Rehabilitation in Anoxic Brain Injury

15. CAHILL, LS

Maximising Memory: An Interdisciplinary Pilot Project Of Group Self-Management For Those With Mild Cognitive Impairment

16. CARSTENS, J

The Effects of Goal Management Training in Undergraduate Students with Problems in Attention Functioning

17. CONSTANTINOU, M

CBT improves cognition and reduces amount of seizures in children

18. FAHMI, H

Web-based Delivery of a Cognitive Training Program

19. FERLAND, MB Errorless Learning and Electronic Cueing Device Use for Training Daily Living and Diabetes Management Routines in a Young Woman with Initiation and Episodic Memory Impairments Following an Acquired Brain Injury
20. FYOCK, C Increased Strategy Use is Associated with Subjective Memory Improvement Following Cognitive Rehabilitation
21. GRIFFITHS, G Same Complaint, Different Profiles: An Examination of Reading Comprehension and Recall Deficits in Individuals with Acquired Brain Injury
22. GRILLI, MD Self-Knowledge and the Self-Imagination Effect (SIE) in Free Recall: Implications for Cognitive Rehabilitation and Memory Disorders
23. HUNT, A Executive Function, Self-Regulation, and Attribution in Acquired Brain Injury: A Scoping Review
24. MACHADO, MA Neuropsychological cognitive-linguistic analysis post-intervention program in daycare educators and children in Brazil
25. MCCANN, S An Abbreviated Version of an Established Cognitive Remediation Program (CRP) Improves Alternating Attention Abilities in Children with Neurological Disorders
26. MILLER, LA Evaluating Memory Training in Patients with Stroke
27. NAOYUKI, H Effects of Intensity of Transient Aerobic Exercise on Cognitive Function
28. O'DELL, KM Defining Meaningful Change in Supervision Level Using the Supervision Rating Scale: A Comparison of Two Methods
29. SIMARD, M Results of a 24-week Randomized Cross-Over Controlled Study on Cognitive Training of Instrumental Activities of Daily Living in Alzheimer's Disease
30. STAMENOVA, V Recollection training in healthy older adults
31. SUMOWSKI, JF Retrieval Practice as a Memory Intervention in Multiple Sclerosis
32. WHITMAN, LA Feasibility of a Non-Pharmacological Working Memory Intervention (Cogmed) in Children with Epilepsy
33. WILSON, R The Effects of Distractors on Working Memory
34. YUTSIS, M The effect of Cognitive Rehabilitation Delivered via Telemedicine on Functional Independence in Persons with Severe Traumatic Brain Injury: A randomized Clinical Trial
35. GREMILLION, AL The Importance of Affective Stabilization in Neurorehabilitation
- Memory Functions**
36. NEMETH, DG Using Music to Enhance Memory Recovery in Outpatient Neurorehabilitation
37. CRANE, J Memory for Scenes and Designs: Medial Temporal-Lobe Contributions
38. DÉJOS, M The identification of the four cognitive patterns with a unique virtual tool: a pilot study
39. ERICKSON, RL Visual Memory in Agenesis of the Corpus Callosum: Faces and Visual Reproduction
40. FAMA, R Striatal, Limbic, and Cerebellar Substrates of Visuomotor Learning in Alcoholism+HIV Infection Comorbidity
41. HEMANI, S Complementary hippocampal-caudate interactions during navigation of well-learned and novel environments
42. IAMPIETRO, M Executive and Encoding Aspects of Memory in Patients with Epilepsy as Assessed by a Novel Scoring System of the 15-item Biber-Glosser Figure Learning Test
43. JORDAN, LL Cognitive Factors Contributing to Verbal Memory Performance in a Pediatric TBI Sample
44. LANE, EM The Relationship Between White Matter Fiber Length, Cerebrovascular Disease Markers, and Memory Performance in Older Individuals
45. LECOMTE, SA Impact of cue-action strength of association in prospective memory performance in mild Alzheimer's disease patients
46. LOGAN, DM Memory and Attention in Pregnant/Post-Partum Women: Neuropsychological Findings
47. LOUGHAN, AR TOMM Performance in Children with an Intellectual Disability
48. MANSOOR, Y Dimensionalizing the Serial Digit Learning Test Using Baddeley's Model of Working Memory
49. MATTHEWS, MA Person-Identity Semantics Predicts Cognitive Decline in Cognitively Intact Older Participants
50. MCKEEVER, JD Associations Between Self-Reported Prospective Memory Problems and Objective Test Results in Multiple Sclerosis
51. MENDIZABAL, S Developmental differences of visual short-term memory
52. NOVITSKI, J Metamemory for Famous Names in MCI
53. PARADIS, V Brain Regions Involved in Retrospective and Prospective Memory Retrieval
54. PRESTON, T Neurocognitive Correlates of Prospective Memory in Clinically Referred Children
55. PRESTON, T Psychosocial and Behavioral Correlates of Prospective Memory in Clinically Referred Children
56. RASKIN, S Methods of Measurement of Prospective Memory
57. REYNOLDS, EW Imagining is Believing: The Imagination Inflation Effect in Adults With Alzheimer's Disease
58. SAMARINA, V Executive Functioning and Working Memory as a Unitary Construct are Associated with Delayed Memory in Older Adults
59. SEIDEL, CA Cerebral Ischemic Disease, Carotid Stenosis, and Episodic Memory in Older Adults with Aortic Stenosis
60. SIMARD, S Effect of cue salience in event-based prospective memory in patients with a ruptured cerebral aneurysm: role of executive functions
61. TANNER, JJ Verbal Learning Profiles and Entorhinal Cortex Volume in Parkinson's Disease
62. TROYANSKAYA, M Correlation Between Persistent Memory Impairment Following Mild, Blast-Related TBI and PTSD Symptoms in OEF/OIF Service Members and Veterans

63. WALD, DM The Relationship between Visual Spatial Processing, Attention, and Visual Memory
- Multiple Sclerosis/ALS/Demyelinating Disorders**
64. BASSO, MR The CMDI Predicts Depression Diagnosis but not Neuropsychological Dysfunction in People with MS
65. MILLER, A Depressive Symptom Dimensions and Neuropsychological Impairment in Multiple Sclerosis
66. BEIER, ML Is There a Relationship Between Alcohol and SDMT Performance?
67. BEIER, ML Alcohol Use in an Outpatient American MS Sample
68. BERARD, J Neuroimaging Correlates of Cognitive Change Following Immunoablative Therapy and Bone Marrow Transplant in MS: A Pilot Study
69. BERARD, J Cognitive Fatigue in Individuals with Multiple Sclerosis Undergoing Immunoablative Therapy and Bone Marrow Transplant
70. WALKER, LA PASAT Performance Before and After Immunoablative Therapy and Bone Marrow Transplant in Individuals with MS
71. BERRIGAN, L Cognition in Early Relapsing-Remitting Multiple Sclerosis: Consequences May Be Relative to Working Memory
72. BERRIGAN, L The Performance of Individuals with Multiple Sclerosis and Controls on the Symbol Digit Modalities Test and the Paced Auditory Serial Addition Test: More than Just Processing Speed
73. DAGENAIS, E Subjective and Objective Prospective Memory Measures in Patients with Multiple Sclerosis
74. ENSLEY, M The Differential Effects of Disease Severity on Cognition, Depression, and Fatigue in Multiple Sclerosis
75. EPPIC, J Clock Drawing in Multiple Sclerosis: Relationship with Executive Functioning and Episodic Memory
76. FARRELL, EM Relationship of Anxiety, Depression, and Information Processing Speed for Individuals with Multiple Sclerosis (MS) at an Outpatient Clinic
77. FORD-JOHNSON, LM Modafinil for Improving Attention in Multiple Sclerosis
78. FUCHS, K The TVSC Differentiates Healthy Controls and MS Patients
79. FUENTES, A Relationship Between Memory Outcomes and Normalized Regional Brain Volumes in Pediatric-Onset Multiple Sclerosis Patients
80. GENOVA, HM Decline in Trail-Making Performance Correlates with White Matter Integrity Reduction in MS
81. GOVEROVER, Y Task meaningfulness and cognitive impairment affect self-generation in improving learning and memory in Multiple Sclerosis
82. GOVEROVER, Y Intellectual and online awareness in Multiple Sclerosis
83. GROMISCH, ES Using a Highly Abbreviated CVLT-II to Detect Verbal Memory Deficits: An ROC Analysis of Three MS Cohorts in the US
84. HOOCS, MM Executive Function Mediates the Relationship Between Disease Severity and Disinhibition and Euphoria in Multiple Sclerosis
85. MORSE, C Unemployment in Multiple Sclerosis: A Novel Cognitive Perspective
86. NOLL, K Test-Retest Reliability and Practice Effects of the Symbol Digit Modality Test in Patients with Demyelinating Disease
87. NOLL, KR Relationships between Retinal Nerve Fiber Layer Thickness and Cognitive and Motor Functioning in Multiple Sclerosis
88. O'DONNELL, EH Pediatric Demyelinating Disease: A Description and Comparison of Neuropsychological Profiles of Patients with MS, CIS and ADEM
89. RADOMSKI, AD Decision Making with Explicit Rules in Patients with Multiple Sclerosis
90. RANDOLPH, JS Cigarette Smoking and Cognition in Multiple Sclerosis
91. RANDOLPH, JJ Correlates Of Real World Compensatory Cognitive Strategy Use In MS
92. REILLY, EJ Exploring the Relationship between Pain and Altered Task Induced Deactivation of the Default Mode Network in Patients with Multiple Sclerosis
93. ROBERG, BL Perceived Memory Difficulties Are Associated With Performance on Tests of Executive Functioning in MS
94. TILL, C Clinical and MRI Predictors of Cognitive Changes in Children and Adolescents with Multiple Sclerosis
95. VARGAS, GA Specific Regions of Gray Matter Atrophy Related to Depression in Multiple Sclerosis

4:45–6:15 PM**Symposium 1: Social Outcomes in Pediatric Traumatic Brain Injury: Perspectives from Social Neuroscience and Developmental Psychology****Chair: Keith Yeates****Discussant: Skye McDonald****Outremont**

1. YEATES, K Social Outcomes in Pediatric Traumatic Brain Injury: Perspectives from Social Neuroscience and Developmental Psychology
2. YEATES, K A Heuristic Model for the Study of Social Outcomes in Childhood Traumatic Brain Injury
3. EWING-COBBS, L Joint Attention after Traumatic Brain Injury in Young Children
4. HANTEN, G Effects of Moderate to Severe Traumatic Brain Injury on Performance by Adolescents in Anticipating Consequences of Actions
5. ANDERSON, V Social Skills 6 Months Following Childhood TBI
6. TAYLOR, H Peer Perceptions of Friendships, Acceptance, and Social Characteristics among Children with Traumatic Brain Injury

4:45–6:15 PM**Paper Session 1: Video, Web, and Computer Technology in Assessment**
Moderator: Robert Roth
Verdun

1. PARIKH, M Consumer Acceptability of Teleneuropsychology
2. RABIN, LA Utilization Rates of Computerized Test Batteries Among Clinical Neuropsychologists in the U.S. and Canada
3. BLOCK, P Computerized Assessment of Cognitive Function: Accessibility and Accommodations for People with Disabilities
4. DUFFIELD, T A Comparison of Paper-Pencil Versus Video-Conferencing Administration of a Neurobehavioral Screening Test
5. HENRY, M The Virtual Stroop : A Novel Approach to Assess Impulsivity

5:00–6:00 PM**Invited Address: Reconsidering the Role of White Matter Disease in Cognitive Aging and Dementia**
Mont-Royal/Westmount**Early Career Award Winner: Adam Brickman**

1. BRICKMAN, A Reconsidering the role of white matter disease in cognitive aging and dementia

6:00–6:30 PM**Poster Symposium: Transdisciplinary Advances in Applied Neuropsychology in Venezuela**
Chair: Marianela Moreno de Ibarra
Salons Fontaine A and B

1. PIÑA, A Transdisciplinary Approach to a Preschooler Case of Attention Deficit Disorder with Hiperactivity (ADHD)
2. PEREZ, A Transdisciplinary Approach to a Teenager Case of Attention Deficit Disorder with Hiperactivity (ADHD)
3. VEGA, L Transdisciplinary Approach to a Case of PDD-NOS
4. GONZALEZ, J Transdisciplinary Approach to a Case of Early Onset Schizophrenia
5. MORENO, MC Transdisciplinary Approach to a Case TBI
6. BARAK, M Transdisciplinary Approach to a Case of Craniopharyngioma with Bilateral Vision Lost

6:15–7:00 PM**Distinguished Career Award Ceremony**
Mont-Royal/Westmount**7:00–8:00 PM****Wednesday Evening Reception**
Ballroom Foyer**THURSDAY, FEBRUARY 16, 2012****7:20–8:50 AM****Thursday Morning Continuing Education Courses**
Refer to CE Schedule for Location**9:00–10:30 AM****Invited Symposium: Frontiers of Cognitive Neuroscience**
Chair: Michael Cole
Mont-Royal/Westmount

1. COLE, MA Frontiers of Cognitive Neuroscience
2. NOBRE, AC How Memory Predicts Perception
3. KNIGHT, RT Prefrontal Cortex and Organized Behavior: Evidence from Neurological and Neurosurgical Patients
4. D'ESPOSITO, M Cognitive and Pharmacological Therapies for Deficits in Cognitive Control

9:00–10:30 AM**Symposium 2: Surviving Prosperity: Metabolic Syndrome and the Brain**
Chair: Andreana Haley
Outremont

1. HALEY, AP Surviving Prosperity: Metabolic Syndrome and the Brain
2. HALEY, AP Metabolic Syndrome and the Brain
3. LERITZ, E The Relationship of Cholesterol to Brain Structure and Cognition in Metabolic Syndrome

4. HASSENSTAB, J Obesity and Insulin Sensitivity: Impacts on Brain Functioning and Outcomes from Successful Weight Loss
5. CHERRIER, MM Cognitive Change during the Midlife years. An examination of midlife risk factors in the Seattle Longitudinal Study

9:00–10:30 AM**Paper Session 2: Brain and Systemic Cancer****Moderator: Sarah Lageman****Verdun**

1. BRINKMAN, T Psychoactive Medication Use and Neurocognitive Function in Adult Survivors of Childhood Cancer: A Report from the Childhood Cancer Survivor Study
2. KRULL, KR Neurocognitive and Physiological Outcome in Survivors of Childhood Acute Lymphoblastic Leukemia Treated with Prednisone versus Dexamethasone
3. ROBINSON, KE Neurocognitive and Psychosocial Functioning of Survivors of Pediatric Brain Tumors: A fMRI Study of Neurobiological and Behavioral Associations
4. CONKLIN, HM Self-Ordered Search as a Probe for Working Memory Impairment among Childhood Brain Tumor Survivors: A Functional Magnetic Resonance Imaging (fMRI) Study
5. KRULL, KR Central Nervous System Integrity in Adult Survivors of Childhood Hodgkin Lymphoma

9:15–10:45 AM**Poster Session 2: ADHD/Learning Disabilities/Language/Autism****Salons Fontaine A and B****ADHD/Attentional Functions**

1. ANTONINI, T Exploring the Relationship between Performance on Computerized Neuropsychological Tasks and Performance on an Analogue Math Task
2. BEAN, J Visual Attention and Lateralization: A Unique Pattern of Attentional Abnormalities in Autism Spectrum Disorders
3. BIERSTONE, D Understanding the Structure of Reaction Time Variability in ADHD using the Ex-Gaussian Distribution
4. BLACK, LC Comparison of Parent-Reported Behavior Difficulties in a Clinical Sample to Attentional Deficits on Neuropsychological Testing
5. BOLAÑOS, ML Differences in Neuropsychological Profile of Combined and Inattentive ADHD Subtype
6. COHEN, ML Parkinson Patients' Impaired Disengagement From Focal Attention Impairs The Allocation Of Global Attention
7. TABAQUIM, MM Attention Deficit and Hyperactivity Disorder: Predictive Value of Diagnostic Criteria
8. DIRENFELD, E Examining the Relationships Between Anterior Cingulate Cortex Morphology and Behavior in a Sample of Spanish Children with ADHD
9. ELLIS, A Executive Functioning Distinguishes Children With Attention Deficit Hyperactivity Disorder and Tic Disorder
10. GUERRERO, M Analysis of the Components of Attention on Simultaneous Performance of Two Tasks
11. HANNA, S Verbal Executive Functioning Disruptions in Adolescents with ADHD
12. MANGUM, R Variant Effects of ADHD and PEA on Frontal Lobe Visual Tasks
13. HOELZLE, J Self-reported ADHD symptom onset and neuropsychological performance: Does age matter?
14. KERNE, VV Social Functioning Variables in ADHD
15. KLAVER, J Anatomical Correlates of Executive Functioning in Children with Attention-Deficit/Hyperactivity Disorder and Developmental Dyslexia
16. KORIAKIN, T Increased Intra-Subject Variability (ISV) in ADHD Differs as a Function of Test Format and Stimulus Modality
17. LYONS USHER, AM Use of Measures of Executive Functioning with Children and Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD)
18. MCKNIGHT, ME Intellectual, Academic, and Neurocognitive Stability of Neuropsychological Findings in School-Age Children with ADHD
19. MIARMI, L Fatigue Enhances Stimulus-Driven Attention
20. MLODNICKA, AE Longitudinal Impact Of Service Use On Neuropsychological Functioning, ADHD Symptom Severity, And Social Skills In Preschoolers With Inattention/hyperactivity
21. NORRIS-BRILLIANT, A A Comparison of Comorbidity in Attention Deficit Hyperactivity Disorder Subtypes in a Low Income Urban Population
22. NORRIS-BRILLIANT, A A Comparison of Cognitive Profiles of Attention Deficit Hyperactivity Disorder Combined Type and Attention Deficit Hyperactivity Disorder Inattentive Type
23. O'BRIEN, KM Examining the Relationship Between Sluggish Cognitive Tempo and Performance on Computerized Neuropsychological Tasks
24. RABINOVITZ, B The Influence of Developing Executive Control on the Relationship Between Temperament and ADHD
25. RENNIE, B A Three-year Longitudinal Study of Change in Working Memory and Response Inhibition in Elementary-aged Children with ADHD
26. SCHOFIELD, HT Comparison of Two Stroop Color-Word Test Interference Scores in Youth With and Without ADHD

27. STAIKOVA, E And the Snowman Melted: Narrative Discourse Profiles of Children with ADHD
28. STERN, M Incremental Validity of the D-KEFS in Diagnostic Assessment of Adolescents with ADHD
29. SUHR, J Stimulant Medication Does Not Normalize Frontal Lobe Hypoactivation in Adult ADHD
30. SUHR, J The Relation of Symptom Subtype to Frontal Lobe Activation in Adult ADHD
31. SUHR, J The Effects of Response Expectancies on Task Performance in Adults Concerned about ADHD
32. SUHR, J Impaired Performance on the TOVA is not Specific to ADHD
33. VASSERMAN, M Neuropsychological Endophenotypes in Developmental ADHD Versus ADHD in Epilepsy
34. WIJK, KL Inhibition, Selective Attention, and Parent Reported ADHD Symptoms in 5-Year-Old Internationally Adopted Children
35. WILLIAMSON, JB Chronic Left Parietal but not Chronic Right Hemisphere Lesions are Associated with an Ipsilesional Spatial Bias
36. HERNÁNDEZ, S Psychological profile and executive functions in adults with Attention Deficit and/or Hyperactivity Disorder
- Learning Disabilities/Academic Skills**
37. HERNÁNDEZ, S Inhibition Assessment in Reading Disabilities: Stroop Test versus Five Digit Test
38. CADAVID-RUIZ, N Relationships Between Visuo-spatial and Reading Skills in a Group of Colombian Children Diagnosed With Poor Reading Garden-variety
39. CADAVID-RUIZ, N Phonological Awareness and the Development of Reading Abilities in a Group of Colombian Children with Non-specific Poor Reading Skills
40. CAO, A Neurobiological Correlates of Sentence Comprehension in Children with Specific Reading Comprehension Disability
41. DEWEY, D One more step: Does walking impact adding?
42. ELIAS, JT Magnitude Representation, Spatial Abilities, and Mathematical Performance in Adults
43. FERNANDEZ, V Developmental dyslexia: Volumetric analysis of regional variability in the cerebellum
44. GABAY, Y Dissociation between Online and Offline Learning in Developmental Dyslexia
45. GREEN, BM Implicit Learning Deficits in Individuals with Dyslexia
46. JANKE, KM Relations between Cognitive Functioning and Early Academic Skills in Preschool-Aged Children with NF1
47. MARTIN, RB Counting Procedural Skill and Conceptual Knowledge in Kindergarten as Predictors of Grade 1 Math Skills
48. MAXWELL, EC Symbolic and Non-symbolic Magnitude Comparison and Math Skills in Adults
49. NAKAGAWA, Y Grammatical difficulties in deaf children: Assessing the comprehension of written Japanese
50. BEGUM, F Prevalence of Learning Disability in School Children from Different Educational System in South India
51. NATHAN, B A Study on the Awareness and Perception of Learning Disability (LD) among Teachers in Tamil Nadu
52. NATHAN, B A Study on the Awareness and Perception of Learning Disability (LD) among Parents
53. MERIGHI TABAQUIM, M Constructive Dyspraxia in Children with Cleft Lip and Palate
54. OSMON, DC Factor Invariance between Credible and Noncredible Performers on the Word Memory Test
55. OSMON, DC Comparison of Effort Tests in Learning Disability Clinic Referrals
56. PINHEIRO CRENITTE, PA Use of Phonological Remediation Program in Developmental Dyslexia
57. PINHEIRO CRENITTE, PA Phonological Remediation Program Contributions in Preschoolers with Risk for Learning Difficulties
58. GONÇALVES, TS Auditory and Visual Memory Deficits related to Dyslexia
59. GONÇALVES, TS Elementary School Teachers' Knowledge Before and After Speech Pathology Orientation
60. PINHEIRO CRENITTE, PA Written Language Alterations and Auditory Processing Performance in Silver-Russell Syndrome: Case Report
61. RIMRODT, S Neurobiological Correlates of Short-Term Memory on an Orthographic Processing Task
62. WILLIAMS, BL Differentiating Attention Deficit Hyperactivity Disorder and Reading Disability with the Delis-Kaplan Executive Function System
63. WILLIAMS, VJ Cortical Thickness in Good and Poor Readers
64. WILSON, LM Word Reading Performance of Children and Adolescents with Neurofibromatosis Type 1 Following Intervention
65. LAMÔNICA, DC Interdisciplinary Neuropsychological Evaluation of children with changes development of communication and learning
- Language and Speech Functions/Aphasia**
66. LAMÔNICA, DC Psycholinguistics skills in diplegic cerebral palsy children
67. LAMÔNICA, DC Infantile development and receptive vocabulary abilities in Brazilian children with Congenital Hypothyroidism
68. AILION, A Longitudinal Analysis of Risk Factors Affecting Reading Trajectories in Children Diagnosed with Pediatric Brain Tumors
69. FALCHOOK, AD Sign Language Aphasia in Probable Alzheimers Disease
70. FAN, Q Thalamus Connectivity: What Can Diffusion Tractography Tell Us about Reading Difficulties in Children?
71. MCENTEE, ML Cognitive Correlates of Qualitative Aspects of Verbal Fluency Performance
72. WEAVER, JR Neuroanatomic Correlates of Clustering on Verbal Fluency Tasks in Healthy Adults

73. SEDO, MA
74. SUNG, K
75. URLACHER, J
76. WILSON, MA
77. CAMODECA, A
78. COURCHESNE, V
79. GREEN, R
80. GUNJI, A
81. LAJINESS-O'NEILL, R
82. LUCE, KE
83. MCMANUS, SM
84. S. MEILLEUR, A
85. MEYER, A
86. MINTAH, K
87. MORIN, K
88. NADER, A
89. NAIR, A
90. PERREAULT, A
91. RICHARD, AE
92. SOUTHWICK, JS
93. SUH, J
94. TAKEICHI, H
95. FAN, SD
96. FAN, SD
97. YOUNG, C
- Two-Minute "Kiddy Words": Five Little Steps in the Lexical Road
A Clustering Analysis of Semantic Associations among Letter-Cued Word Fluency Productions by Healthy Adults
Bilingualism, Metacognition, and the Bilingual Verbal Ability Test (BVAT)
Impaired L1 Output Lexicon Access from Semantics in a Bilingual Italian-English Aphasic Patient
- Autism Spectrum Disorders**
- Automatic and Controlled Processing in the Broad Autism Phenotype
Intelligence Testing in Very Low Functioning Autistic Children: The Good Surprise
Neurological Correlates of Spatial Learning and Memory in Autism
Voice-specific brain responses: a NIRS study
Occipitoparietal Cortical Activation During Gaze Cueing to Faces and Words in Autism Spectrum Disorder (ASD) and Relationship to Measures of Social Cognition: A Magnetoencephalography (MEG) Study
Differences in Social Functioning as a Function of Gender and Severity in Children with Autism Spectrum Disorder
Visual Scanning of Dynamic Affective Stimuli in Autism Spectrum Disorders (ASD)
Magnitude of Perceptual Peaks in Autism is Partially Dependent on the Choice of the Matching Variable: The Example of Pitch Discrimination
Marquette University PEERS Pilot: EEG Coherence and Friendship Qualities in Teens with Autism
Autistic Traits and Romantic Relationships Are Not Incompatible
Face perception in autism : assessing the effect of viewpoint change on identity discrimination
Comparing WISC-III and WISC-IV Profiles in Children with Autism versus Asperger Syndrome
Neuropsychological Correlates of Thalamocortical Connectivity in Autism Spectrum Disorders (ASD)
Visual Shape Perception in Adolescents with Autism
Impaired Prefrontal Gamma Band Synchrony in Autism Spectrum Disorders (ASD) During a Gaze Cueing Task
Verbal Learning and Neurodevelopmental Outcomes in Autism
Evaluation of Language and Pragmatic Abilities in Optimal Outcome Children with a History of Autism Spectrum Disorders through the Use of Narratives
Development of an Efficient Method for Evaluation of Pervasive Developmental Disorders
Location-based Negative Priming in Preschool Autism Spectrum Disorders
- Executive Functions/Frontal Lobes**
- The effective of self-monitoring strategies enhances ability of cognitive and response inhibition among preschool boys
Maternal Reports of Executive Functioning Skills in Children with ADHD, ASD, and Comorbid Presentations

10:45 AM–12:15 PM

1. MEDAGLIA, JD
2. CLAYSON, PE
3. KOUSAIE, S
4. PUENTE, AN
5. DAS, A

Paper Session 3: Cognitive Control Functions
Moderator: David Kaufman
Outremont

- Effective Connectivity Findings Suggest a Role of the Cerebellum in Cognitive Control
Effects of Dopamine Depletion on Cognitive Control and Performance Monitoring
Bilingualism and Cognitive Control in Healthy Older Adults
An fMRI Investigation of Inhibition in Normal and Older Adults with Mild Cognitive Impairment
Evidence for Persistent Recruitment of the Executive Control Network to Maintain Cognitive Performance in Multiple Sclerosis (MS)

10:45 AM–12:15 PM

1. MCCLINTOCK, SM
2. BUTTERS, M
3. CULLUM, M
4. MCCLINTOCK, SM
5. TROSTER, AI

Symposium 3: The Cognitive Effects of Neurostimulation Therapies for the Treatment of Depression
Chair: Shawn McClintock
Verdun

- The Cognitive Effects of Neurostimulation Therapies for the Treatment of Depression
Depression Associated Neurocognitive Effects
Neurocognitive Effects of Electroconvulsive Therapy
Neurocognitive Effects of Magnetic Seizure Therapy
Neurocognitive Effects of Deep Brain Stimulation

11:00 AM–12:00 PM

Invited Address: The Neuropsychology and Cognitive Neuroscience of Episodic Memory: Past, Present, and Future
Speaker: Morris Moscovitch
Mont-Royal/Westmount

1. MOSCOVITCH, M

The Neuropsychology and Cognitive Neuroscience of Episodic Memory: Past, Present, and Future

11:00 AM–12:30 PM

Poster Session 3: Assessment and Psychometrics/Drug and Toxin-related Disorders/Callosal and Laterality
Salons Fontaine A and B

Hemispheric Asymmetry/Laterality/Callosal Studies

1. ABBASSI, E
 2. BIRATH, B
 3. YOUNG, CM
 4. BURTIS, DB
 5. ELIAS, LJ
 6. ELIAS, LJ

Affective Word Priming in the Cerebral Hemispheres as a Function of Stimulus Onset Asynchrony
 Discourse Coherence on the Thematic Apperception Test in Agenesis of the Corpus Callosum
 Awareness of Consequences in Agenesis of the Corpus Callosum
 Constrained Monocular Viewing (CMV) and its Effects on the Autonomic Nervous System
 Native Reading Direction and Corresponding Preferences for Left- or Right-Lit Images
 Estradiol and Functional Cerebral Asymmetries: A Failure to Support the Interhemispheric Decoupling Hypothesis

7. FALCHOOK, AD
 8. FALCHOOK, AD
 9. FALCHOOK, AD
 10. GUIMOND, A
 11. KIPMAN, M

Right Up There: Hemispatial and Hand Asymmetries of Altitudinal Pseudoneglect
 Focal Vertical Attention and Hemispheric-Hand Bias: Who Has the Upper Hand?
 The Upward Bias in Vertical Line Bisection and Quadrisection
 Rey Complex Figure : sensitivity to right hemisphere damage of a new scoring method
 Overvaluing the Left: Right Hemisphere Dominance for Facial Perception as Predicted by Gender and Intelligence

12. KLUTH, JT

Diffusion Tensor Tractography of the Hypoplastic Corpus Callosum in Spina Bifida: Relations with Neurobehavioral Function

13. MCCULLOCH, K

Frequency, Attention, and Phonetic Characteristics That Influence the Right-Ear Advantage for Speech Perception

14. MNEIMNE, M

State and Trait Effects of Emotion on Memory and Hemispheric Asymmetries

Assessment/Psychometrics/Methods (Adult)

15. MNEIMNE, M
 16. AHERN, D
 17. AN, K

Shared and Unique Contributions of Psychopathology to Frontal Lobe Task Asymmetries
 Lowering the Floor on Trail Making Test Part B: A New Scoring Metric
 Poor Effort and the Neuropsychological Experiment: Findings from A Healthy Undergraduate Research Pool

18. JEFFAY, E

Cognitive Variability in High-Functioning Individuals & Its Implications for the Practice of Neuropsychology

19. BAIRD, AD

The Independent Living Scales In Canadian Older Adults Without Cognitive Complaints

20. BENOIT, S

Assessment of Semantic Memory through Famous Person Knowledge among an Aging French-Quebecer Population

21. BEZDICEK, O

Czech Version of the Trail Making Test Normative Data is not Equivalent to the American Version

22. BUCHTEL, H

Does the instruction "Do not lift your pencil" affect times for the Trail Making Test?

23. BUTLER, B

The Vertical Flanker Task: A Reasonable Alternative

24. CARLOZZI, N

Developing patient reported outcome measures of environmental factors affecting participation in medical rehabilitation

25. CARTER, K

An Alternate Form of the Texas Card Sorting Test: A Pilot Study

26. CELINSKI, MJ

Is Malingering the Same as Poor Effort?

27. CHERTKOW, H

In Mild Cognitive Impairment, Does the Severity of Impairment on the MoCA (Montreal Cognitive Assessment) Predict Progression to Dementia?

28. DEAN, PM

Reconsidering the "what am I wearing and holding?" item on the Mattis Dementia Rating Scale-2

29. DELGADO, A

Using the Rasch Model to Test the Psychometric Quality of Emotion Recognition Items

30. DOANE, BM

Relationship between MMPI-2-RF Somatic/Cognitive Scales and Neuropsychological Functioning

31. DONAGHY, S

Relative Utility of the Wechsler Test of Adult Reading (WTAR) and OPIE-3 in Predicting Premorbid Intelligence Using the WAIS III

32. DONAGHY, S

Comparison of Three Models Generated by the Test of Premorbid Functioning (TOPF) to Predict Premorbid Intellectual Abilities

33. DONOVICK, PJ

Raven Standard Progressive Matrices: Faster is not Better

34. DOUGLAS, A

Measuring incidents of harm in people with dementia after hospital discharge

35. FREEDLAND, A

Test-Retest Reliability on the Rey-Osterrieth Complex Figure Test in a Sample of Parkinson's Disease Patients Compared to Normal Controls

36. GLASS UMFLEET, L

Thirty-second Transcription Rates on WAIS-IV Coding

37. GROSCHE, MC

A New, Quick and Cost Effective Coding Test: The Texas Assessment of Processing Speed (TAPS)

38. HANE, L

Patterns of Performance Across Trials of the PASAT as a Predictor of Brain Injury Severity

39. HEATON, RK

The NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox): Validity of Composite Scores for the Cognitive Function Battery in Adults

40. WEINTRAUB, S The NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox): Validity of the Cognitive Function Battery in Adults
41. HUBLEY, AM Hubley Depression Scale for Older Adults (HDS-OA): Reliability, Validity, and a Comparison to the Geriatric Depression Scale
42. JOHNSON, CP Variations on a Paradigm: Relationships Between Common Verbal List Learning Tests
43. KANE, KD Naming Test of the Neuropsychological Assessment Battery: Validity and Receiver Operating Characteristic Curves
44. KANE, K Validity and ROC Curve Analyses of the Brief Visuospatial Memory Test, Revised (BVRT-R)
45. KESSELS, RP The Location Learning Test – Revised Edition: Normative Data and Validation in Patient Groups
46. KIMPTON, T Does Preparation Outside of the Lab Facilitate the Simulation of Mild Traumatic Brain Injury?
47. KLEMAN, V The Influence of Verbal Mediation on WAIS-IV Matrix Reasoning
48. LANGLOIS, R Assessing Memory for Transient and Enduring Public Events: A New Promising Tool
49. LAUNEANU, M Does the Total Score Make Sense? Factor Structure of the Geriatric Depression Scale-15 (GDS-15)
50. MACE, L Measuring Simulation Sickness During Virtual Reality Driving in Neurological Populations
51. MASON, LH Differential Sensitivity of the MMPI-2-RF Validity Scales to Random Responding and Overreporting of PTSD Symptoms
52. MILLER, D WAIS-IV and WMS-IV in Older Adults
53. MOORE, PS From Basic to Clinical Science: Translating Neurocognitive Measures to Understand the Cognitive Effects of Electroconvulsive Therapy
54. NOVITSKI, J Sensitivity and Specificity of the RBANS in Mild Cognitive Impairment
55. PASTOREK, NJ Validation of Embedded Measures of Symptom Validity in the Neurobehavioral Symptom Inventory
56. PYUN, S A Study Of Development And Standardization Of Korea University Naming Test (KUNT)
57. RABIN, LA Assessment Practices of Clinical Neuropsychologists in the U.S. and Canada: A 10-Year Follow-Up Survey
58. RAHAYEL, S Validity of the Montreal Cognitive Assessment to Detect Mild Cognitive Impairment in Chronic Obstructive Pulmonary Disease
59. RIORDAN, P Comparison of Computer Graphics Tablet and Paper-and-Pencil Administrations of the Rey-Osterrieth Complex Figure Test
60. SCHWAB, ZJ Disentangling Emotional and Cognitive Intelligence
61. SONG, CH Time is of the Essence: The Design Organization Test as a Valid, Reliable, & Brief Measure of Visuospatial Ability
62. TAM, JW The Role of Processing Speed in the Brief Visuospatial Memory Test (BVRT)
63. UKUEBERUWA, D Identifying Coping Style Factors in Multiple Sclerosis
64. UMFLEET, LG Parkinson's Disease Normative Study: Normative Data for Commonly Used Clinical Neuropsychological Measures in 379 PD Patients
65. UMFLEET, LG Comparison of Nondominant and Dominant Hand Performances on the WMS-IV Visual Reproduction Subtest
66. VANNORSDAL, TD Normative Data for an Expanded Qualitative Verbal Fluency Scoring System
67. WALDRON, EJ Is reliable change different for individuals with brain damage? A comparison of neurologically stable brain damaged patients with normal controls
68. WEISSBERGER, G Which Neuropsychological Tests Are Sensitive to Future Alzheimer's Disease Progression Across Cultural Groups?
69. WHEARTY, K Emotional Response to Verbal Drug Cues: Toward the Development of a Drug Word Bank for Neuropsychological Testing
- Assessment/Psychometrics/Methods (Child)**
70. ATKINSON, T Predicting Attention-Deficit/Hyperactivity Disorder Using Computerized Performance Tests
71. BAUM, KT Measurement of Intelligence in Children and Adolescents with Autism Spectrum Disorder: Factors Affecting Performance
72. DAY, LA Feasibility and Initial Validation of a Modified Signed Paired Associates Test for Deaf Children
73. TABAQUIM, MM Neuropsychologic Evaluation of Children with Cleft Lip and Palate
74. DOTY, ND An Ecological Model of Child Neuropsychological Assessment: Integrating Cognitive, Psychiatric, Academic, and Family Factors
75. DROUIN-GERMAIN, A Sense of Presence and Performance in ClinicaVR: Classroom-Stroop
76. ELZINGA, B Neuropsychological and Behavioral Correlates of the Inattentive/Overactive Profile in Internationally-Adopted Children
77. ERTELT, TW Neuropsychological, Academic Achievement, and Behavioral Differences Between the Child Behavior Checklist Pediatric Bipolar Disorder Profile, Attention-Deficit/Hyperactivity Disorder, and Emotionally Normal Controls
78. GONZÁLEZ-PÉREZ, P Adaptation of the Neuropsychological Test of Learning and Visual Memory (DCS) in an Child Spanish Population
79. GREEN, R Measuring Classroom-related Inattention in a Virtual Environment
80. HARGRAVE, DD CVLT-C Recognition Discriminability as an Embedded Validity Indicator After Pediatric Mild Traumatic Brain Injury
81. ISQUITH, PK Improving Concussion Assessment in Children with Symptom Reports and Test Performance
82. MCCURDY, MD Classification of ID Using the WISC-IV: FSIQ or GAI?

83. MCGILL, C Tracking Recovery From Concussion With a Monitoring Version of the Behavior Rating Inventory of Executive Function (BRIEF)
84. MCKNIGHT, ME Stability of Repeat Neuropsychological Assessment Profiles in Children with Dyslexia
85. SADY, MD Factor Analysis of the Post Concussion Symptom Inventory (PCSI) for Children Ages 5-12
86. SESMA, HW Parent and Teacher Ratings of Executive Function Are Differentially Related to Performance-based Measures of Attention and Working Memory
87. WAHLSTROM, D Validity of New WPPSI-IV Working Memory, Processing Speed, and Inhibitory Control Subtests Using Factor Analytic Techniques
88. ZIMMERMAN, E Proposed Score Adjustment Formula for California Verbal Learning Test-Children Version Executive Functioning Process Scores
- Drug/Toxin-Related Disorders (Including Alcoholism)**
89. GONZALEZ, R Decision-Making Performance Influences the Relationship between Amount of Cannabis Use and its Negative Consequences
90. GONZALEZ, R Decision-Making Influences the Relationship between Cannabis Harm Perception and Negative Consequences Reported from its Use: Preliminary Findings
91. KRENGEL, M Gulf war illness: A meta-analytic review of cognitive findings
92. LEBLANC-MENZIES, S Smoking in Depression: Associations with Cognition and Cognitive Risk Factors for Suicide Attempt
93. MARSHALL, DF The Impact of Substance Use Disorder on Cognitive Functioning in Euthymic Bipolar Patients
94. PAXTON, J Neurocognitive performance in drug dependent males and females with PTSD symptoms
95. PAXTON, J Amphetamine dependence is associated with greater impairment in neurocognitive aspects of impulsivity than heroin dependence
96. REED, B An Association of Chronic Low-Level Hydrogen Sulfide Exposure With Psychomotor Speed
97. VASSILEVA, J Neurocognitive Impulsivity in Abstinent Heroin and Amphetamine Users
98. WEBER, E Neurocognitive Deficits are Associated with Risk of Unemployment Among Methamphetamine Dependent Adults

12:00–1:30 PM**Thursday Lunchtime Continuing Education Courses
Refer to CE Schedule for Location****1:30–3:00 PM****Invited Symposium: Applied Memory and Hippocampal Functioning:
Effects of Age and Disease
Chair: Ramona Hopkins
Mont-Royal/Westmount**

1. HOPKINS, RO Applied Memory and Hippocampal Functioning: Effects of Age and Disease
2. KIRWAN, B Pattern Separation Processes in the Hippocampus: Evidence from Amnesia
3. STARK, CE Where did I put my keys? Tales from the hippocampus for anyone over 30
4. BRICKMAN, AM Considering the contributions of hippocampal and cerebrovascular dysfunction in Alzheimer's disease
5. HOPKINS, RO Life after Critical Illness: Where did my memory go?

1:30–3:00 PM**Symposium 4: Transdisciplinary Collaboration Between Neuropsychology
and Speech-Language Pathology
Chair: Alexander Quiros
Outremont**

1. QUIROS, AE Transdisciplinary Collaboration Between Neuropsychology and Speech-Language Pathology
2. CASTILLEJA, N The Role of Speech Language Pathologists in Transdisciplinary teams
3. SCHAMBER, W Tools Used by Speech-Language Pathologists to assess Audition
4. KIMBELL, A Collaborating with Speech-Language Pathologists in Medical and School Settings
5. QUIROS, A Tools Used by Speech-Language Pathologists to Assess Language

1:30–3:30 PM**Symposium 5: In Memoriam: A Neuropsychological Appreciation for the
Life of Byron P. Rourke
Chair: Ken Adams
Verdun**

1. ADAMS, KM In Memoriam: A Neuropsychological Appreciation for the Life of Byron P. Rourke

1:45–3:15 PM**Poster Session 4: Cancer/Emotional Processes/Psychopathology
Salons Fontaine A and B****Cancer**

1. AASE, DM Preoperative and Early Postoperative Cognitive Functioning in Patients with Primary Brain Tumors

2. ARONOVITCH, B Verbal Learning Strategy Following Treatment of Acute Lymphoblastic Leukemia (ALL) in School-Age Children
3. DORFMAN, A A Study of the Acute Effects of Chemotherapy on Neurocognitive Function Among Pediatric Cancer Patients
4. EDELSTEIN, K Self-Reported Neurocognitive Concerns and Neuropsychological Test Performance in Adult Brain Tumor Patients
5. FITZGERALD, KM Primary Central Nervous System Lymphoma: Disease and Treatment-Related Effects on Neurocognitive Functioning
6. GOPIN, CB Differential pattern emerges on Continuous Performance Test: Comparison between children treated for Acute Lymphoblastic Leukemia and those diagnosed with Attention-Deficit/Hyperactivity Disorder
7. GRIGSBY, J Breast cancer alone is not an independent risk factor for cognitive impairment
8. HEINKS-MALDONADO, TH Off to a Bad Start: Attention and Memory Impairment in Children with Brain Tumors before Medical Intervention
9. HILE, S Neurocognitive Deficits and Parental Adjustment Predict Functional Impairment in Acute Lymphoblastic Leukemia and Lymphoma: A Pilot Study
10. HILE, S Detecting Patterns of Missingness in Pediatric Clinical Trial Data
11. HOWARTH, RA Examining the Value of Structural Neuroimaging in Predicting Response to Methylphenidate among Childhood Cancer Survivors
12. JAYAKAR, R Normal Semantic Clustering Despite Verbal Memory Impairment in Long Term Survivors of Pediatric Brain Tumors
13. KARLSON, C Brief Neurocognitive Screening For Pediatric Brain Tumor Patients
14. KESLER, S Abnormal Cortical Networks Following Breast Cancer and Chemotherapy
15. KIMBERG, C Concordance Between Parent and Child Behavioral Ratings and a Continuous Performance Test in Survivors of Childhood Acute Lymphoblastic Leukemia
16. KING, TZ The Moderating Role of Processing Speed in Predicting Adaptive Living Skills in Adult Survivors of Childhood Brain Tumors
17. LUXTON, J Use of the Attention Network Test in survivors of childhood acute lymphoblastic leukemia
18. LUXTON, J Use of the N-Back task to assess working memory in survivors of childhood acute lymphoblastic leukemia
19. MOLZON, E Child Executive Functions and Parenting Factors in Survivors of Childhood Acute Lymphoblastic Leukemia
20. MONTOUR-PROULX, I Effects of Triple Intrathecal Therapy on Working Memory Functioning in Survivors of Acute Lymphoblastic Leukemia: Preliminary Results from a Canadian Multi-Centre Study
21. OLDHAM, SD Domain-specific Cognitive Performance Among Adult Survivors of Cancer Treated with Chemotherapy: A Meta-analysis of Prospective, Longitudinal Studies
22. PARSONS, M Processing Speed and Fatigue After Adjuvant Chemotherapy for Breast Cancer
23. PATWARDHAN, SY Assessment of Cognitive and Neurobehavioral Effects of IFN- α Treatment among Patients with Chronic Myelogenous Leukemia
24. WALSH, KS Neurocognitive Trajectory in a Case of Pediatric Paraneoplastic Limbic Encephalopathy
25. WONG, AL Glucose as a Predictor of Neurobehavioral Dysfunction in Cancer Patients

Emotional Processes

26. ABEARE, C The Emotion Word Fluency Test: Characterizing Performance in Healthy Young Adults
27. BONNER, S Scanner Noise Impacts Attentional Performance and Self-Reported Affect
28. BRIGGS, G Multimodality of Measures Increases the Validity of Studies Examining the Neurophysiology of Pain and Emotions
29. BURTON, L Verbal Fluency, Personality, and Gender
30. BURTON, L Gender, Personality, and Perception of Vocal Emotion
31. BURTON, L Effect of Prenatal Androgen on Adult Personality: Greater Openness with More Female-Typical 2D:4D Digit Ratios
32. DELDONNO, S The Influence of Cognitive and Emotional Intelligence on Performance on the Iowa Gambling Task
33. FINE-FOSTER, E Deconstructing the Psychological Components of Emotional Decision Making and their Relation to the Suicide Continuum
34. GARON, M Induced mood influences visual treatment of threatening stimuli
35. GRIGOROVICH, A Relationship Between Neuropsychological Functioning And Severity Of Depression Following Electrical Injury
36. HAASE, BD Angry Error Bias in Major Depression is Associated with Subgenual Cingulate Hyperactivation
37. HAMILTON, JR Differential Visual and Auditory Emotion Processing Capabilities in Children
38. JENKINS, LM Emotional Reactivity Following Surgery to the Prefrontal Cortex
39. JENKINS, LM Perception of Emotion in Patients Following Surgery to the Prefrontal Cortex
40. KILLGORE, WD Emotional Intelligence Correlates with Somatic Marker Circuitry Responses to Subliminal Cues of Facial Trustworthiness
41. KILLGORE, WD Trust Me! Neural Correlates of the Ability to Identify Facial Trustworthiness
42. KILLGORE, WD Sleep Deprivation Degrades Recognition of Specific Emotions
43. KIPMAN, M The Insightful Yet Bitter Comedian: The Role of Emotional versus Cognitive Intelligence in Humor Appreciation

44. KOLB, A Correlations Between MMPI-2 Clinical Scales and RBANS Indices
 45. KOVEN, NS Selective Attention, Memory, and Alexithymia: Performances on an Emotional Stroop Task and WMS-III Subtests
 46. KUMFOR, F Reduced Emotional Enhancement of Memory in Frontotemporal Dementia
 47. LITTLE, MM State and Trait Influences on the Emotion Word Fluency Test
 48. LOWE, DA Age Differences in Depressive Symptoms Among Cognitively Intact Older Adults
 49. LUBOMSKI-HALFACRE, MM The Impact of the Lee Silverman Voice Treatment (LSVT) on Facial Expression Frequency in Parkinson's Disease: Preliminary Effects of Emotion and Gender
 50. PUTNAM, MC An Ecological Approach to Characterizing Pediatric-Onset Mood Disorders
 51. STRAND, M Major Depression in Remission and Partial Remission. A Modified Version of the Emotional Stroop Test

Psychopathology/Neuropsychiatry (Other)

52. BENOIT, A Changes in Memory Performance Over a 15-month Period in Relation to Achieving Symptomatic Remission After a First-Episode Psychosis
 53. CONSIDINE, CM Alexithymia Assessed through Auditory-Affective Perception and Interpersonal Problems as Mediators of the Relationship between Trauma and Depression
 54. DAWSON, E Impulsivity as a Predictor of Psychosocial Functioning in Adults with Bipolar Disorder Recently Hospitalized for Acute Mania
 55. DOUGLAS, K Personality Correlates of Risk Taking Behavior on the Balloon Analogue Risk Task
 56. ESTEVIS, E Self-Reported Symptoms of Depression and Neuropsychological Function in Inpatients: A Comparison of Two Depression Indices
 57. HAMMAR, A Cognitive Functioning in First Episode Depression
 58. HOOPER, SR Neuropsychological Functioning of Young Adults with Adolescent Limited versus Life Course Persistent Substance Use Disorder (SUD)
 59. IP, RY Clinical Features of the Neuropsychiatric Patients
 60. LONG, EA Relationship between Family Environment and Emotional Processing in Adolescents at Risk for Bipolar Disorder and with Bipolar Disorder
 61. MCKENNA, BS Failure to Deactivate Default Mode Regions during Working Memory in Euthymic Bipolar Patients
 62. MORENO DE IBARRA, M Transdisciplinary Advances in Applied Neuropsychology In Venezuela
 63. NELSON, A Neurocognition and Social Functioning in Depressed Inpatients
 64. PONGRACIC, SJ Executive Function Abilities in Young Adults with Obsessive-Compulsive Disorder
 65. ROBINSON, JS A Neurocognitive Profile of a Sample of PTSD Diagnosed Individuals
 66. ROBINSON, JS ERPs during Emotion Regulation Task Affected by Symptoms of Dissociation in PTSD Patients
 67. BLAISDELL, J Patterns of Serial Position Recall Effects in a Sample of PTSD Diagnosed Individuals
 68. RODRIGO, AH A Near-Infrared Spectroscopy Study of Response Control in Borderline Personality Disorder
 69. ROSSO, IM 1H-MRS of Glutamate and GABA Metabolism in the Anterior Cingulate of PTSD Subjects
 70. SCHEINER, D The Contribution of Posttraumatic Stress Disorder to Explicit Verbal Learning and Memory Performance in Major Depression
 71. THAMES, A Depression strongly predicts decision-making deficits after controlling for executive dysfunction
 72. WALKER, SJ Depression and Neuroticism: State and Trait Effects on Error Monitoring and Reactivity
 73. ZIMAK, EH The Physiology of Subclinical Psychopathy
 74. ZIMAK, EH Neuropsychological Underpinnings of Subclinical Psychopathy

Psychopathology/Neuropsychiatry (Schizophrenia)

75. BARROSO, J Action Fluency Impairment in Schizophrenia
 76. COBIA, D Multimodal Imaging Reveals Compensatory Neural Mechanisms in the Maintenance of Neuropsychological Performance in Schizophrenia
 77. DOYLE, AE Relevance of genetic copy number variants to a pediatric neuropsychology clinic
 78. GARLINGHOUSE, M Subjective Ability to Inhibit Impulses is Related to Cortical Thickness of Frontal Regions in Schizophrenia
 79. GICAS, K Cognition as a Predictor of Long-Term Functional Outcomes in First-Episode Psychosis: The Moderating Effects of Substance Use
 80. GOULD, F Predictors of the Accuracy of Self Assessment of Functioning in People with Schizophrenia
 81. HAWCO, C Patterns of Neurocognitive Deficits in People with Psychosis: Evidence for generalized and domain specific deficits
 82. JOHANNESSEN, JK Evaluation of Learning Potential as a Predictor and Outcome of Cognitive Remediation in Schizophrenia
 83. KAO, P Exosomal miRNA profiling in prefrontal cortices of patients diagnosed with bipolar disorder and schizophrenia
 84. LAKIS, N ERP Scalp Topography of Emotional Picture Recognition in Schizophrenia Men and Women
 85. LAVOIE, M Social cognition impairments in parents of patients with schizophrenia
 86. OJEDA, N Cognitive Reserve as a Moderator of Outcome in Chronic Schizophrenia
 87. OJEDA, N Cognitive Explanations for Discrepancies Between Objective and Subjective Measures of Functional Outcome in First-Episode Psychosis: Insights from Cognitive Rehabilitation
 88. REILLY, JL Deficits in behavioral response inhibition among unmedicated first episode schizophrenia patients

89. ROSEBERRY, JE Schizophrenia Patients Show Practice Effects on the MCCB Comparable to those Observed in Psychiatrically Healthy Controls
90. BOISSEAU, E Theory of Mind in Paranoid Schizophrenia: What are we Measuring?
91. SCHERZER, P Lessons from Cognitive Mediators of Theory of Mind Performance in Paranoid Schizophrenia
92. VANNORSDALL, TD Word and Design Fluency Show Different Patterns of Association with Cortical Thickness in Adults with Schizophrenia and Healthy Controls
93. WANG, Y An Exploratory Study of Schizotypy Traits and Empathy Performances in Chinese College Students

3:15–4:45 PM**Symposium 7: Considerations for Structural Neuroimaging in Neurodegenerative Disorders****Chair: Catherine Price
Outremont**

1. PRICE, C Considerations for Structural Neuroimaging in Neurodegenerative Disorders
2. STEBBINS, G Application of Diffusion Tensor Imaging in Alzheimer's Disease and Mild Cognitive Impairment
3. MARECI, T Imaging the White Matter Structure of the Brain with Diffusion-Weighted Magnetic Resonance
4. TANNER, JJ Fiber Tracking Alexander, DeLong & Strick Circuits: Considerations for Reliability and Applications to Neurodegenerative Diseases
5. GOLDMAN, J Structural Magnetic Resonance Imaging Markers of Cognitive Impairment and Dementia In Parkinson's Disease

3:30–5:00 PM**Poster Session 5: Epilepsy/Genetics and Genetic Disorders/Medical Disorders (Child and Adult)
Salons Fontaine A and B****Epilepsy/Seizures**

1. BERMAN, R Recall of Faces and Facial Affect during the Wada Test
2. BERRIOS-SIERVO, GM Behavioral Outcomes Following Hemispherectomy in Children With Intractable Epilepsy
3. FALCHOOK, AD Closure in Epilepsy
4. FOSTER, MK Relationship of Executive Function and Working Memory with Recognition of Emotion in Patients with Temporal Lobe Epilepsy
5. GALE, SD Mesial Temporal Sclerosis and Congruent Temporal Lobe Epilepsy: Lateralization predicted by RAVLT and BVMT-R
6. HARGRAVE, DD A Case Study of a Patient with Somatic Delusions Following Left Anterior Temporal Lobe Resection
7. HARRIS, M Verbal and Design Fluency in Left vs. Right Temporal Lobe Epilepsy
8. HAUT, JS Neuropsychological Outcomes after Pediatric Epilepsy Surgery: Children with Intractable Temporal Lobe Epilepsy are at Risk for Declines in Verbal Memory and Language after Left Temporal Lobectomy
9. KEARY, TA Victoria Symptom Validity Test (VSVT) Performance in Patients with Intractable Epilepsy: Replication and Extension of Loring et al. (2005)
10. LEAFFER, E Longitudinal assessment of skill development in children with first febrile seizure
11. MARSH, MC Parent Ratings of Executive Dysfunction in Young Children with Epilepsy – the BRIEF-Preschool Version
12. NAGORSKAYA, I Language Disorders in Children With Symptomatic Epilepsies Associated With Cortical Displasias
13. PATEL, SM Revised Scoring Technique Improves the Clinical Utility of the Intracarotid Amobarbital Procedure (Wada)
14. POTVIN, D A Widening Gap: The Relation between Seizure Frequency and the Intelligence-Achievement Gap in Children with Intractable Epilepsy
15. RITCHIE, D Estimation of Premorbid Intelligence in Children with Intractable Epilepsy
16. SALINAS, CM Understanding Different Mechanisms of Memory and Attention Problems in Children with Epilepsy and ADHD
17. SHENG, X Wada, fMRI, and Cognitive Changes after Temporal Lobe Epilepsy Surgery
18. SZIKLAS, V Improving Neuropsychological Markers in Left Temporal Lobe Epilepsy
19. TUCHSCHERER, VN Executive Dysfunction and Behavior Problems in Children with New Onset Epilepsy
20. URBÁN RUIZ VÍQUEZ, M Emotional Memory in Temporal Lobe Epilepsy
21. WISDOM, N Use of the Health Attitude Survey (HAS) to Detect Patients Experiencing Psychogenic Non-Epileptic Events (PNEE) on a Long-Term Monitoring Unit

Genetics/Genetic Disorders

22. CASNAR, C Fine Motor Abilities in Young Children with Neurofibromatosis-1
23. CHISHOLM, LZ Development of the Quality of Life – Huntington's Disease Scale
24. GERNER, GJ Predictors of Self-injurious Behavior in Lesch-Nyhan Disease: Evidence of Maladaptive Sensation-seeking?
25. SCHRETLEN, DJ Cognitive and Anatomic Brain Differences in a Female Monozygotic Twin Pair Discordant for Lesch-Nyhan Disease

26. GOODRICH-HUNSAKER, NJ The Effect of Age and Molecular Variables on Brain Structure in Adult Female Fragile X Premutation Carriers: A Deformation-Based Morphometry Study
27. JACOBSON, DA Role of Cortisol in Social and Memory Impairments in Individuals with Velocardiofacial Syndrome (VCFS)
28. KLEIN-TASMAN, BP Interrelations among Social Skills, Attention Problems, and Intellectual Functioning in Young Children with Neurofibromatosis-1
29. MURPHY-BOWMAN, SC Personality Characteristics of Adults With Autism and Lesch-Nyhan Disease
30. ROMERO, C Genetic Risk to Violent Behavior and Brain Volume
31. SNOW, J Neurocognitive Characteristics of Joubert Syndrome
32. SOLLMAN, MJ Neuropsychological Performance of Several Siblings with Familial Idiopathic Normal Pressure Hydrocephalus
33. VAURIO, R Cognitive and Clinical Outcomes in Boys with Adrenoleukodystrophy Treated with Lorenzo's Oil
34. YEO, RA Rare Copy Number Genetic Deletions and Complex Human Phenotypes: General Cognitive Ability, Schizophrenia, and Brain Volume
35. BRUNELLE, T The Relationship Between Cerebellar Volume and Executive Functioning in Fragile X-Associated Tremor/Ataxia Syndrome
36. GRIGSBY, J Preliminary Magnetic Resonance Spectroscopy Findings Among Carriers of the Fragile X Premutation
- Medical/Neurological Disorders/Other (Adult)**
37. GRIGSBY, J Low Diastolic Blood Pressure is Associated with Impaired Executive Functioning among Older Persons in the San Luis Valley Health and Aging Study (SLVHAS)
38. BALDWIN, R Stage 1 Hypertension as a Risk Factor for Cognitive Slowing on Measures of Executive Functioning
39. BRENNAN, L Assessment of Activities of Daily Living in Parkinson's Disease: Examination of Physical and Cognitive Task Demands
40. BUTTERFIELD, LC Cognitive predictors of quality of life in Parkinson's disease
41. EARL, SR Neuropsychological, Psychological and Functional Correlates of Tremor vs. Postural Instability/Gait Symptoms in Patients with Parkinson's Disease
42. OBTERA, KM Using the Mattis Dementia Rating Scale to Identify Mild Neuropsychological Deficits in Nondemented Parkinson's Disease Patients
43. FOSTER, S Making a Difference to Outcome: A Qualitative Look at the Various Roles of Neuropsychology in an Acute Inpatient Rehabilitation Setting
44. GALIOTO, R Sleep Problems and Cognitive Function in Morbidly Obese Individuals
45. GARCIA, SL Association Between Sleep Quality and Cognitive Function in Heart Failure Patients
46. GELB, S Factors Associated with Low WMS-IV Brief Cognitive Status Exam Scores in Parkinson's Disease
47. LANGILL, MA Comparing Computerized Cognitive Screening to the MoCA in Parkinson's Disease
48. GONZALES, M Frontal White Matter Perfusion and Memory Performance in Type 2 Diabetes
49. JAYWANT, A The Effects of Normal Aging and Parkinson's Disease on Design Fluency
50. JONES, J Contribution of Apathy and Depression to Global Cognitive Status in 209 Non-Demented Parkinson Patients
51. JONES, J Health Comorbidities, Cognition and Quality of Life in Parkinson Disease : Results from the National Parkinson Foundation Quality Initiative with 1935 Patients
52. KIEWEL, NA Neurobehavioral Effects of Deep Brain Stimulation in a Case of Essential Tremor and Tourette's Syndrome
53. KNECHT, K Additive Effects of Heart Failure and Obstructive Sleep Apnea on Cognitive Functioning
54. KOZORA, E Sleep Abnormalities and Cognitive Dysfunction in Systemic Lupus Erythematosus (SLE)
55. KOZORA, E The Clock Drawing Test is Limited as a Screening Measure in Emphysema
56. MELIKYAN, Z Memory and Executive Functions in Mild and Moderate TBI 3 and 6 Months Post-Injury
57. MILLER, LA Cognitive Profiles in Heart Failure: A Cluster Analytic Approach
58. MILLER, LA Cognitive Effects of Bariatric Surgery at 12 Month Follow-up
59. MINGER, J Identifying Symptoms of Parkinson's Disease That Influence Caregiver Burden
60. PATERSON, TS Examination of the Relationships Between Transplant Effects Questionnaire Measured Worry, and General Symptoms of Anxiety and Depression in Renal Transplant Patients
61. RUPPERT, P Longitudinal Neuropsychological Assessment in a Case of Adult-Onset Hemophagocytic Lymphohistocytosis (HLH)
62. RUSSO, AA Hyperbaric Oxygen in Chronic Stable Brain Injury (HYBOBI): Effects on Processing Speed and Working Memory
63. SINGH, N Subjective Cognitive Complaints in Post-Lyme Disease Syndrome: Effects of Mood Disturbance and Actual Performance Decline
64. STROBER, L The Perceived Deficits Questionnaire (PDQ): Perception, deficit, or distress?
65. SULLWOLD, K Relationship between neuropsychological and behavioral manifestations of executive dysfunction following deep brain stimulation in Parkinson's disease
66. UMFLEET, LG Neuropsychological Test Performance: Effects of Age of Onset in a Non-demented Parkinson's Disease Patient Population
67. WARD, J Predictors of Work Status in Systemic Lupus Erythematosus
68. WISHART, HA Longitudinal Change in Cognition-Related Brain Activity in Multiple Sclerosis

69. WERTHEIMER, JC Fatigue and Apathy in Individuals with Parkinson's Disease with and without Deep Brain Stimulation: Implications for Neuropsychologists
70. YEH, D Insomnia and Attentional Decline in Cognitively Intact Older Adults
- Medical/Neurological Disorders/Other (Child)**
71. CUNNINGHAM, TR Preliminary results from an exercise program targeted at neuro-recovery in pediatric brain tumor survivors treated with cranial radiation therapy
72. GERSTLE, M Neuropsychological Functioning in Sickle Cell Anemia Following Peripheral Blood Stem Cell Transplantation: A Pediatric Case Study
73. HAMPTON, LE Cognitive and Academic Outcomes of Pediatric Rasmussen's Encephalitis Patients With Hemispherectomies
74. HARDY, KK Computerized Cognitive Training for Children with Neurofibromatosis Type 1 (NF1): A Pilot Study
75. HELDER, EJ Cognitive, behavioral, and emotional outcomes in older international adoptees
76. HERNÁNDEZ, S Neuropsychological Assessment of Executive Function in a Case of Dandy-Walker Syndrome
77. HUDEPOHL, M Neuropsychological Patterns in Children with Acquired Cerebellar Lesions
78. IAMPETRO, M A Person-Centered Approach to Understanding Preschool Children with Sickle Cell Disease
79. JANOS, AL Processing Speed and Executive Abilities in Children with Phenylketonuria
80. KHATCHADOURIAN, A Neuropsychological Functioning in Opsoclonus Myoclonus Syndrome: A Case Series
81. KRIVITZKY, LS Executive Functioning across Pediatric Medical Disorders: A BRIEF profile analysis
82. MCNALLY, KA Understanding of Ironic Criticism and Empathic Praise in Children with Arterial Ischemic Stroke
83. MRAKOTSKY, C Long-term Effects of Steroids on Memory and Behavior in Children with Crohn's Disease
84. NOGGLE, C The Neuropsychology of de Morsier Syndrome: A Case Report
85. POWELL, SK Young Children with Congenital Hydrocephalus Demonstrate Early Developmental Deficits with Improvement Post Surgery
86. SCHROEDER, RW A Case Study of an Adolescent with Progressive Neurocognitive Decline Following a Period of Normal Development
87. SPURGIN, A Neuropsychological Impact of Bilateral Cerebral Abscesses in an Adolescent
88. STANEK SELLBOM, K Associations Between Brain Structure and Body Mass Index in Children and Adolescents
89. WIJK, KL Longitudinal Neuropsychological Functioning of Two Female Siblings with 4H Syndrome

Executive Functions/Frontal Lobes

90. EASON, DM The Influence Of Common Medical Illnesses On Executive Functioning And Treatment

Cognitive Intervention/Rehabilitation

91. NASH, K Self Regulation Therapy Alters Frontal-Striatal BOLD Response in Children with Fetal Alcohol Spectrum Disorders
92. HOOFIEN, D Comparisons of the Long Term Effects of Three Comprehensive Neuropsychological Rehabilitation Programs among Patients with Acquired Brain Injuries

Dementia (Alzheimers)

93. POLLARD, K Predicting Degree of Cognitive Decline In Older Adults Using An Index of Cognitive Reserve

3:45–4:45 PM

Invited Address: Fronto-Parietal Interactions in Working Memory: Monitoring versus Manipulation

Speaker: Michael Petrides

Mont-Royal/Westmount

1. PETRIDES, M Fronto-Parietal Interactions in Working Memory: Monitoring versus Manipulation

3:45–5:15 PM

Symposium 6: Binge Drinking and Neurocognition in Youth: Evidence from Cross-sectional and Prospective Neuroimaging Studies

Chair: Krista Medina

Discussant: Susan Tapert

Verdun

1. MEDINA, KL Maximum Binge Drinking Dose Predicts Smaller Left Hippocampal Volumes in Male Emerging Adults
2. MCQUEENY, T Abnormal Cortical Architecture in Binge Drinkers: Unique Gender Effects
3. JACOBUS, J Longitudinal Changes in White Matter Integrity Among Adolescent Substance Users
4. WETHERILL, RR Neuroimaging of Inhibitory Processing Across Adolescence: Effects of Heavy Drinking
5. MEDINA, KL Binge Drinking and Neurocognition in Youth: Evidence from Cross-sectional and Prospective Neuroimaging Studies

5:15–6:15 PM

Birch Lecture: Memory: Looking Back and Looking Forward**Speaker: Brenda Milner**
Mont Royal/Westmount/Outremont

1. MILNER, B

Memory: Looking Back and Looking Forward

FRIDAY, FEBRUARY 17, 2012

7:20–8:50 AM

Friday Morning Continuing Education Courses**Refer to CE Schedule for Location**

9:00–10:00 AM

Invited Address: Social Cognition and the Frontal Lobes: Amazing What Patients Can Teach You if You Just Listen, Observe, Think and Measure**Speaker: Donald Stuss**
Mont Royal/Westmount/Outremont

1. STUSS, DT

Social Cognition and the Frontal Lobes: Amazing What Patients Can Teach You if You Just Listen, Observe, Think and Measure

9:00–10:30 AM

Paper Session 4: Cognitive Aging**Moderator: Adam M Brickman**
Verdun

1. SOLDAN, A
2. MAY, PE
3. EDMONDS, EC
4. BETTCHER, B
5. PAUL, R

ERP correlates of cognitive reserve in healthy older adults
 Longevity Assurance Gene 1's (LASS1) Association with Cognitive and Physical Functioning, Functional Capacity, and Inflammation in Centenarians
 Late Life Cognitive Activity is Associated with Greater Functional Connectivity of the Default Mode Network in Non-Demented Older Adults
 Inflammation is Related to White Matter Integrity and Executive Functions in Healthy Older Adults
 Quantitative Diffusion Tractography Reveals Reduced Frontal White Matter Fiber Lengths in Older Adults

9:15–10:45 AM

Poster Session 6: Behavioral Neurology/Forensic Neuropsychology/Adult and Child TBI
Salons Fontaine A and B**Behavioral Neurology**

1. CLAUNCH, JD
2. CLAUNCH, JD
3. FALCHOOK, AD
4. KEIFER, E
5. LIEBERMANN, D
6. ODAGIRI, M
7. SHIPLEY, SM
8. SILVA, LM

Remembered Spaces and Famous Faces Influence Vertical Line Bisections
 The Highs and Lows of Attentional Disengagement during Vertical Line Bisection
 Conceptual Apraxia in Alzheimer Disease: Impaired Mechanical Knowledge with Preserved Tool Selection Associative Knowledge
 Motor Perseverations in Patients with Neurological or Psychiatric Disease
 Subjective Cognitive-Affective Status Following Thalamic Stroke
 The Visual Search Strategy Associated with Action Organization/Disorganization: Are There Any Particular Fixation Patterns Attributable to Errors in General?
 Accuracy of Community Acquired P.E.T. Scans in the Diagnosis of Dementia
 The Relationship Between Verbal IQ and the Anterior Vermis in Children Born Very Low Birth Weight/Preterm

Forensic Neuropsychology

9. CROSSMAN, DM
10. FARRER, TJ
11. FROST, R
12. HARGRAVE, DD
13. OSTROSKY, F
14. SULLIVAN, S

Psychopathic Personality and Attention: A College Sample
 Traumatic Brain Injury Among Juvenile Offenders: A Meta-Analysis
 Intimate Partner Violence and Traumatic Brain Injury: A Meta-Analysis
 Examination of Decreasing Scores from TOMM Trial 2 to the Retention Trial as an Indicator of Negative Response Bias
 Early Trauma and Adult Psychopathy
 Imprisoned Abilities: A Comparison of the Cognitive Abilities of Prisoners and Non Prisoners

TBI (Adult)

15. ARMSTRONG, V
16. BERGQUIST, TF
17. BERRIOS-SIERVO, GM

Outcome Prediction Following Severe Traumatic Brain Injury: Comparison of the Disability Rating Scale (DRS) and Glasgow Outcome Scales (GOSS and GOSE)
 Mayo Classification System for Traumatic Brain Injury in persons presenting for post-acute rehabilitation
 The Effects of Moderate Exercise on Recovery from Concussion: A Preliminary Study

18. BINEY, F The Relationship Between Blood Alcohol Level and Global Outcome of Individuals With Severe Traumatic Brain Injury
19. BLAHNIK, M Blast vs. Non-Blast mTBI: Comorbid Problems in OEF/OIF Veterans and Service Members Screened and Treated at the Minneapolis VA Health Care System
20. BOSWORTH, CC Interhemispheric Hippocampal Connectivity Among Boxers
21. BOTTARI, C The Benefit Of Triangulating fMRI, ERP And Measures Of Complex Everyday Activities To Better Understand Mild Traumatic Brain Injury
22. BOTTARI, C Fatigue Secondary To a Mild Traumatic Brain Injury And Its Impact On Complex Activities Of Daily Living
23. CHAMARD, E Metabolic Changes in the Acute Phase of Female Athletes after Sports-Related Concussions
24. DAVIS, K Significance of Delirium Associated Motor Disturbance on TBI Recovery
25. DIKMEN, S Health Related Quality of Life in Traumatic Brain Injury: Is a Proxy Report Necessary?
26. DUNNAM, M Clarifying the Relationship Between Mild Traumatic Brain Injury and Posttraumatic Stress Disorder
27. EDMUNDSON, M A Meta-Analytic Review of Minnesota Multiphasic Personality Inventory (MMPI) Profile Elevations Following Traumatic Brain Injury
28. ENSLEY, M Factor Structure, Reliability, and Validity of the British Columbia Postconcussion Symptom Inventory (BC-PSI) in Veterans With and Without Blast Exposure and Mild TBI
29. EVANS, J Perceived Quality of Life as a Mediator of Neuropsychological and Psychological Outcomes Following Mild Traumatic Brain Injury
30. FORD-JOHNSON, LM Examination of Executive Functions in TBI using the DKEFS
31. GARDIZI, E Medical Comorbidities and Health Insurance as Predictors of Functional Outcome Following Traumatic Brain Injury
32. GARMOE, W The Relationship of Self-Awareness in Moderate and Severe Traumatic Brain Injury Patients in the Inpatient Rehabilitation Setting with Self-Awareness Six Months Post-Discharge
33. GRAEFE, AC The Relationship Between Neuropsychological Performance and Self-reported Task Demands in Acquired Brain Injury
34. GRINN, M The Role of Diffusion Tensor Imaging in the Diagnosis of Sub-Acute Mild Traumatic Brain Injury: A Case Report
35. HAMMERQUIST, J Attitudes and Behaviors Regarding Helmet Use Among Intermediate and Advanced Skiers and Snowboarders
36. KEHOE, RA Subjective Report of Executive Function in Mild Traumatic Brain Injury (mTBI)
37. KIERNAN, RJ Minor Head Injury and the Rear-End Impact
38. KNEZEVIC, B A Mixed-Effects Modeling Approach to Measuring Recovery in Processing Speed Following Traumatic Brain Injury
39. KRCH, D Subjective Memory in TBI is Associated with Psychosocial Factors Rather than Objective Memory Performance
40. KRENGEL, M Examination of cognitive and health symptoms in OEF/OIF Veterans: The impact of multiple TBI-related events
41. KRISHNAN, M Use of the Tower of London – Drexel University, Second Edition (TOLDX) for Adults with Traumatic Brain Injury
42. LANGE, R Factors Influencing Postconcussion Symptom Reporting Following Traumatic Brain Injury in the Military
43. PANCHOLI, S Self-reported Cognitive Complaints and Neuropsychological Test Performance Following Traumatic Brain Injury in US Military Service Members
44. LENGENFELDER, J Using fMRI to examine the use of organizational strategies on verbal list learning in individuals with TBI
45. LOCKWOOD, CA Facial Affect Recognition in a VA Polytrauma Patients
46. LOCKWOOD, CA Post Concussive Symptoms in Single vs. Multiple Mild Traumatic Brain Injury
47. MC DONALD, K Longitudinal Evidence of Trait-like Concussive Symptoms In A Healthy Sample
48. MC DONALD, K Component Analysis of Verbal Fluency in Patients with Moderate and Severe Traumatic Brain Injury
49. MCGUIRE, KA Neuropsychological Characteristics in OEF/OIF Veterans and Service Members with High vs. Low Demoralization on the MMPI-2
50. MORENO, JA Sexuality after traumatic brain injury
51. OGRAM, C Age Disparities in Functional Outcome Following TBI
52. PARISH, RV No Significant Differences between Blast and Blow Concussions in Soldiers in a Combat Environment across Multiple Neurocognitive Measures and Symptoms
53. PASTOREK, NJ Effect of Demographic and Clinical Characteristics on Social Participation in Returning Veterans with Histories of Mild Traumatic Brain Injury
54. PEACH, RK Cognitive Deficits Associated with Impaired Discourse Production After Traumatic Brain Injury
55. PEECHATKA, A A Longitudinal fMRI Study of Working Memory in TBI During Early Recovery
56. POTVIN, M The EXACT (EXAMen Cognitif abrégé en Traumatologie): Proposition of a Brief Cognitive Examination in Traumatology
57. RABINOWITZ, AR Cognitive Inconsistency Before and After Sports-Related Concussion in a Sample of College Athletes
58. RAMANATHAN, DM Increase in Traumatic Brain Injury Incidence in Older Adults: 18-Year Trends in Pennsylvania
59. RAMIREZ FLORES, M Which neuropsychological tests allow differentiate the severity of TBI?
60. RAMIREZ FLORES, M Computerized Neuropsychological Battery in Mexican TBI's Patients

61. REDMOND, KA Functional Gains and Traumatic Brain Injury: Transdisciplinary Neurorehabilitation Interventions for Patients with Long Standing TBI
62. ROSKOS, P The Reliability and Validity of the Neurological Outcome Scale for Traumatic Brain Injury (NOS-TBI) in Persons with Post-Acute Traumatic Brain Injury (TBI) and Healthy Control Participants
63. ROSTAMI, S Functional Imaging Findings of Working Memory after Traumatic Brain Injury: a Meta-analysis
64. SCHAEFER, LA The MoCA in Inpatients with Traumatic Brain Injury: Relationship to Functional Outcome
65. SHANDERA-OCHSNER, AL Outcome in OIF/OEF Veterans with PTSD and History of Concussion
66. SOBLE, JR Neuropsychological Functioning of OEF/OIF Combat Veterans with PTSD and Mild TBI
67. SORG, S Loss of Consciousness is Associated with Disrupted Frontal White Matter and Impaired Executive Functions in Veterans with Mild Traumatic Brain Injury
68. SUHR, J The Effects of Negative Response Expectancies on Head Injury Recall and PCS Symptom Report in Football Players
69. SUNDERARAMAN, P Preliminary descriptors of changes in neuropsychological performance and driving performance in young adults after concussion
70. THAIS, ME Admission Pupillary Examination is Associated with Long-Term Cognitive Prognosis in Severe Brain Injured Patients
71. TRONTEL, HG Diagnosis Threat in a Mild Traumatic Brain Injury Population
72. VENKATESAN, UM Is Right Right? Hemispheric Differences During Visuospatial Working Memory in TBI
73. WALDRON-PERRINE, B Prediction of Reported Post-concussive Symptoms in a Veteran Population: Contribution of Injury-related Factors and Emotional Distress
74. WEBER, M Are Group Analyses Suitable For Mild Traumatic Brain Injury Research?
75. WINGO, J An Evidence-Based Review of Neuropsychological Assessment for Diagnosis of Mild TBI
76. WRIGHT, MJ The Frontotemporal Signature of TBI-Induced Acute Cerebral Metabolic Crisis
77. WRIGHT, MJ The Ratio of Concussions to Games Predicts Attention in Retired Professional Football Players
78. YOZAWITZ, LR Voxel-based Lesion Symptom Mapping of Letter and Category Fluency Performance in Individuals with Penetrating Traumatic Head Injuries
- TBI (Child)**
79. ALBERTY, J A Comparison of Delayed Visual/Verbal Memory in Bilingual and Monolingual Children with Traumatic Brain Injury
80. BELLEROSE, J Moral Reasoning Abilities Following Paediatric Traumatic Brain Injury
81. GERST, EH The Influence of Testing Environment on Performance in Baseline Concussion Testing of Children
82. KRAMER, ME Using Early Ratings of Responsiveness to Predict Inpatient Rehabilitation Discharge Status in Children with Significant Brain Injury
83. MAERLENDER, A The Effect of Sleep the Night Before on Baseline Neuropsychological Screening and Symptom Reporting
84. MCCAULEY, SR The Relation of Regional Diffusion Tensor Imaging with Incentivized Event-Based Prospective Memory in Children following Traumatic Brain Injury
85. MERKLEY, TL Inhibitory Control, Volumetrics and White Matter Integrity of Caudal Anterior Cingulate Following Early Pediatric Traumatic Brain Injury
86. MORAN, LM Relationship between Social Information Processing and Perceived Social Competence in Pediatric Traumatic Brain Injury
87. NEWMAN, JB Evidence of Validity for Pediatric ImPACT Based on Convergence with Working Memory and Processing Speed Tasks
88. NEWMAN, JB Parental Concern and Perceived Need for School Accommodations Following Concussion: Children with ADHD and/or LD vs. Typically Developing Children
89. PETERSON, RL Internalizing Symptoms in Adolescents Following Traumatic Brain Injury Are Associated with Parental Anxiety
90. SADY, MD Gender Differences in Adolescents' Reporting of Emotional Symptoms Prior to and After Concussion
91. SADY, MD Pediatric ImPACT Neurocognitive Performance and Symptom Reporting During Recovery from Childhood Concussion
92. SALORIO, C Behavior after TBI in children who require brief hospitalization
93. SUSKAUER, SJ Laboratory Predictors of Parent Report of Inhibitory Control in Children with History of Traumatic Brain Injury
94. VAUGHAN, C Utility of Standardized Regression Based (SRB) Change Methodology for Examining Within Task Differences in Performance on Pediatric ImPACT
95. VAUGHAN, C Relative Contribution of Parent and Child Post-Concussion Symptom Report to Classification of Injury Status
96. VERBALIS, AD Relationship Between Executive Functioning and Theory of Mind in Young Children 18 Months After Traumatic Brain Injury
97. WARZAK, WJ Concussion Recovery and Energy Exertion: The Missing Link

10:30–11:30 AM**Invited Address: Hemispheric Differences in Learning and Memory: Insights from Deficit Patterns and from Functional Neuroimaging**
Speaker: Marilyn Jones-Gotman
Outremont

1. JONES-GOTMAN, M

Hemispheric Differences in Learning and Memory: Insights from Deficit Patterns and from Functional Neuroimaging

10:45 AM–12:15 PM**Paper Session 5: Mild Cognitive Impairment**
Moderator: Mark Bondi
Mont-Royal/Westmount

1. BANGEN, KJ
2. WIERENGA, CE
3. PINEAULT, J
4. JEFFERSON, AL
5. THOMAS, KR

Structural and Arterial Spin Labeling MRI Biomarkers for Mild Cognitive Impairment
Effect of mild cognitive impairment and APOE genotype on resting cerebral blood flow and its association with cognition
Evidence of Altered Neural Networks Underlying Semantic Processing in Amnesic Mild Cognitive Impairment : A MEG Study
An Elevated Vascular Health Index is Related to Worse Cognitive Performance in Individuals with Mild Cognitive Impairment
Verbal Prompting as a Method for Improving Everyday Cognition in MCI and Unimpaired Older Adults

10:45 AM–12:15 PM**Paper Session 6: ADHD and Learning Disabilities**
Moderator: Jill Aloia
Verdun

1. KERNE, VV
2. KARALUNAS, SL
3. MCAULEY, T
4. BORKOWSKA, AR
5. RANE, S

Social Functioning, Social Cognition, and Executive Functioning Differences Associated with ADHD Subtypes
More than the Mean: Mechanisms Underlying Group Differences in Reaction Times in ADHD
Persistence of Cognitive Deficits Point to Underlying Genetic Risk in ADHD
In search of the neurological basis of spelling problems. fMRI study
The impact of a longitudinal intervention for reading on level of attention in middle school students

11:00 AM–12:30 PM**Poster Session 7: Executive and Frontal Lobe Functions/Malingering and Effort**
Salons Fontaine A and B**Executive Functions/Frontal Lobes**

1. ABECASSIS, M
2. ABECASSIS, M
3. ARAUJO, G
4. ÅRDAL, G
5. BEEBE, DW
6. BEITZ, KM
7. BORRANI, J
8. BUELOW, MT
9. BUELOW, MT
10. BUELOW, MT
11. CHAN, RC
12. CHAN, RC
13. CLARK, A
14. CLAYSON, PE
15. DRAKE, D
16. DULAY, MF
17. DUVALL, SW
18. EDIDIN, JP
19. FALKOWSKI, JA
20. FEDOR, A

Retrospective Report of Childhood Trauma Predicts Executive functioning in Current Everyday Life
Relationship between Family Functioning and Executive Control in a Mixed Pediatric Clinical Sample
The Normative Development of Response Monitoring
Depression and the association between cognitive inhibition and general functioning - a study of patients in remission
Impact of Multi-Night Experimental Sleep Restriction on Adolescent Executive Functioning
Strategic Decision Making on the Iowa Gambling Task in Children, Adolescents, and Adults
Cognitive Flexibility in Juvenile Delinquents
Personality Characteristics and State Mood Influence Deck Selections on the Iowa Gambling Task (IGT)
Parkinson's Disease, Apathy, and Risky Decision Making
Balloon Analogue Risk Task (BART) Performance in Parkinson's Disease with and without Apathy
Neurological soft signs in healthy elder people: Prevalence and relationships to neurocognitive functioning
Do patients with bipolar disorders and schizophrenia share similar deficits in semantic inhibition? A meta-analysis of Hayling Sentence Completion Test
Characterizing the Impact of Executive Dysfunction on Everyday Life in Adults with Stroke
Effects of Dopamine Depletion on Neuropsychological Measures of Executive Functioning
Predicting Self-Reported Risk Taking and Risk Perception Using Experimental Measures of Risky Decision Making and Executive Functions
Frontotemporal White Matter Fiber Tract Integrity and Impaired Executive Functions in Temporal Lobe Epilepsy
Executive Function in Full Term and Very Low Birth Weight (VLBW) preschoolers: A Principal Component Analysis Study
Neurocognitive Functioning in Homeless Youth
Executive Functioning and the Metabolic Syndrome: A Project FRONTIER Study
Higher BMI is Associated with Reduced Cognitive Performance in Division I Athletes

21. FRANCHOW, EI Self-Reported Burden of Affective Suppression Explains Executive Performance
22. FRANCHOW, EI Clinical Significance of Affective Suppression in the Assessment of Executive Functioning
23. GALBREATH, J Utility of the Wisconsin Card Sorting Test in Predicting Adaptive Living Skills
24. GONZÁLEZ-OSORNIO, MG Developmental trends of Executive Functions in preschool age children
25. GORLYN, M Decision-Making and Cognitive Abilities: Processing Speed is Integral to Iowa Gambling Task Performance
26. HATFIELD-ELDRED, M The Effect of Working Memory Capacity, Probability of Loss, and Gender on Decision-Making
27. HUMES, SH Is There a Connection Between Quality of Life, Personality, and Frontal/Executive Functioning?: Implications for Cognitive Impairment and Preventative Measures
28. ISKANDAR, S Obesity in Older Adulthood is Associated with Lower Performance on the Switching Component of Verbal Fluency
29. JACOLA, LM The Relationship between Executive Functioning and Maladaptive Behavior in Adolescents with Down Syndrome
30. KARR, JE Omega-3 Polyunsaturated Fatty Acids and Cognition in a College-Aged Population
31. KASZYNSKI, K Executive Dysfunction and Social-Emotional Adjustment in Homeless Youth
32. KAWAMURA, M The Relationship of Word Generation Mechanism and Individual Differences in Working Memory Capacity
33. KEIFER, E Does the Delis-Kaplan Executive Function System Measure Frontal Lobe Dysfunction? A Study in Patients with Focal Frontal Lesions
34. KILLGORE, WD Daytime Sleepiness Affects Prefrontal Regulation of Food Intake
35. KILLGORE, WD Overeating is Associated with Altered Cortico-Limbic Responses to Images of High Calorie Foods
36. LALONDE, G The Link Between Traditional and Virtual Reality Neuropsychological Measures of Executive Functions
37. LEININGER, SL Rey-Osterrieth Complex Figure Flowchart Organizational Approach as a Measure of Executive Functioning in Parkinson's Disease Patients
38. LUNDEQUIST, A Born too early. Cognitive outcome in prematurely born adolescents, in relation to gestational age
39. MOES, E Cognitive Correlates of Mindfulness Meditation
40. MOLNAR, AE Convergent and Divergent Executive Functioning Skills on the BRIEF in School-Age Children with ADHD-C, ADHD-PI, or Dyslexia
41. MORIN-MONCET, OP Occlusion of LTP by action observation: A neurophysiological TMS study
42. MUNOZ OSPINA, BE Cognitive control mechanisms and Traumatic Brain Injury in patients with prefrontal lesions in the Wisconsin Card Sorting Test performance
43. PIGOTT, SE The Relationship Between the Informant Version of the BRIEF-A and Performance-based Measures of Executive Functioning in Adults with Moderate to Severe Traumatic Brain Injury
44. REAGAN, TA Executive Function and Working Memory in Children: Developmental Considerations
45. RECKOW, J State/Trait Anxiety, Aviation, and the Frontal Lobe
46. ROGERS, SA Is There a Relationship between Spirituality and Frontal-Temporal Functioning?
47. ROTH, RM Evidence of Validity for Pediatric ImPACT Based on Convergence with the Tasks of Executive Control
48. SANDOVAL OCAMPO, CS Relationship of the gene COMT and Executive Function in Children
49. SCHMID, MT Executive Functioning in patients with first episode Major Depressive Disorder
50. SEDO, MA Neuropsychological Testing of Quechuan-Speaking Groups : Clinical Value of Speed and Errors
51. SHEEHAN, JC The Impact of Natural Strategy vs. Verbal Strategy in Motor-Control
52. SKEEL, R Individual differences in Urgency, Impulsivity, & Anxiety Affect Performance on Risk-Taking Tasks
53. SOHLBERG, MM Normative Performance Across Settings on the Revised Executive Function Route-Finding Task
54. STÅLNACKE, J Cognitive and Behavioral Functioning in Adolescents and Young Adults after Exposure to Antenatal Corticosteroids
55. THAKKAR, KN Women Are More Sensitive to Prior Trial Events in the Stop Signal Task
56. THORGUSEN, SR Age and Gender Differences in a Motor Learning Task
57. VERA, E The Influence of Cognitive Flexibility on Moral Reasoning in Adolescence
58. WALDMAN, J The PASAT: A Sensitive Measure of Inhibition, Attention, and Working Memory in Adolescents
59. WALSH, KS Symptom Congruence Between Developmental ADHD and Neurofibromatosis Type 1
60. WEBER, RC Hot and Cool Executive Functioning Advantages in Bilingual Children
61. LOUGHAN, AR Driving After Brain Injury: The Value of Executive Functioning Tests
- Malingering/Effort Testing**
62. LOUGHAN, AR Performance on the Test of Memory Malingering (TOMM) by Age in Children
63. LOUGHAN, AR Does Intelligence Impact Performance on the Test of Memory Malingering (TOMM) in Children?
64. BAKER, AM Performance characteristics on the TOMM and WMT in an aging population: Preliminary Data
65. BOHME, E Effort as Measured by the TOMM and MMPI-2 Clinical Scale Correlates in Adults with Epilepsy
66. BORTNIK, KE Performance on Standard Indices of Effort Among Patients with Dementia
67. BOXLEY, L Utility of the CVLT-Short Form Forced Choice Paradigm in the Detection of Adequate Effort in a Veteran Population
68. BUSSE, M Classification Accuracy of a Combined Visual Spatial Measure in Detecting Problematic Cognitive Effort
69. BUSSE, M The CPT-II as a Symptom Validity Measure

70. DENBOER, J Memory for Complex Pictures (MCP): Development and Validation of a Symptom Validity Test in a Sample of Patients with Traumatic Brain Injury
71. DENBOER, J Memory for Complex Pictures (MCP): Results for Pediatric Patients with Traumatic Brain Injury
72. YOUNG, JC Verbal Intelligence and Reading Measures: Are These Insensitive to Poor Effort?
73. DOWD, AC Classification Accuracy of Simple Proration and Regression-Derived FBS Estimation Methods using the 370-Item MMPI-2 Fake Bad Scale (FBS-S)
74. JONES, RD FBS cutoff scores in a mixed neurological patient group
75. KOLB, A Identification of Embedded Measures of Effort on the Wisconsin Card Sorting Test (WCST) with a Mixed Clinical Population
76. KOLB, A Convergence of the Embedded Measures of Effort on the WCST and RBANS
77. MOTYKA, M Correlations Between Embedded Measures of the WCST and Outcomes on the WMT
78. MOTYKA, M Links Between Proposed Embedded Measures of Effort on the WCST and Performance on the TOMM
79. MOTYKA, M Correlations Between the TOMM and Outcomes on RBANS Subtests
80. NOGGLE, C How is the WCST Related to Outcomes on the RBANS Indices?
81. NOGGLE, C Associations Between the WMT and RBANS Indices
82. NOGGLE, C Correlations Between the RBANS Embedded Effort Calculation and Performance on the TOMM
83. NOGGLE, C How Does Elevations on the MMPI-2 F-scale Relate to Performance on a Measure of Neuropsychological Functioning?
84. NOGGLE, C Linear Relationships Between Outcomes on the TOMM and RBANS Indices
85. PECK, CP Can the FBS and the RBS from the MMPI-2 Differentiate Malingering from Conversion Disorder?
86. PEDERSEN, H Digit Span Sequencing as an Embedded Measure of Effort
87. RITCHIE, D Incidence of Insufficient Effort in Combat Related Head Trauma Examinations
88. SCHEIBEL, RS Atypical Word Memory Test Performance in OEF/OIF Veterans with Mild, Blast-Related Traumatic Brain Injury
89. SCHROEDER, RW Examination of the Initial Three Word Memory Test Cutoff Scores in a Criterion Group Litigating TBI Sample
90. SIDERS, CA Sensitivity and Specificity of the Brief Visual Memory Test-Revised (BVM-T-R) for Detecting Suspect Effort in a Clinical Sample
91. THOMPSON, JC Association of the WCST embedded effort calculation and the F-scales of the MMPI-2 and MMPI-RF
92. THOMPSON, JC Is there a relationship between the WMT and outcomes on the F-scales of the MMPI-2 and MMPI-RF
93. WALD, DM Classification Accuracy of the Rey Complex Figure Test
94. WALL, JR Do Renderings of the MMPI-2 F-Scale Predict Outcomes on the TOMM?
95. WALL, JR Covariance of the RBANS Effort Scale and F-scale of the MMPI-2 and MMPI-RF
96. WISDOM, N Empirical Support for Abbreviating the Administration of the Test of Memory Malingering (TOMM)

11:45 AM–1:15 PM**Showcase of Outstanding Student Research****Chair: Sommer Thorgusen
Outremont**

1. THORGUSEN, SR Showcase of Outstanding Student Research
2. GEFEN, T Quantitative and Clinically Concordant Regional Variations of Alzheimer's disease Pathology in Aphasic versus Amnesic Dementia Phenotypes
3. BUTTS, AM FreeSurfer vs. Manual Tracing: Distinguishing Stable from Cognitively Declining Elders Using Prospectively Measured Hippocampal Volume
4. SORG, S Loss of Consciousness is Associated with Disrupted Frontal White Matter and Impaired Executive Functions in Veterans with Mild Traumatic Brain Injury
5. JENKINS, LM Perception of Emotion in Patients Following Surgery to the Prefrontal Cortex
6. MORAN, LM Relationship between Social Information Processing and Perceived Social Competence in Pediatric Traumatic Brain Injury

12:00–1:30 PM**Friday Lunchtime Continuing Education Courses****Refer to CE Schedule for Location****1:30–3:00 PM****Symposium 8: Common Data Elements in Neurological Research****Co-Chairs: Noelle Carlozzi, David Tulskey****Discussant: Thomas Novack****Outremont**

1. CARLOZZI, N Common data elements in neurological research
2. WILDE, EA Establishing Common Data Elements for Adult and Pediatric Traumatic Brain Injury Research
3. TULSKY, D An overview of the NIH Toolbox, PROMIS and Neuro-QOL initiatives
4. CARLOZZI, N Adaptations of the PROMIS and Neuro-QOL to traumatic brain injury (TBI) and Huntington disease (HD)

1:30–3:00 PM**Symposium 9: Current Controversies in Parkinson Disease****Chair: Dawn Bowers****Discussant: Donald Stuss****Verdun**

- | | | |
|----|------------|---|
| 1. | BOWERS, D | Current Controversies in Parkinson Disease |
| 2. | TROSTER, A | Mild Cognitive Impairment (MCI) in Parkinson's Disease: New Criteria and Controversies |
| 3. | ZAHODNE, L | Cognitive Decline Following Deep Brain Stimulation: Debates Regarding Clinical Relevance and Potential Mechanisms |
| 4. | PRICE, C | Controversial Topics in Neuroimaging: PD as a Disconnection Syndrome? |
| 5. | BOWERS, D | The Apathy-Depression Conundrum in Parkinson Disease: Does it Matter? |

1:30–3:30 PM**Invited Symposium: The Interdisciplinary Assessment and Treatment of Learning Disabilities: A Team's use of Neurodevelopmental Models and Empirical Methods to Produce Successful Outcomes****Chair: Tim Conway****Discussant: Kenneth Heilman****Mont-Royal/Westmount**

- | | | |
|----|-------------|---|
| 1. | CONWAY, T | The Interdisciplinary Assessment and Treatment of Learning Disabilities: A Team's use of Neurodevelopmental Models and Empirical Methods to Produce Successful Outcomes |
| 2. | BRUNEY, T | The Nurse Practitioner's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities |
| 3. | FRETHEIM, S | The Speech Therapist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities |
| 4. | RICHARDS, L | The Occupational Therapist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities |
| 5. | WARNER, T | The Neuropsychologist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities |

1:45–3:15 PM**Poster Session 8: Cognitive Neuroscience/ Electrophysiology/Functional and Structural Neuroimaging
Salons Fontaine A and B****Cognitive Neuroscience**

- | | | |
|-----|---------------------|--|
| 1. | ANDREJCZUK, MA | Amperage and Electrode Placement Contribute to the Detection of Active Transcranial Direct Current Stimulation (tDCS) |
| 2. | AUBIN, M | The role of stereoscopic depth cues in shape constancy |
| 3. | BLAIS, C | The eyes are not the window to emotions |
| 4. | BOLINSKY, JH | Performance on Decision-Making Task Correlates with Resilience Variables in Two Groups of High-Risk Adolescents |
| 5. | BOSLEY, LV | Spectrographically-aided Measures of Inter-word Intervals Provide Support for an Expanded Assessment of Clustering on Verbal Fluency Tasks |
| 6. | CHAMPOD, A | Effects of Acute Intermittent Hypoxia on Working Memory in Healthy Adults |
| 7. | CORRIVEAU, I | Space impairs visual attention deployment to targets: Evidences from human electrophysiology |
| 8. | DIAMOND, BJ | Greater Physiological Activity at Encoding Predicts Better Memory at Longer Delays |
| 9. | GREEN, R | Traumatic Brain Injury as a Neurodegenerative Disorder |
| 10. | HAWCO, C | Neural Activity Related to Encoding Tasks and Levels of Semantic Relatedness: Self-initiation of task-irrelevant encoding strategies |
| 11. | HÉBERT, K | The use of spatial frequency through time in gender categorization |
| 12. | HIGGINSON, C | The Impact of Walking on Thinking: Preliminary Results from a Dual Task Walking Study |
| 13. | HOSOKAWA, M | Phonological Working Memory in Reversal Task of Word's Mora: A Near-Infrared Spectroscopy Study |
| 14. | HUANG, J | Functional Mapping of Dynamic Happy Facial Expression Processing in Social Interaction Context |
| 15. | KLENCKLEN, G | Implication of Working Memory in Spatial Deficits in the Elderly: an ERP Study |
| 16. | LABELLE-CHIASSON, V | The Role of Intelligence as a Cognitive Predictor of Moral Reasoning |
| 17. | LUSSIER, M | Specific Transfer Effects After Dual-task Training Compared To Active Control In Older Adults |
| 18. | MARCUS, JV | Direct and Indirect Effects of Brain Volume, Socioeconomic Status and Family Stress on Child Cognitive Outcomes |
| 19. | NEUGNOT CERIOLI, M | Moral Reasoning and Empathy in Adolescents |
| 20. | PARIS, A | Consolidation of a new skill in Parkinson's Disease |
| 21. | POMERLEAU, VJ | Seeing red: Color specific differences in attentional deployment |
| 22. | ROBIN, J | The Effects of Cue Familiarity on Episodic Memory, Scene Construction, and Imagining the Future |
| 23. | ROVET, J | Hippocampal Activation During Autobiographical Memory (AM) Retrieval in Children |
| 24. | ROVET, J | Functional Neuroanatomy of Associative Memory in Typically and Atypically Developing Children |
| 25. | SAYEUR, M | Cognitive and Behavioural Profile in Preterm Children at School-Age |

26. SCHUH, JM Developing perspective: The influence of working memory on perspective-taking in children and adults
27. SENI, AG Theory of Mind as a Building Block for Moral Reasoning
28. SODUMS, D Differences in Brain Structure and Activation During Material Specific Memory Tasks in People With and Without University Education
29. TADROS, K The Letter Processing Strategy for Reading is Invariant Across the Cerebral Hemispheres
30. TOUSIGNANT, B Relationship Between Social Cognition and Executive Functions in Healthy Adolescents
31. VUOKSIMAA, E Is Sports Participation Related to Cognitive Abilities Among Young Adults?
- Electrophysiology/EEG/ERP**
32. BOONSTRA, T The Five Factor Model and the Brain: Personality and Resting Brain States via qEEG
33. IKANGA, J Spirituality and Resting Brain Activity in a Sample of University Students
34. BURTIS, DB Electrophysiological Correlates of Constrained Monocular Viewing
35. CLAWSON, A Behavioral and Electrophysiological Indices of Conflict Adaptation in Individuals with Major Depressive Disorder
36. CLAWSON, A Cognitive Control and Conflict Adaptation Similarities in Children and Adults
37. DIETZ, J Detecting Emotional Significance: The Late Positive Potential in Parkinson's Disease
38. DIONNE, E The Use of Event-Related Potentials in the Study of the Development of Audiovisual Multisensory Integration Abilities in Infants and Children
39. FAIR, J OCD and Cognitive Control: Electrophysiological and Behavioral Markers of Regulative and Evaluative Control
40. FARRER, TJ Performance Monitoring Following Mild Traumatic Brain Injury: An Event-Related Potential Study
41. FROST, R EEG Theta Power and Working Memory in Patients with Multiple Sclerosis
42. GAGNON, K Sleep spindles amplitude following sport-related concussions as a marker of cerebral dysfunction
43. GERMAIN, M The Effect of Estrogen on Brain Activity During a Mental Rotation Task
44. GOOD, DA Happy Being Watched: The Effect of Positive Affect on Performance Monitoring During Observation
45. LAVOIE, ME Effects of Obsessive-Compulsive Disorder symptoms intensity on Event-Related Potentials associated with emotional memory
46. PAQUETTE, N Developmental indices of auditory and language processing as revealed by high density electrophysiology
47. SÖDERHOLM, C Lateralized Valence-Related Differences in Electrophysiological Correlates of Successful Word Encoding
48. STEFANATOS, GA Auditory Analysis in Residual Acquired Epileptiform Aphasia
- Imaging (Functional)**
49. AHERN, D Brain Correlates of a New Scoring Metric for Trail Making Test B
50. BARQUERO, LA Neurobiological Outcomes Associated with Intervention in Children with Reading Disability
51. BRICENO, EM That Doesn't Appear Neutral to Me: Potential Activation Confounds in Study of Facial Emotion Recognition in Depression
52. BROWN, C Syntactic Encoding BOLD Activation Negatively Predicts RAVLT Immediate Verbal Memory
53. BURCIAGA, J Patterns of Brain Activation in Response to a Marijuana-Specific Cue-Reactivity Task in Bipolar and Healthy Adolescents
54. EAGAN, DE Gender Differences in the Effect of Body Mass on Task-related Brain Activation
55. FLOREA, O Cortical Localization of Auditory Responses Using Functional Near-Infrared Spectroscopy (fNIRS)
56. GABRIEL, LB To Go or Not to Go? Differential Activation during Response Inhibition in Major Depressive Disorder
57. GHAZI SAIDI, L The Neural Correlates of Cross-linguistic Transfer Effects: Phonological Similarities across Distant Languages
58. HAZLETT, K Cortisol Response to Stress is Related to Elevated Fronto-Limbic Response during Emotion Processing
59. KASSEL, MT Differential Impact of Distraction in Serial Position Curves with the Semantic List Learning Task (SLLT) in Women with and without Major Depressive Disorder (MDD)
60. KRISHNAN, K Time and Frequency Analysis of Default Mode Network Connectivity after TAI
61. LEAVITT, VM A longitudinal investigation of resting-state functional connectivity in the default network of multiple sclerosis patients with memory decline
62. MADORE, MR Functional Connectivity of the Cerebellar Vermis in Bipolar Disorder
63. MEYERS, KK Hypoactivation of Inhibitory Control Circuitry is more Pronounced in Major Depression than in Major Depression comorbid with an Anxiety Disorder
64. MOFFETT, KL Subcortical Involvement in Gulf War Syndrome 2
65. PERAZA, J Over-activation in Emotion Regulating Brain Regions among Youth with a Family History of Alcoholism
66. RIMRODT, S Repetition Task and Word Learning in Skilled Adult Readers
67. SAFI, D Overt Reading of Irregular Words and Non-words: A Functional Near Infrared Spectroscopy Study
68. SCHWAB, ZJ Sex Differences in Functional Brain Responses to Food
69. SIMARD, I Are the Raven's Progressive Matrices Visuospatial or Verbal?
70. TERRY, DP Absence of Long-term Neuropsychological and Functional MRI Differences after Multiple Concussions

71. WELDON, AL Diminished Incentive Responsiveness in Major Depressive Disorder (MDD) is not Related to Decreased Reactivity of Nucleus Accumbens
Imaging (Structural)
72. AGBAYANI, KA DTI Tractography of the Cingulum Bundle and Uncinate Fasciculus and Impaired Memory and Language in Epilepsy
73. AMIRTHAVASAGAM, S Structural Neuroimaging Findings in Persons with Borderline Personality Disorder
74. BERTRAND, J Color discrimination and cortical alterations in Parkinson's disease
75. BLACKMON, K Individual differences in verbal abilities associated with regional blurring of the left gray and white matter boundary
76. BLACKMON, K A neuroanatomical substrate for anxiety symptoms in temporal lobe epilepsy
77. BREWSTER, R White Matter Quality Between the Amygdala and Fusiform Gyrus Predicts Socialization Skill in a Mixed Sample of Participants with ASDs and Controls
78. CHIOU, KS A Long-Term Longitudinal Examination of Brain Volume Change and Cognitive Functioning in Moderate to Severe Traumatic Brain Injury
79. CUNNINGHAM, HB Clock Drawing in PD: What Makes the Clock Drawing Test Tick?
80. DIDDAMS, MJ Diffusion Tensor Imaging of Multiple Sport-related Concussive Injuries 6+ Months Post-concussion
81. DUVAL, SW Neuroanatomical Differences in Very Low Birth Weight (VLBW) and Full Term Preschoolers: A Voxel-Based Morphometry (VBM) Study
82. FARACO, CC RBANS Visuospatial/Constructional Scores and Anisotropy Changes in the Inferior Longitudinal Fasciculus in MCI Compared to Normal Older Adults
83. HAVINS, W Cingulum Bundle (CB) and Uncinate Fasciculus (UF) Integrity and Neuropsychological Performance in Individuals with Temporal Lobe Epilepsy (TLE) and Comorbid DSM-IV Psychiatric Disorders
84. JEFFERSON, AL A Semi-Automated Method for Quantifying Infarcts in Older Adults With and Without Dementia
85. LANCASTER, MA Longitudinal White Matter Changes and Cognitive Decline in Healthy Elderly
86. LANGEVIN, L Examining Common Structural Alterations of Cortical White Matter in Motor and Attention Disorders
87. MATSUI, M Age-related volumetric changes of hippocampus and amygdala from healthy infants to adults
88. MEIER, IB Lobar microbleeds are associated with white matter hyperintensities and memory in older adults
89. MOLINA, Y Quantitative white matter and gray matter indexes and their relationship with frontal lobe performance in healthy middle-age and aging
90. NGUYEN, PT Reliability and Validity of Diffusion Imaging Methods Assessing Caudate to Frontal Lobe Function
91. NGUYEN, PT A Comparison of Three Dorsolateral Prefrontal Cortex Regions
92. O'SULLIVAN, KM Reliability of Automated Versus Manual Regions of Interest: Implications for Fiber Tracking
93. RAO, JA Hippocampal Volume in SuperAging: A Preliminary Report
94. RICKARDS, T Motor Functioning in Children with Cerebral Palsy: A Diffusion Tensor Imaging Study
95. SMITH, K White Matter Connectivity and Word Reading in Typically Developing Young Adults
96. SUGARMAN, MA Structural Correlates of Verbal Working Memory and Delayed Episodic Recall

3:15–4:45 PM**Paper Session 7: Traumatic Brain Injury (Adult)****Moderator: Elisabeth Wilde****Outremont**

1. GENOVA, HM Longitudinal Relationship between White Matter Integrity and Cognitive Decline in Chronic Traumatic Brain Injury (TBI)
2. BRYER, EJ Patterns of Brain Activation in Individuals with Mild TBI During Executive Working Memory Tasks
3. PONSFORD, JL Light Therapy for Treatment of Fatigue and Sleepiness Following Traumatic Brain Injury
4. DAMS-O'CONNOR, K Late-life Re-injury and Dementia among Individuals with Traumatic Brain Injury
5. MCCAULEY, SR Neuropsychological Correlates of Early Impaired Self-Awareness Following Traumatic Brain Injury

3:30–5:00 PM**Symposium 10: Recent Advances in the Study of Fatigue****Chair: Helen Genova****Discussant: John DeLuca****Verdun**

1. GENOVA, HM Recent Advances in the Study of Fatigue
2. ARNETT, P Multimodal Assessment of Fatigue During a Typical Sports Concussion Neuropsychological Testing Battery
3. WYLIE, G An investigation of cognitive fatigue in Traumatic Brain Injury using functional magnetic resonance imaging
4. GENOVA, HM Examination of Cognitive Fatigue in Multiple Sclerosis Using Neuroimaging
5. COOK, DB Can Functional Neuroimaging Data Serve as a Biomarker for Chronic Fatigue Syndrome?

3:30–5:00 PM**Poster Session 9: Aging/HIV, AIDS, and Infectious Disease
Salons Fontaine A and B****Aging**

1. AGBAYANI, KA
2. AHMED, FS
3. AHMED, FS
4. ANDERSON-HANLEY, C
5. ANSADO, J
6. ATCHISON, T
7. BENJAMIN, ML
8. BERENQUER, J
9. CASTONGUAY, N
10. DESJARDINS, L
11. DIAZ-ORUETA, U
12. DIAZ-ORUETA, U
13. DIAZ-ORUETA, U
14. DYKSTRA-AIELLO, CJ
15. FALKOWSKI, JA
16. FANNING, M
17. FEIGON, M
18. FISCHER, AL
19. FISCHER, BL
20. FORTIN, A
21. GARCIA, AM
22. GIFFORD, K
23. GIFFORD, K
24. GIOKARAKI, E
25. GRAND, J
26. GRIGSBY, J
27. HAN, SD
28. HOLLAND, AK
29. HORNING, SM
30. HUBLEY, AM
31. IWAHARA, A
32. KAUR, S
33. KIM, H
34. KORTHAUER, L
35. LANGLOIS, A
36. LOVE, J
37. LOWE, DA
38. LU, W
39. LUC, N
40. WOON, F
41. MESSIER, C
42. METHQAL, I
43. MIRRA, KM
44. MIRRA, KM
- Patterns of Age-Related IQ Changes after Adjustment for the Flynn Effect
Proverb Interpretation Relationship to Functional Independence in a Community-Dwelling Older Adult Population
The Relationship between Theory of Mind and Functional Independence
Neuroimaging Effects of Exercise for Older Adults: Pilot Results from the Cybercycle Study
Neural implementation of cognitive reserve depends of the task demand in normal aging
Self-report of Previous TBI Relationship to Current Cognitive Function in an Older Rural Population
Cortical-Subcortical Functions in Verb and Noun Generation in Healthy Aging
Letter and Category Fluency in Relation to Hippocampal Volume and White Matter Hyperintensities
Sex Differences and the Effects of Hormone Replacement Therapy on Cognitive Performances
Predicting Cognitive Performances Based On a Geriatric Examination in Community-Dwelling Older Adults
Early Years of Formal Education Versus Word Accentuation Test: Implications for the Study of Cognitive Reserve in Elderly People
Predictors for Cognitive Performance From Mid to Late Life: a Cross-sectional Study About Cognitive Reserve Proxies
Do Traditional Physical Performance and Gait Speed Tests Tell Us Anything About Cognitive Performance in Mid to Late Life Age?
Gender and Age Effects on Aerobic Exercise-Induced Reductions in Pain Sensitivity in Sprague-Dawley Rats
Relationship between Exercise and Cognition: Cooper Clinic Longitudinal Study
Insights into the Evaluation of Instrumental Activities of Daily Living
RBANS Neuropsychological Profiles in Older Adults with Memory Decline
Beyond Traditional Models of Theory of Mind in Normal Aging: The Modifying Influence of Blood Pressure
Timed Up and Go (TUG) Tasks Predict Cognitive Performance and Discriminate Between Groups of Elderly Fallers
Validation of a Medial Temporal and a Frontal Lobe Function Index in French-speaking Healthy Older Adults
Strategic Output of Semantic Fluency in Healthy Aging
Subjective Cognitive Complaints Among Older Adults
Subjective Cognitive Complaint Predicts Cognitive and Functional Trajectory in Individuals with Mild Cognitive Impairment
The Role of Cognitive Reserve in Episodic Memory and Executive Functioning in the Elderly
Intra-individual Variability and Behavioral Plasticity Predicts Cognitive Change in Older Adults
Post-Menopausal Hormone Replacement Therapy Associated with Better Executive Cognitive Functioning in the San Luis Valley Health and Aging Study (SLVHAS)
Von Economo Neurons, Conscientiousness, and Purpose in Life in Older Adults
Age-Related Changes in Systolic Blood Pressure and Motor Performance as a Function of Exposure to a Left-Lateralized Stressor
Sensitivity to Facial Expressions across the Lifespan: The Impact of Age and Cognition
Are Memory and Wellbeing Linked? An Exploratory Study with Adults Over Age 80
Olfactory Dysfunction and Cognitive Decline in Middle Aged and Older Adults: Evidence from Yakumo Study in Japan
Nutrition habits and fMRI – effects on fMRI BOLD response in middle age
Increased Prefrontal Activity is Associated with Inefficient Cognitive Control in Aging Subjects
The Impact of White Matter Hyperintensities on Cognitive Function in Aging and Late-Life Depression
Cognitive Complaint in Healthy Older Adults: Its Nature and Association with Objective Measures of Cognition
Function and cognition: The structure of gait and its relation to cognitive status
Extroversion Impacts Older Adults' Intellectual and Frontal-Executive Functioning
Selective Interference of Working Memory in Aging
The Relationship Between Fornix White Matter Integrity and Memory Performance in Mild Cognitive Impairment Subtypes: A Diffusion Tensor Tractography Study
Effects of an Alert Maintenance Task on Driving Performance in Older Adults: A Driving Simulated Study
Press “0” for the operator: Cognitive abilities required in older people for successful interaction with interactive voice response systems
Clustering and Switching During Lexical Fluency: an fMRI Study in Young and Older Participants
Executive Functioning and Instrumental Activities of Daily Living in Healthy Older Adults
Association or Discrepancy: Self-report and Performance-based Measures of Daily Functioning in Healthy Older Adults

45. MONTEBEAULT, M The Impact of Aging on Gray Matter Structural Covariance Networks
46. MOORE, CS The Relationship Between Erectile Dysfunction and Cognitive Performance in Late Middle Age
47. MORRA, L “Normal” Aging and Cognition: The Unacknowledged Contribution of Cerebrovascular Risk Factors
48. MUNRO, CA Sex Differences in the Cognitive Effects of Anticholinergic Medication
49. NEWSOME, RN Preclinical cognitive impairment in “healthy” volunteers, as assessed by MoCA
50. ORTIZ, X Influence of Age and Schooling on Inhibition and Flexibility in Elderly People
51. PAYETTE, J Neuropsychological performances associated with brain activation induced by dual-tasking in older and younger adults: a fNIRS study
52. PETERS, F Auditory-visual integration during object localization and identification in normal aging
53. POLSINELLI, A The Use of Perspective in Older Adults’ Emotional Autobiographical Memories
54. RICHARDSON, EE Neuropathological Diagnosis of Alzheimer’s Disease and Cognitive Status in Centenarians
55. SEELYE, AM A Graded Hierarchy of Prompts to Assist Healthy Older Adults in Completion of Instrumental Activities of Daily Living in a Smart Environment
56. SEIDER, T Carotid Intima Media Thickness is Associated with Executive Function Decline in Non-Demented Elderly
57. SETER, C Everyday Action Through the Years: Aging is Associated with Reduced Accuracy but not Slowed Speed on Complex Tasks
58. SIMMONS, A Neuropsychiatric Symptoms are not Strongly Associated With Degree of Cognitive Impairment in Older Adults
59. SIMON, C Cognitive Correlates of Performance-Based Measures of Everyday Function in Older Adults
60. SUHR, J The Relationship of Premorbid Memory Ability to Cortisol Reactivity in Aging-Related Stereotype Treat
61. VANDERMORRIS, S Older Age is Associated with Elevated Intraindividual Variability on Associative Memory Tasks
62. VASQUEZ, BP Reaction Time Variability is Greater in Older Adults on an Ecologically Valid Measure of Selective Attention
63. VUOKSIMAA, E Association Between Cognitive Functions and Brain Pathology in Late Middle Age: What is the Role of Cognitive Reserve?
64. WOHLTMANN, J A Comparison of Many-to-One Mapping and One-to-One Mapping of Source and Associative Memory in Older Adults
65. WOLFF, K Influence of Personality on Diagnosis of Cognitive Impairment in Older Adults
66. WRIGHT, HH Cohesion and local coherence in narratives across the lifespan
67. YEUNG, SE Depressive Symptoms Predict Everyday Problem Solving Ability in Older, but not Young, Adults
68. ZAMORA, D Is Aging a Privilege or a Burden?
69. ZEC, RF Effects of Age, Education, Gender on “FAS” Phonemic Word Fluency
70. ZIMMERMAN, ME Neuropsychological Performance, Actigraphy, and Self-Report of Sleep among Healthy Older Adults
- HIV/AIDS/Infectious Disease**
71. ARENTOFT, A Socioeconomic Status Predicts Neuropsychological Test Performance Among Racially/Ethnically Diverse HIV+ Adults
72. BLACKSTONE, K Deficit Scores versus Clinical Ratings: Defining Neurocognitive Impairment in HIV
73. BRAGA, D HIV-Associated Neurocognitive Disorders are Associated with Driving Cessation
74. CATTIE, J Longitudinal Cognitive, Affective, and Neurobehavioral Effects of Interferon and Ribavirin Therapy for Hepatitis C Virus (HCV)
75. DOYLE, KL Interrelationships of Age, Prospective Memory, and Health-Related Quality of Life in HIV Infection
76. FELLOWS, RP Effects of HIV-Associated Distal Sensory Polyneuropathy on Neuropsychological Test Performance
77. GIESBRECHT, CJ Memory Recall Processes of Poly-Substance Users: Associations with Viral Exposure
78. GRUBB, JR Brief Screening Tools for HIV-Associated Neurocognitive Disorders
79. GUPTA, S Sensitivity of a Performance-Based Assessment of Functional Impairment to HIV and Neuropsychological Status in Spanish-speakers
80. GUPTA, S Relationship Between Self-reported Cognitive Complaints and Objectively-measured Functional Impairment in Spanish-speakers Living with HIV
81. HEAPS, JM Neuroimaging markers of HIV-infection in South Africa
82. HINES, LJ Cortical Brain Atrophy and Intra-Individual Variability in Neuropsychological Test Performance in HIV Disease
83. IUDICELLO, J Semantic Cueing Improves Verbal Fluency in Persons Living with HIV Infection
84. KAMAT, R Apathy is Associated with Antiretroviral Non-adherence in HIV+ Persons with Methamphetamine Use Disorders
85. MARCOTTE, TD Early HIV Antiretroviral Treatment Improves Mild Neurocognitive Deficits
86. MARTIN, E Delay Discounting is Impaired with Hepatitis C but not HIV
87. MCINTOSH, RC Neuropsychological Correlates of Emotion Regulation in Women with HIV: An ERP Study
88. MORGAN, EE Lower Cognitive Reserve Among Individuals with Syndromic HIV-associated Neurocognitive Disorders
89. MORGAN, EE Longer Ongoing Task Delay Intervals Exacerbate Prospective Memory Deficits in HIV-associated Neurocognitive Disorders (HAND)
90. PANOS, S Longitudinal effects of APOE e4 on HIV-Associated Neurocognitive Dysfunction
91. PATEL, SM The Additive Effects of Neurological Risk Factors on Cognition Among HIV-Infected Individuals

92. POQUETTE, AJ Antiretroviral Medication Non-Adherence is Associated with Deficits in Time-based Prospective Memory: Differential Effects of Longer Ongoing Task Delay Intervals
93. POSADA, C Memory Deficits for Affective Words Among HIV+ Persons with Bipolar Disorder
94. ROURKE, SB The Canadian "CHARTER" Report: Prevalence and Determinants of HIV-Associated Neuropsychological Impairment in the OHTN Cohort Study
95. SAKAMOTO, M Norms and Alternative Cutpoints Improve Sensitivity/Specificity Tradeoff for the HIV Dementia Scale: The CHARTER Study
96. SALAMA, C Impact of Parenting Quality and Executive Functioning on HIV Risk in South African Youth
97. SUAREZ, PA Relationship between HIV-associated Functional Impairment and Neuropsychological Abilities in Spanish-speakers of Mexican Origin
98. VASSILEVA, J Cognitive Modeling Analysis Reveals Distinct Effects of HIV and Drug Use on Decision-Making Processes in Women
99. WILSON, MJ Effects of Antiretroviral CNS Penetration on Procedural Learning Task Performance in HIV+ Drug Users
100. WOODS, S Habitual Prospective Memory in HIV Infection

3:45–4:45 PM**Invited Address: Neuroadaptation to Alcohol Dependence: Consequences and Opportunity for Recovery****Speaker: Edith Sullivan****Mont-Royal/Westmount**

1. SULLIVAN, EV Neuroadaptation to Alcohol Dependence: Consequences and Opportunity for Recovery

5:15–6:15 PM**Presidential Address: Neuropsychology in the Era of Translational Neuroscience****INS President: Rus Bauer****Mont Royal/Westmount/Outremont**

1. BAUER, RM Neuropsychology in the Era of Translational Neuroscience

6:15–6:45 PM**INS Business Meeting****Mont Royal/Westmount/Outremont****6:45–7:45 PM****Friday Evening Reception
Ballroom Foyer****SATURDAY, FEBRUARY 18, 2012****7:20–8:50 AM****Saturday Morning Continuing Education Courses
Refer to CE Schedule for Location****9:00–10:30 AM****Symposium 11: Are They Faking or Is It Real? Research on Symptom Validity Testing for Learning Disability and ADHD Assessment****Chair: Allyson Harrison****Discussant: Robb Mapou****Westmount**

1. OSMON, DC Are They Faking or Is It Real? Research on Symptom Validity Testing for Learning Disability and ADHD Assessment
2. GREEN, P Specificity of SVT failure in Children-what data from intellectually disabled children tell us
3. HARRISON, AG A review of data from confessed college-aged malingerers undergoing LD and ADHD assessments: What can they teach us?
4. JASINSKI, L Applications of analogue TBI methods when using SVT tests with College ADHD assessments
5. ANDRESEN, EN Sensitivity and specificity of the MSVT and embedded measures for the CPT-2 and TOVA when evaluating college students for possible ADHD
6. SUHR, JA Strategies for Addressing Noncredible Performance in Psychoeducational Assessments of Young Adults

9:00–10:30 AM**Paper Session 8: Ecologically-Valid Assessment and Treatment****Moderator: Kathleen O'Toole****Outremont**

1. BOWERS, D Unmasking the Face of Parkinson Patients: Results from a Randomized Double-Blind Sham-Controlled Behavioral Intervention Trial
2. DAWSON, D Managing age-related executive changes with ecologically valid strategy training: A randomized controlled trial
3. YAO, C PDA and Smartphone Use by Individuals with Moderate-to-severe Memory Impairment: Long-term Application of a Theory-driven Training Program
4. YU, S Real World Disability and the Predictive Validity of Executive Test Measures
5. DOUGLAS, A Predicting incidents of harm for people with dementia being discharged from hospital

9:00–10:30 AM**Symposium 12: Brain Electrophysiology of Cognitive Processes: Transdisciplinarity Essential****Chair: Marianela Moreno de Ibarra****Discussant: Salvador Rodriguez Curcio****Verdun**

1. MORENO DE IBARRA, M Brain Electrophysiology of Cognitive Processes: Transdisciplinarity Essential
2. DOS SANTOS, A Theory of Mind (TOM) in High Functioning Autistic (HFA), Attention Deficit And Hyperactivity Disorder (ADHD) and children Without Diagnosis (WD)
3. MORENO DE IBARRA, M Central Coherence in High Functioning Autistic (HFA), Attention Deficit and Hyperactivity Disorder (ADHD) and children Without Diagnosis (WD)
4. JAYARO, C Quantitative EEG Brain Mapping (QEEG) of Executive Function through Five Digit Test (5DT)
5. ROJAS, J Educational Software to Develop Mathematical Competencies in Children with Dyscalculia. Transdisciplinary Assessment with Brain Electrophysiology

9:30–11:00 AM**Poster Session 10: Dementia/Stroke/Visuospatial Abilities****Salons Fontaine A and B****Dementia (Alzheimers)**

1. ALOSCO, M Impaired Knowledge of Driving Laws Independently Predicts Recommended Driving Cessation Among Patients with Dementia and Cognitive Decline
2. ANSADO, J Interhemispheric coupling can improve the brain's ability to compensate neural decline related to Alzheimer's disease in low cognitive demand
3. BEN-AMI, J The Impact of Memory Strategy Use on Activities of Daily Living in Mild Cognitive Impairment
4. BREWSTER, PW Protective Effects of Late-Life Mental Activities Against Cognitive Decline in Prodromal Alzheimer Disease and their Relation to Earlier-Life Reserve Proxies
5. CABRERA, YI Blood Pressure and Cerebrovascular Comorbidity in Alzheimer's Disease
6. CINES, S A Tale of Two Measures: When Clinical Ratings and Objective Scores of Memory Awareness Conflict
7. CLARK, LR Differential Effects of Aging and APOE Genotype on Cerebral Blood Flow at Rest
8. FOSTER, MK Risk Factors for Alzheimer's Disease and Longitudinal Memory Performance
9. FUJITA, T Differences in behavioral disorders in Alzheimer's disease patients with regard to dementia severity measured using the at-the-desk instrumental activities of daily living (IADL) test
10. GRABYAN, JM Plasma Cortisol does not Predict Rate of Cognitive Decline in Alzheimer's Patients
11. GUZMAN, VA White matter hyperintensities and amyloid are independently associated with entorhinal cortex volume in the Alzheimer's Disease Neuroimaging Initiative
12. HAUGRUD, NA Clustering and Switching Strategies During Verbal Fluency Performance Differentiate Dementia Subtypes
13. HAYASHI, A Pure Agraphia for Kanji Characters in a Japanese Patient with Probable Alzheimer's Disease: A 2-year Follow-up Study
14. HOWIESON, D Risk of Conversion to Alzheimer's Dementia within Two Years of MCI Onset
15. JOHNSON, SC Brain atrophy precedes cognitive change in asymptomatic late middle-aged adults at risk for AD: A four year longitudinal study
16. KIEWEL, NA Patterns of Reliable Digit Span Performance in Patients with Alzheimer's Disease
17. LESKIN, LP FDG-PET Cortical Metabolic Activity Associated with List Learning Serial Position Effect in Alzheimer's Disease
18. MANNING, KJ Empirical Evaluation of Dementia Driving Risks Proposed by the American Academy of Neurology
19. MCHENRY, C Comprehension of phonetic and prosodic information with audio-visual and linguistic cues in Alzheimer's disease and mild cognitive impairment
20. MIKOS, AE APOE4 is Associated with Increased Frontally Mediated Neurobehavioral Symptoms in Amnesic MCI and Alzheimer's Disease
21. MOGRABI, D Emotional reactivity and awareness of task failure in Alzheimer's disease
22. PARE, N Diagnostic Predictive Value of the MOCA and the MMSE in Alzheimer's Disease, Vascular Dementia, and Fronto-Temporal Dementia

23. PERRY, JS Prediction of Conversion From Mild Cognitive Impairment to Alzheimer's Disease
24. POOCK, JL Simple and Complex Gait Dual-Task Performance in Groups of Patients with Preclinical, Mild, and Moderate Alzheimer's Disease Compared to Healthy Older Adults: The Differential Effect of Task Complexity is Evident Only in the Moderately Impaired AD Group
25. PREDOVAN, D Altered Semantic Priming Effect in the Recognition of Famous People in Alzheimer's Disease
26. SADEK, JR Behavioral Problems and Depression Symptoms Are Not Associated with Performance-Based IADLs in Dementia
27. SANTORELLI, G Hopelessness and Defeatist Beliefs as Predictors of Poor Cognitive Remediation Outcome in Elderly Patients Diagnosed with Alzheimer's Disease
28. SEDO, MA Five-Minute Digital Stroop of Alzheimer's Patients: Time and Error Scores
29. VALLET, GT When Patients with Alzheimer's Disease Do not Show Perceptual Priming Effects: Insight from the Cross-Modal Priming Paradigm
30. VICK, SC Predicting Depression in Older Adults Based on Cognitive Status
31. WOODARD, JL Measures of Episodic Forgetting Complement Structural and Functional MRI for Detection of Cognitive Decline in Apolipoprotein E $\epsilon 4$ Carriers
32. YEATMAN, CW Does Gender Buffer Against Visuospatial Decline?
33. YOUNG, JC Differentiation of Alzheimer's Dementia versus Vascular Dementia Using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS)
- Dementia (Subcortical, Specific Disorders, MCI, etc.)**
34. YOUNG, JC Characterization of Primary Progressive Aphasia Variants with the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): A Case Series Report
35. NATION, DA Pulse Pressure Predicts Cognitive and Functional Decline in Mild Cognitive Impairment
36. NATION, DA Qualitative Aspects of Semantic Fluency in Amnesic and Nonamnesic MCI
37. BARROSO, J Behavioral Variant Ftd and Phenocopy: A Neuropsychological Differentiation in Early Stages
38. BERTRAND, J Color discrimination and cognitive impairment in Parkinson's disease
39. BERTRAND, J Risk of dementia in Parkinson's disease with rapid eye movement sleep behavior disorder
40. BURROWS, CL Is Subjective Memory Complaint Related to Cognitive Deficits in Mild Cognitive Impairment?
41. BURTON, R Exploring the Natural History of Mild Cognitive Impairment in a Memory Clinic Sample Using a Multiple Case Report Format
42. BUSSE, M Differentiating Depression and Dementia: An Exploration of Various Measures
43. CALLAHAN, BL The Effect of Depressive Symptoms on Memory for Emotional Word Lists in Older Adults at Risk for Developing Dementia
44. CHERTKOW, H Amnesic Mild Cognitive Impairment in a Memory Clinic: Longitudinal Course and Predictors of Progression
45. CHERTKOW, H Low Tech Diagnostic Approach with the MoCA (Montreal Cognitive Assessment) Fails to Distinguish Alzheimer's Disease from Frontotemporal Dementia
46. DEAN, PM Distinguishing Characteristics of Cognitive Phenotypes across Frontotemporal Lobar Degeneration (FTLD) TDP-43 subtypes
47. TAN, J Physicians' Perceptions of Alcohol-Related Dementia
48. FRTUSOVA, JB Logistic Regression Analysis of the MoCA: Which Items Distinguish Normal Aging, Mild Cognitive Impairment, and Alzheimer Disease?
49. GAUDREAU, P Abnormal event-related potentials in patients with Parkinson's disease: effects of REM sleep behavior disorder and mild cognitive impairment
50. GÉNIER MARCHAND, D Frequency of Mild Cognitive Impairment in Rapid Eye Movement Sleep Behavior Disorder
51. GÉNIER MARCHAND, D Mild Cognitive Impairment in Parkinson's Disease is associated with Rapid Eye Movement Sleep Behavior Disorder
52. GILLIS, M The Frontal and Medial Temporal Lobes Contribute Differentially to Temporal Order Memory in Amnesic Mild Cognitive Impairment
53. GOMEZ, ME Reduced Abstract Reasoning and Memory Decline are Strong Predictors for Converting to Mild Cognitive Impairment
54. HEIDARIAN, L FDG-PET Correlates of Semantic (SF) and Phonemic (PF) Fluency Discrepancies
55. INGLES, J Semantic Fluency Patterns in Mild Cognitive Impairment, Autopsy-Confirmed Alzheimer's Disease and Healthy Elderly
56. KEARY, TA Cardiovascular Risk Factors and Neuropsychological Outcome Following Deep Brain Stimulation (DBS) in the Subthalamic Nucleus (STN)
57. KRAYBILL, M Predicting future cognitive decline in individuals with mild cognitive impairment: The role of executive and everyday functioning
58. LAMARRE, AK Objective Social Cognition Deficits in Fourteen Pathology-Confirmed Patients with Progressive Supranuclear Palsy
59. MANSOOR, Y Alzheimer's Disease and Behavioral Variant Frontotemporal Dementia: Memory Profiles in Pathology-Confirmed Clinical Groups
60. MARCONE, S The Envelope Task: Clinical Sensitivity in the Detection of Prospective Memory Impairment in Normal and Pathological Aging
61. MCGEE, JS Amnesic MCI, Sleep Disturbance, and Cognitive Functioning
62. MICKLEWRIGHT, JL Neuropsychological Correlates of Parietal Atrophy in Logopenic Progressive Aphasia

63. MYERSON, CE Expanding the Model of Apathy in Parkinson's Disease: Conceptual Domains and Neuropsychological Correlates
64. PAQUIN-MORELLI, A The clinical value of the Clock Drawing Test in the detection of MCI in Parkinson's disease and patient with idiopathic REM sleep disorder
65. PARK, LQ Apathy Has Detrimental Effects on Functional Impairment that is Independent of Depression and Cognitive Impairment
66. PIROGOVSKY, E Prospective Memory Deficits are Associated with Functional Impairment in Parkinson's Disease
67. RAMRATAN, W Level of Recall, Retrieval Speed, and Variability on the Cued-Recall Retrieval Speed Task in Amnesic Mild Cognitive Impairment
68. SELIGMAN, SC Cluster Analysis of Error Types on a Test of Everyday Action in Dementia
69. STEPHENS, M Does a "Frontal" Memory Pattern Exist? Comparisons Between Behavioral Variant Frontotemporal Dementia and Early Alzheimer's Disease
70. TIMPANO SPORTIELLO, MR Characterizing Mild Cognitive Impairment Neuropsychological Profile: A Cross-sectional Study
71. WATSON, P Early Deficits in Executive Functioning Identify Presymptomatic Huntington's Disease
72. WILKINS, S Very Long-Term Consolidation of Verbal Material in Mild Cognitive Impairment
73. ZAHODNE, LB Neuropsychological Correlates and Functional Impact of Apathy and Depression in Amnesic Mild Cognitive Impairment
74. ZANJANI, A On the Use of Repetitive Transcranial Magnetic Stimulation in the Treatment of Motor Symptoms in Parkinson Disease: A Quantitative Review of the Literature

Stroke/Aneurysm

75. ANDERSON, AJ Multidisciplinary Stroke Care Associated with Increased Neuropsychology Utilization and High Patient/Provider Satisfaction
76. CARTER, SL The Collaborative Use of Neuropsychological and ADL Assessment in a Case of Ruptured ACoA Aneurysm
77. CARTER, SL A Case Study of the Effects of Methylphenidate on Attention Following Left PComm Aneurysm Clipping: A Pre-Post Comparison
78. FERREIRA, MG Depression after Stroke: Association with Vascular Risk Factors in a Brazilian Sample
79. FERREIRA, MG Cognition and functional capacity after thrombolysis: preliminary results in a Brazilian sample
80. HAJEK, CA Cognitive Outcomes Following Arterial Ischemic Stroke in Children
81. KEMP, J Social Cognition Impairment Following Left Caudate Damage: A Case and SPECT Study
82. PULSIPHER, DT Validity of the Neuropsychological Assessment Battery (NAB) after Unilateral Stroke
83. SPRINGATE, BA Contributions of Stroke Patients' Cognitive and Functional Status to Family Functioning
84. STERLING, C Lesions in the Centrum Semiovale Related to Poorer Retention of Motor Improvement after CI Therapy

Visuospatial Functions/Neglect/Agnosia

85. CHEN, P Small Clock Drawings may Reflect Neglect Patients' Limited Ability to Enlarge the Attentional Aperture
86. MARK, VW Aphasia vs. Neglect on Cancellation Tests after Stroke
87. MERIGHI TABAQUIM, M Analysis of Gnosis Functions in Children with Cleft Lip and Palate: Neuropsychological Assessment
88. VOS, LC Asymmetric lateralization of vigilance for visual field change

Psychopathology/Neuropsychiatry (Other)

89. DUBREUCQ, S Impact of cognitive difficulties on pharmacological adherence of patients with affective disorder or ADHD

10:45 AM–12:15 PM

Symposium 13: Empirically-based Cognitive Rehabilitation from Healthy Aging to Alzheimer's Chair: Benjamin Hampstead Westmount

1. HAMPSTEAD, BM Empirically-based cognitive rehabilitation from healthy aging to Alzheimer's
2. KESSELS, R Implicit Memory Function, Errorless Learning and Their Application in Cognitive Rehabilitation in Alzheimer's Disease
3. HAMPSTEAD, BM Toward a model of stage-appropriate cognitive rehabilitation in Alzheimer's disease
4. BELLEVILLE, S Cognitive training in aging and mild cognitive impairment: measuring efficacy and brain substrates

10:45 AM–12:15 PM

Paper Session 9: Cognition in Low Birth Weight/Premature Birth Moderator: Dalin Pulsipher Outremont

1. LUONG-TRAN, C Small for Gestational Age v. Appropriate for Gestational Age Late Preterm Birth: Neuropsychological and Behavioral Outcomes at Age Three: The PETIT Study
2. BERRY, K Neuropsychological and Behavioral Outcomes at Age Three of In Vitro Fertilization and Late Preterm Birth: The PETIT Study

3. HORNACK, S Occipitofrontal Circumference Predicts General Cognition While Medical Risk Predicts Executive Function in Extremely Low Birth Weight Children at Age Six: Evidence from the PETIT Study
4. BAPP NEWMAN, J The Relationships between Head Circumference and Neuropsychological Performance in Preschoolers Born Prematurely
5. DUVALL, SW Perinatal Medical Variables Predict Executive Function Within a Sample of Preschoolers Born Very Low Birth Weight (VLBW)

10:45 AM–12:15 PM**Symposium 14: Korsakoff's Syndrome Revisited with Neuroimaging and Translational Investigations**

Chair: Rosemary Fama
Discussant: Edith Sullivan
Verdun

1. FAMA, R Korsakoff's Syndrome Revisited with Neuroimaging and Translational Investigations
2. PITEL, A Macrostructural Brain Abnormalities in Alcoholic Korsakoff's Syndrome
3. SAVAGE, L Impairment and Recovery of Cortical Function in a Translational Model of Korsakoff's Syndrome
4. KOPELMAN, MD Aspects of Context Memory in the Alcoholic Korsakoff's Syndrome
5. OSCAR-BERMAN, M Nonmnemonic Deficits in Korsakoff's Syndrome

12:30–2:00 PM**Paper Session 10: Psychopathology**

Moderator: Shawn McClintock
Westmount

1. KEILP, JG Decomposing the Nature of Memory Impairments in Depressed Suicide Attempters
2. CULANG-REINLIEB, M The Neuropsychological Profile of MRI-Defined Vascular Depression
3. WEISENBACH, S The Double Burden of Age and Disease on Cognitive Functioning in Bipolar Disorder
4. KILLGORE, WD Shared and Unique Patterns of Cortico-Limbic Activation Across Anxiety Disorders
5. SHENG, X Correlates of Work Stability over the Preceding Year in Outpatients with Severe Mental Illness and Healthy Adults

12:30–2:00 PM**Paper Session 11: Pediatric Structural Neuroimaging**

Moderator: Michelle McKerral
Outremont

1. LLOYD-DAVIES, A Diffusion Tensor Imaging of Limbic Pathways and their Relation to Memory after Early Moderate to Severe Pediatric Traumatic Brain Injury
2. FABER, J Diffusion Tensor Imaging of the Hippocampus and Its Relation to Memory in Moderate to Severe Pediatric Traumatic Brain Injury
3. HANTEN, K Perforant Pathway Diffusion Tensor Tractography and Its Relation to Verbal Recall in Children with Traumatic Brain Injury
4. YALLAMPALLI, R Relation Between Iowa Gambling Task and White Matter Changes of the Ventral Striatum in Moderate to Severe Pediatric Traumatic Brain Injury
5. AYOUB, KW Novel Longitudinal Vertex Analysis and Diffusion Tensor Tract-Based Spatial Statistics Reveal Evolving Subcortical Structural Changes in Patients with Traumatic Brain Injury

12:30–2:00 PM**Paper Session 12: Cognitive Functioning in Epilepsy**

Moderator: Shawn Gale
Verdun

1. BECK DUNN, C Age of Onset of Temporal Lobe Epilepsy Partially Mediates the Relationship between Gross Sulcal Morphology and Item Visual Memory
2. LADOWSKI, D Lateralized hippocampal activations during fMRI verbal and nonverbal learning tasks correlate with performance on material-specific memory tasks performed in the clinic
3. SEPETA, L Hippocampal Connectivity in Typically Developing Children and Children with Focal Epilepsy
4. LEE, GP Predictors of Nociferous Cortex in Children with Intractable Temporal Lobe Epilepsy
5. STEWART, CC The Influence of Side of Seizure Focus, Age of Seizure Onset, and Handedness on fMRI Language Lateralization in Temporal Lobe Epilepsy Patients

Abstracts Presented at the Fortieth Annual Meeting International Neuropsychological Society

February 15-18, 2012
Montréal, Québec, Canada

WEDNESDAY AFTERNOON, FEBRUARY 15, 2012

Students of INS (SINS) Workshop: Writing Successful Grants in Neuropsychology

Speakers: Mark Aloia, Rob Paul

12:00–4:00 p.m.

M.S. ALOIA & R. PAUL. Students of INS (SINS) Workshop: Writing Successful Grants in Neuropsychology.

Securing external funding from NIH or other federal agencies is critical to support research costs and academic promotion. Success in securing external funding for research in neuropsychology is often perceived by junior investigators as extraordinarily challenging, if not painfully frustrating. In this symposium a panel of neuropsychologists will provide direction and insights towards developing a program of sustained externally funded research. Comprised of senior faculty, members of the panel have successfully obtained NIH funding for their research, currently serve as reviewers on NIH grant panels, and have mentored junior scientists towards securing funding for their own lines of research. Didactics will focus on key strategies towards writing competitive grants and the process of NIH study section review. Following the didactic component the panel will conduct a working session that will include a mock review of grant applications. The symposium is geared towards students with a focus on the unique challenges faced by junior investigators. Correspondence: Mark S. Aloia, Ph.D., National Jewish Health, 1400 Jackson Street, Denver, CO 80206. E-mail: AloiaM@NJHealth.org

Poster Session 1: Cognitive Rehabilitation/MS and Demyelination/Memory/Cross-cultural

4:15–5:45 p.m.

Cross Cultural

E.C. ANDERSON, A.M. VANDERHOFF & P.J. DONOVICK. Written Expression Performance of Bilingual versus Monolingual College Students.

Objective: Prior research suggested that while bilingual college students were at a disadvantage to monolinguals when performing oral English expressive vocabulary tasks, there was no difference in measures of either general intelligence or receptive language. We postulated that, compared to monolingual students, bilingual college students would be at a disadvantage on English standardized tests of written expression.

Participants and Methods: Of the 104 Binghamton University student participants, 27 were monolingual males, 24 were bilingual males, 27 were bilingual females and 26 were monolingual females. The Raven progressive matrices were administered in order to establish baseline nonverbal intelligence. We then obtained a sample of written expression using the PIAT-R/NU. In addition to standard scoring of the sample we used the LIWC linguistics software to analyze each individual's written document.

Results: We found no difference in nonverbal intelligence between groups. Across a wide variety of linguistic backgrounds we found that monolinguals wrote significantly more than bilinguals in response to the picture prompt, during the allotted time. We also found that bilinguals tended to score lower than monolingual students on the written expression sample.

Conclusions: Given that performance in American colleges and universities is measured by written and oral English proficiency, this series of experiments indicates that bilingual students are at a disadvantage when compared to monolingual classmates.

Correspondence: Eliza C. Anderson, Binghamton University, BU Box 2171S PO Box 6000, Binghamton, NY 13902. E-mail: eanders1@binghamton.edu

J. BENNETT & S.P. VERNEY. The Relationship Between Phonemic Fluency and IQ in Hispanic Bilingual Students.

Objective: Phonemic fluency is strongly and consistently associated with intelligence. However, rapid growth of the bilingual Hispanic population requires a re-evaluation of such associations for proper diagnosis and treatment. Recent theories in bilingualism such as frequency of use and competing resources postulate that characteristics such as language dominance and age of acquisition may influence neurocognitive results. The purpose of this study is to examine the relationship between phonemic fluency and intelligence among bilingual Hispanics.

Participants and Methods: Monolingual English speaking European-American (MESEA; n=30) and age, education and gender similar bilingual Hispanic (n=99) undergraduates completed the Controlled Oral Word Association Test (COWAT, letters FAS); and a non-verbal estimate of intelligence, the General Adult Measure of Ability (GAMA). Bilingual participants were categorized into early (n=77) and late (n=22) age of acquisition groups (early: 2nd language learned <=6 years).

Results: The early bilingual group scored similarly to the MESEA students on phonemic fluency, but significantly lower on GAMA. The late bilingual group scored significantly lower than MESEA on both measures, but similarly to the early group on GAMA. Consistent with current literature, MESEA students demonstrated a significant correlation between phonemic fluency and GAMA score ($r=0.53$, $p<0.01$). However, neither bilingual group demonstrated a significant association between phonemic fluency and intelligence.

Conclusions: The phonemic fluency - intelligence relationship observed with MESEA students doesn't appear to hold for bilingual Hispanic students. Underlying cognitive mechanisms involved in bilingual neuropsychological performance may influence this relationship. These findings highlight the need to evaluate bilingual individuals' linguistic history before applying established norms to phonemic fluency performance.

Correspondence: *Jennifer Bennett, M.S., Psychology, Univ New Mexico, 1 University of New Mexico, MSC03 2220, Albuquerque, NM 87131. E-mail: jenben@unm.edu*

M. CROSSLEY, S. LANTING, H. ST. DENIS-KATZ, M.E. O'CONNELL, N. HAUGRUD & D.G. MORGAN. The Northern Cultural Assessment of Memory (N-CAM): Normative Data from an Inner-city Clinic Supports Efficacy and Validity of a Cognitive Screen for Aboriginal Adults.

Objective: The N-CAM was developed to provide a culturally appropriate cognitive screen for Aboriginal adults. Normative data collection in an inner-city health clinic provides indicators of efficacy and validity.

Participants and Methods: The N-CAM was developed through participatory research with Aboriginal health care staff and seniors' support groups. The protocol does not assume literacy and can be administered in the preferred language of the patient or through translation. The cognitive screen is scored on a 100-point scale and contains measures of attention, memory, language, executive functions, and praxis. A health and culture interview, standardized cross-cultural measures of memory and language (Lanting et al., 2011), and the N-CAM were administered to volunteers recruited through a health clinic. Participants (N=81, 41 males, 92% Aboriginal, age range from 19-81 yrs) endorsed high levels of chronic health and social problems, including 70% with addiction problems, 48% with hepatitis C, 38% with a history of head injury, and 68% with less than highschool education.

Results: N-CAM scores ranged from 73 to 99 (M = 93.4) and had statistically non-significant and small associations with age ($r = -.165$) and education ($r = .20$). Associations were highly significant with standardized tests of memory ($r = .513$), confrontational naming ($r = .508$), and semantic associations ($r = .601$), demonstrating good construct validity. Participants with scores below 80 (N=5) on the N-CAM performed in the impaired range on one or more of the standardized tests. Ninety-five% of participants were rated as fully co-operative and only 16% as test-anxious.

Conclusions: The N-CAM, developed through community-based partnerships, is a brief and well-tolerated cognitive screening protocol that demonstrates sensitivity to differences in higher brain functions and impairment, but not to age- or education-effects in Aboriginal adults and high-risk inner city residents.

Correspondence: *Margaret Crossley, PhD, Psychology, University of Saskatchewan, 9 Campus Drive, Saskatoon, SK S7N 5A5, Canada. E-mail: margaret.crossley@usask.ca*

J.R. JENKINS. Bilingual Proficiency and Contextual Memory Performance in a Hispanic Adult Sample.

Objective: The study examined differences in contextual (story) memory performance based on varying bilingual abilities. It also served to heighten awareness for neuropsychological practice involving Hispanic, bilingual individuals and how standardized measures may be employed in thoroughly assessing language abilities.

Participants and Methods: Spanish-English speaking, Hispanic American community college students (N = 29) participated in the study. Three bilingual groups (balanced bilingual, Spanish dominant, and English dominant) were determined based on receptive/expressive language abilities (EIWA/WAIS Vocabulary subtest). Contextual memory was assessed in Spanish (Bateria Neuropsicologica-Prose memory) and English (WMS III-Logical memory). Mann Whitney U tests assessed bilingual group differences on contextual memory performance. Wilcoxon Signed Rank tests evaluated within-group performance differences on Spanish and English language administration.

Results: Results revealed no differences in performance on contextual memory between the balanced bilingual group, and the Spanish and English dominant groups. Within-group analyses showed no differences in performance when language of administration varied from Spanish to English within the balanced bilingual group. The English dominant group showed no differences in performance on the Spanish and English measures of verbal memory. The Spanish dominant group produced higher scaled scores on the Spanish measure of verbal memory.

Conclusions: Findings did not reveal discrepancies in performance between the balanced bilingual and dominant individuals with regards to verbal memory performance. The variation in performance based on group membership highlights the lack of predictability when working with bilingual individuals. Results offer implications for clinical practice in neuropsychological assessment when working with Hispanic bilingual individuals.

Correspondence: *Jennifer R. Jenkins, M.A., Psychology, Alliant International University-CSPP, 43 Winship St., Apt A, Brighton, MA 02135. E-mail: jenrjenkins@gmail.com*

R. JOSHI, T.D. MARCOTTE, A. LIU, R. MEYER, R. KAMAT, A. GEISERMAN, R. HEATON, I. GRANT, S. MEHENDELE & M. GHATE. Real-World Validity of Cross-Cultural Neuropsychological Testing: Cognitive Functioning and Occupational Level in India.

Objective: Although neuropsychological (NP) tests have been related to occupational functioning in Western countries, this has not been explored in resource-limited settings where many factors influence access to education and occupational opportunity. This study examines whether NP test performance is associated with occupational level in an Indian cohort, after controlling for education.

Participants and Methods: 116 HIV seronegative controls with 6 to 12 years of education (a range in which participants could achieve a variety of occupational levels) were identified from a neuroAIDS study in Pune, Maharashtra, India, and completed an NP battery in Marathi. Mean age was 33.7 (8.2) years, education was 9.1 (1.7) years, and 59% were male. Mean unadjusted scaled scores (mSS) were used to estimate overall NP functioning. Jobs were assigned a ranking of 1 (e.g., managers) to 9 (e.g., laborers) using the official Indian National Classification of Occupations scale, which ranks jobs based upon the overall responsibilities, skill level, and training needed.

Results: Univariate analysis showed no effect for age and gender, but there was a significant effect for education ($R^2 = 0.05$, $p = 0.02$), and particularly for mSS ($R^2 = 0.143$, $p < 0.0001$). In a multivariate model including mSS and education, mSS was the only significant factor associated with occupational level.

Conclusions: Despite social constraints and resource scarcity, these results suggest that NP tests developed for Western cultures are informative about real-world outcomes in the Indian context. They also support using these measures for future studies examining the issue of cognitive reserve in India.

Correspondence: *Thomas D. Marcotte, PhD, University of California, San Diego, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: tmarcotte@ucsd.edu*

K.M. LAU. Set-shifting, mental flexibility, and bicultural stress among Chinese American adults.

Objective: Bicultural stress develops from negotiating between disparate Chinese and American cultural systems. It has been hypothesized that bicultural individuals who can flexibly alternate and fluidly switch between cultural frames will afford better psychological outcomes. The present study examined the role of cognitive flexibility and acculturation on bicultural stress.

Participants and Methods: The sample included 92 Chinese American adults of 1.5 and 2nd generational status. Pearson r correlations examined the relationship between set shifting (TMT-B), mental flexibility (WCST-perseverative errors), and bicultural stress (Asian Bicultural

Stress Scale). Hierarchical multiple regressions examined whether the relationships between set shifting and mental flexibility with bicultural stress depended on levels of acculturation (European American Values Scale-Asian American-Revised) and enculturation (Asian Values Scale-Revised). Post-hoc analyses examined slope differences within three-way interaction results.

Results: Higher set-shifting ($r = -.27, p = .01$) and mental flexibility ($r = -.20, p = .05$) were found to be correlated with lower bicultural stress. Regression analyses revealed a significant three-way interaction ($R = .454, \Delta R^2 = .206, \Delta F(1, 84) = 8.628, p = .004$). The relationship between mental flexibility and bicultural stress was strongest when Chinese Americans endorsed more balanced levels of acculturation and enculturation.

Conclusions: Current study is first to examine executive function and acculturation within the sociocultural context of bicultural stress among Chinese Americans. Similar to bilingualism research, executive control appears necessary to avoid interference from non-target culture, and monitor cultural expectations. Findings implicate the importance of fostering mental flexibility as a coping mechanism among bicultural individuals.

Correspondence: *Karen M. Lau, M.A., California School of Professional Psychology; Alliant International University; 100 Beach Street, Suite 100, San Francisco, CA 94133. E-mail: karen.m.lau@gmail.com*

D.A. MARTINEZ REYES, D. YEH, A. LEGENKAYA, C. LUCAS, D.R. CARR, A.M. MEIER, S.S. SHINEY, A.M. YU, A. HOROWITZ, M.E. GOMEZ, L. BROGDON, J. KIM, K.J. MILLER & G.W. SMALL. Monolingual and Multilingual Performance Differences on Tests of Unstructured Visuoconstruction Ability and Contextual Memory.

Objective: Multilingualism may play a role in delaying the onset of cognitive decline and serve as a protective factor for certain cognitive abilities.

Participants and Methods: Neuropsychological data was collected on 135 participants; 96 were monolingual and 39 were multilingual (i.e., they reported speaking more than one language). The mean age was 61.70 (SD = 11.47) and mean education was 16.68 (SD = 2.99). Multilingualism was negatively correlated with education ($r = -.18$), but not associated with gender and global cognitive functioning. The battery of tests consisted of tasks of attention, processing speed, language, executive functioning, and memory.

Results: Using a Multivariate Analysis of Variance (MANOVA) with the covariate of education, multilinguals demonstrated statistically significant differences in cognitive functioning when compared to monolinguals, including: decreased performance on a test of complex visuoconstruction (Rey-O Copy), and increased performances for contextual memory - immediate recall of paragraph stories (WMS-3: Logical Memory Immediate) and delayed recall of paragraph stories (WMS-3: Logical Memory Delay), Pillai's Trace = 0.076, $F(3, 130) = 3.59, p = .02$.

Conclusions: Results suggest that multilinguals show decreased performances on visuoconstruction and better performances for contextual memory tests when compared to monolinguals. This has implications for research involving factors of cognitive functioning in multilingualism.

Correspondence: *Daniel A. Martinez Reyes, MS, MA, UCLA Semel Institute for Neuroscience and Human Behavior, 801 S Grand Ave, Pasadena, CA 91105. E-mail: danchile@gmail.com*

M.M. CHARCAPE, L.A. RABIN, A.T. SPADACCINI, K.S. GRANT & W.B. BARR. Trends in the Neuropsychological Assessment of Ethnic Minorities: A Survey of Neuropsychologists in the U.S. and Canada.

Objective: Key challenges in the neuropsychological assessment of ethnic minorities include appropriate translation and validation of tests, utilization of appropriate norms to assist in the interpretation of raw

scores, and clinicians' cultural competence and linguistic proficiency. Challenges in providing services for ethnic minorities go beyond the domain of assessment, as neuropsychologists who identify as ethnic minorities are under-represented. Despite the importance of this issue as society becomes more demographically diverse, research has yet to survey neuropsychologists regarding multicultural assessment practices. As part of a larger, 10-year follow-up study of test usage practices, the current study surveyed neuropsychologists with regard to assessment of ethnic/racial minority populations, proficiency in languages other than English, approaches to interpreting the cognitive scores of ethnic/racial minorities, and challenges associated with assessing ethnic/racial minority patients.

Participants and Methods: Respondents were 500 doctorate-level psychologists in the U.S. and Canada (25% usable response rate; 54% female) affiliated with the National Academy of Neuropsychology and/or International Neuropsychological Society.

Results: Results indicated that 92% of respondents identified themselves as "White", making it an overwhelming majority. Respondents reported spending the majority (64%) of their professional time with White patients/clients followed by Black or African American clients (16%). Only 13% of respondents reported conducting assessments in languages other than English (primarily Spanish). Lack of appropriate norms, tests, and referral sources were identified as the greatest challenges associated with assessment of ethnic/racial minorities.

Conclusions: Findings are discussed in relation to the need for appropriate education and training of neuropsychologists in multicultural issues as well as the provision of more valid assessments for minority clients/patients.

Correspondence: *Laura A. Rabin, Ph.D., Psychology, Brooklyn College/CUNY, 2900 Bedford Ave, Brooklyn, NY 11210. E-mail: lrabin@brooklyn.cuny.edu*

D. RITCHIE, A. ODLAND, A. STEVENS & W. MITTENBERG. Selection Criteria for Clinical Neuropsychology Internships.

Objective: Internship in clinical neuropsychology is an essential part of specialty training. This paper reports a survey of the applicant evaluation and selection criteria currently used at clinical neuropsychology internships.

Participants and Methods: Training sites were identified from listings published by INS, AITCN, APA Division 40, and APPIC. Internship information was reviewed for concordance with the Houston Conference and INS/APA Division 40 guidelines. Utilizing these criteria, 103 internships that offered a minimum of 50% of training devoted to clinical neuropsychology were identified. Supervising neuropsychologists were contacted and asked to complete a 10-item survey of candidate selection criteria used in a prior similar study.

Results: 75 (72.8%) of sites responded to the survey. Clinical experience in neuropsychological assessment, specialization in neuropsychology during graduate school, the interpersonal skills of the applicant during the interview, and letters of recommendation from clinical neuropsychologists were reported as the most salient selection criteria. Applicants that had completed graduate school curricula that provided specialty education in neuropsychology, with clinical neuropsychologist faculty and supervisors were preferred. Internship supervisors valued prior practicum experience with neurological cases at university affiliated or V.A. medical centers, flexible assessment approaches, and supervision by neuropsychologists. Research experience was also viewed important by most internship sites.

Conclusions: Results indicate continued endorsement of the vertically integrated model of education and training outlined by the Houston Conference and INS/APA Division 40 guidelines for the didactic and experiential components of specialization in clinical neuropsychology. The number of neuropsychology internship sites has more than doubled during the past 10 years.

Correspondence: *David Ritchie, Nova Southeastern University, 3300 College Ave., Davie, FL 33014. E-mail: dritchier@nova.edu*

P. SAEZ, H.A. BENDER, W.B. BARR, M. RIVERA MINDT, C.E. MORRISON, J. HASSENSTAB, M. RODRIGUEZ-RIVERA & B. VAZQUEZ. The Impact of Sociocultural and Neurological Variables on Nonverbal Neuropsychological Test Performance Among Latino/a Epilepsy Patients.

Objective: The present study examined the relationship between various sociocultural (e.g., acculturation, education), neurological variables (e.g., epilepsy duration and seizure frequency) and nonverbal neuropsychological test performance in a sample of 305 Latino/a and non-Latino/a White adults with and without epilepsy.

Participants and Methods: All participants completed nonverbal neuropsychological (NP) measures of visuospatial skills, memory, executive functioning, and psychomotor speed. An acculturation scale was administered to Spanish-speaking epilepsy patients and controls.

Results: Education was strongly correlated with performance on all but one of the nonverbal NP study measures (i.e., RFFT-Short Form Perseverative Errors) across the entire sample. Among Spanish-speaking Latino/a epilepsy patients, level of acculturation to U.S. culture was associated with RFFT-Short Form Perseverative Errors T-score ($p < .05$) and with a composite measure of nonverbal NP test performance ($p < .05$). Finally, the results of hierarchical regression models showed that sociocultural factors accounted for a greater proportion of variance in nonverbal NP test performance than did neurological factors.

Conclusions: These results provide further evidence that sociocultural factors are strong predictors of neuropsychological test performance in clinical populations, even on nonverbal tests. Assessment of acculturation may be as critical as assessment of disease factors in interpreting cognitive performance in Latino/a individuals.

Correspondence: *Pedro Saez, Ph.D., Neuropsychology, Harbor-UCLA Medical Center, 600 S. Spring Street, Apt. 1403, Los Angeles, CA 90014. E-mail: pedroasaez@gmail.com*

B.M. SCOTT, S. PEERY, P.C. TIEU, V.J. LOZANO & A.M. STRUTT. Determination of Suspect Effort: Primarily Spanish-Speaking TBI Patients and the Test of Memory Malinger.

Objective: The psychometric properties of the Test of Memory Malinger (TOMM) have been well documented in the neuropsychology literature on suboptimal effort in English-speaking participants. However, a consensus regarding the use of this instrument with primarily Spanish speaking adults in the US has not been reached. The present study investigated the performance of Spanish-speaking patients diagnosed with traumatic brain injury (TBI) on the TOMM, as well as a comprehensive neuropsychological battery.

Participants and Methods: Data were retrospectively collected from charts of patients who underwent neurocognitive evaluations. Slick et al. (1999) criteria for malingered neurocognitive dysfunction was utilized for clinical determination of the validity of participants' neuropsychological profiles, which resulted in 16 valid and 4 suboptimal performers (SOP).

Results: No significant demographic or mood differences were found between valid versus SOP; however, patients with valid effort significantly outperformed their suboptimal counterparts on all three trials of the TOMM. While all SOPs were correctly classified with the recommended cut-off for TOMM Trial 2, 19% of valid performers were misclassified as malingering, and lower levels of education appeared to reduce performance on this measure within the valid group. Although SOP generally demonstrated greater cognitive impairments, a significant between group difference was only found for standard scores of visuospatial planning ($p=0.006$). As SOP demonstrated gross impairments on this measure, utilizing a TOMM Trial 2 cut-off of 45 in conjunction with a cut-off of two standard deviations for this neurocognitive domain correctly classified all valid and SOPs.

Conclusions: Current findings generally support the use of the TOMM with primarily Spanish speaking TBI patients in the US, and highlight the need for clinicians to consider such performance in conjunction with a patient's education level in addition to various lines of evidence (i.e., Slick criteria).

Correspondence: *Bonnie M. Scott, Baylor College of Medicine, 6550 Fannin, Suite 1801, Houston, TX 77030. E-mail: bonnie.m.scott@gmail.com*

A. THAMES, D.A. BYRD, M. RIVERA-MINDT, S. MORCELLO, R. NAGARAJAN, S.K. MANOJ, T.A. MICHAEL, S.M. PATEL, P. STELLA, X. CAGIGAS & C.H. HINKIN. Neuroimaging & neuropsychological assessment among African Americans: The impact of literacy.

Objective: Neuropsychological (NP) assessment is commonly used for diagnostic purposes; however, concerns regarding the validity of NP testing with African Americans have been raised (Byrd et al., 2006). Research suggests that quality of education (based on literacy measures), rather than years of education, better explains race/ethnicity-based differences in NP performance (Manly et al., 2002). Among racially/ethnically diverse cohorts, neuroimaging is strongly associated with clinical diagnosis (DeCarli et al., 2008), whereas associations between NP and clinical diagnosis are attenuated (Leritz et al., 2010). The aim of this study was to examine relationships between NP and neuroimaging performance, after controlling for literacy, in a racially/ethnically diverse sample.

Participants and Methods: Participants (N=95; 40 African Americans & 55 Caucasians) completed a NP battery. Twenty participants (9 African Americans & 11 Caucasians), also underwent neuroimaging (magnetic resonance spectroscopy imaging [MRSI]). Basal ganglia and frontal white matter were examined (MRSI metabolites: N-acetylaspartate, choline, creatine, glutamate, glutamine, myo-inositol, and aspartate).

Results: African Americans demonstrated significantly lower performance ($M=92$; $SD=16.96$) on WTAR than Caucasians ($M=100$; $SD=13.873$), and in the demographically-corrected NP domains of learning/memory and executive functioning (all p 's < .05). After controlling for WTAR, ethnic differences in these domains were non-significant (all p 's > .05), and there were significant improvements in the strength of relationships between MRSI metabolites in frontal-striatal regions of interest and NP performance for African Americans. Interestingly, there were no significant changes in the relationships between MRSI metabolites and NP for Caucasians.

Conclusions: Our findings suggest that literacy-corrected neuropsychological data more accurately represent brain functioning and may improve clinical diagnosis among African Americans.

Correspondence: *April Thames, Ph.D., University of California Los Angeles, 760 Westwood Plaza CS-746, Los Angeles, CA 90095. E-mail: athames@ucla.edu*

Cognitive Intervention/Rehabilitation

P. BELCHIOR & M. MARSISKE. The Association of a Multidimensional Construct of Useful Field of View With Standardized Visuospatial and Non-Visuospatial Measures.

Objective: Computerized measures of Useful Field of View (UFOV)/Visual processing speed have been shown to be related to older adults' everyday activities, such as driving. However, as is true for many experimental measures, UFOV tasks have not been validated with regard to traditional neuropsychological measures of visuospatial and verbal cognition. Thus, the aims of the current study were: 1) To explore the convergence among multiple measures of UFOV / Visual Processing Speed; 2) To explore the convergent and discriminant validity of the UFOV by examining raw bivariate association among UFOV and other visuospatial and non-visuospatial measures; 3) To examine the unique association between UFOV and visuospatial/non-visuospatial measures after controlling for age, education and gender. A total of 149 older adults participated in this study.

Participants and Methods: Participants were 65 years or older (mean = 73 years; $SD = 5.7$). Fifty nine percent of the sample was female and 70% of the sample had a bachelor's degree or higher. Three UFOV, four other visuospatial measures and three non-visuospatial measures were administered to participants.

Results: An exploratory factor analysis revealed that the multiple measures of UFOV converged to one general factor. This general construct was correlated with two visuospatial measures on mental rotation (Shepherd & Metzler figures and Schaie Object Rotation Test) but was not correlated with JOLO or Block Design test. Furthermore, UFOV was not correlated with non-visuospatial measures (HVLIT, PANAS and GDS). After controlling for age, education and gender, the association between UFOV and visuospatial measures persisted.

Conclusions: The UFOV factor shows clear convergent and discriminant validity, and is particularly associated with measures of mental rotation. It represents variance that is fairly distinct from many other cognitive and neuropsychological measures and it would be a useful addition to existing batteries of visuospatial function with older adults. Correspondence: *Patricia Belchior, PhD, School of Physical & Occupational Therapy, McGill University, 3654 Promenade Sir-William Osler (Drummond), Hosmer 203, Montreal, QC H3G 1Y5, Canada. E-mail: patricia.belchior@mcgill.ca*

Y. BOGDANOVA, E. ANASTASIO, M. VERFAELLIE & M.P. ALEXANDER. Trial of Cognitive Rehabilitation in Anoxic Brain Injury.

Objective: Many out of hospital cardiac arrest (OHCA) survivors exhibit persistent impairments in executive function and memory. We investigated the efficacy of a structured rehabilitation program on these deficits in cognitive function and associated disability.

Participants and Methods: Six OHCA patients with persistent cognitive deficits at least 12 months post-onset participated in a 10-week group intervention based on modified Goal Management Training (GMT). All patients were administered a battery of standardized cognitive tests and measures of neuropsychiatric functioning, cognitive lapses, and daily activities (patient and family ratings) before (T1), immediately after (T2), and three months post-treatment (T3).

Results: There were modest improvements in executive function and memory, a reduction in apathy, and an improvement in daily functions immediately following the intervention (T2). Only small improvements in executive tasks and daily function were sustained to late assessment (T3). The degree of improvement was inversely correlated with the initial severity of memory impairment and apathy.

Conclusions: This was a pilot study with a small – but fairly homogeneous – group of patients with chronic, complex cognitive deficits after OHCA. The GMT program produced improvements in cognition and daily function, but the gains were small and of very modest functional benefit. Very severe memory loss and marked apathy were strong predictors of no response to treatment. GMT programs should be evaluated in a larger population of anoxic brain injury patients with less severe memory impairment. Correspondence: *Yelena Bogdanova, PhD, Psychiatry, Boston University School of Medicine, Psychology Research (151-A), 150 South Huntington Street, Boston, MA 02130. E-mail: bogdanov@bu.edu*

L.S. CAHILL & C. BUSSOLARO. Maximising Memory: An Interdisciplinary Pilot Project Of Group Self-Management For Those With Mild Cognitive Impairment.

Objective: In collaboration with a consultant Neuropsychologist, the Occupational Therapy and Speech Pathology Departments of a major metropolitan Australian health network piloted a study for an education and self-management group for those with mild cognitive impairment. To date, cognitive rehabilitation group programs have not been common practice in Australia.

Objectives for participants were:

Increased understanding and use of cognitive rehabilitation strategies
Increased confidence and satisfaction in problem-solving skills to manage cognitive difficulties

Increased confidence in being able to self-manage cognitive and communication difficulties

Participants and Methods: Participants were eight community dwelling clients with mild cognitive impairment and their carers. Clients all had

a diagnosis of Vascular, Alzheimer's or Semantic Dementia. Pre and Post evaluation measures used included the modified Goal Attainment Scale (GAS), the Zarit Burden Scale and semi-structured interviews. Participants attended groups sessions weekly for 8 weeks where compensatory cognitive strategies were taught and practised. Sessions were facilitated by Occupational Therapists, Speech Pathologist and other multidisciplinary and medical guests.

Results: Consistent with the targeted approach to strategy implementation that was a focus of the group, achievement of most goals was demonstrated on Goal Attainment Scales, though clinical significant change was only indicated for two participants. Post evaluation measures indicated an increase in the number of strategies used by clients to manage cognitive difficulties. Carer burden was shown to be reduced for two of three carers.

Conclusions: This project suggests the effectiveness of a group program in increasing confidence in use of strategies and reducing carer burden in a group with mild cognitive impairment. This program could be easily replicated in other health networks, in Australia and internationally.

Correspondence: *Liana S. Cahill, Bachelor of Occupational Therapy, Occupational Therapy, The Royal Melbourne Hospital, Royal Park Campus, 32-52 Poplar Road, Parkville, VIC 3053, Australia. E-mail: liana.cahill@mh.org.au*

J. CARSTENS & A. BAIRD. The Effects of Goal Management Training in Undergraduate Students with Problems in Attention Functioning.

Objective: Most research involving training of executive functions (EFs) has been conducted with older adults or individuals who have sustained brain injury. The present study was intended to further our understanding of EFs in a population who report less severe difficulties in this area.

Participants and Methods: One hundred twenty-two undergraduates participated in this study. They reported some difficulties with attention and EFs but denied ever receiving a diagnosis of a learning disorder. Students were randomly assigned to either an experimental or a control group. The experimental group received a forty-five minute session of Goal Management Training (GMT) based on the description in Levine et al. (2000). The control group underwent unrelated memory testing as a distraction task for a similar interval. Both groups completed tasks requiring goal management (GM) before and after their session.

Results: Repeated-measure ANOVAs showed a significant decrease in completion time of the GM tasks in the total sample ($p < .05$), as well as a significantly greater decrease in completion time in the experimental group compared to the control group ($p < .05$). There was a non-significant decrease in errors across both groups at the second measurement with no significant group difference in change.

Conclusions: In addition to demonstrating the presence of a robust practice effect on GM tasks, the results suggest that brief GMT may be helpful to undergraduates who experience attentional difficulties. Further work is needed to understand the value of GMT in this population and to determine what components of GMT are essential for benefit.

Correspondence: *Jenny Carstens, M.A., University of Windsor, 333 Randolph Ave., Windsor, ON N9B2T4, Canada. E-mail: carstenj@uwindsor.ca*

M. CONSTANTINOU & M. KAREKLA. CBT improves cognition and reduces amount of seizures in children.

Objective: Epilepsy is a medical diagnostic entity that is often associated with anxiety and depression; which in return are often related to a higher number of seizures. This study investigated the neuropsychological/cognitive and health-related benefits following cognitive behavioral therapy (CBT) in a group of children.

Participants and Methods: Twenty-one children (ages, 8-12) diagnosed with epilepsy (a homogeneous group with temporal lobe epilepsy with simple partial seizures) underwent CBT (8 weeks). Children were medicated (no changes during treatment) and had on average 5.4

recorded seizures per month. Parent/teacher evaluations (CBCL) were used to assess their anxiety and mood every other week and a neuropsychological evaluation was administered pre-post treatment. A control group of 19 matched children did not receive CBT during the same period.

Results: The children who underwent CBT experienced 3.2 fewer seizures ($p < 0.01$) than their peers and had significantly lower CBCL-scores on anxiety, withdrawal, and depression ($p < 0.01$) and better neuropsychological functioning (memory, attention, and executive functioning; $p < .05$).

Conclusions: Overall, CBT appears to significantly benefit children medically, psychologically, and neuropsychologically-cognitively.

Correspondence: *Marios Constantinou, Ph.D., Psychology, University of Nicosia, 46 Makedonitissas Avenue, Engomi, Nicosia 1700, Cyprus. E-mail: constantinou.m@unic.ac.cy*

H. FAHMI, E. MARZIALI, L. MIDDLETON, B. LEVINE, S. BLACK & G. TURNER. Web-based Delivery of a Cognitive Training Program.

Objective: An evidence-based cognitive training program - Goal-Management Training (GMT) - has proven successful in improving cognitive abilities in patients with executive dysfunction (Levine et al., 2011). GMT typically requires in-class small-group attendance, placing time and travel burdens on participants. To date there are no published reports investigating the use of real-time video conferencing platforms to deliver group-based cognitive rehabilitation. Here we adapt an established web-delivery platform for dementia caregiver support groups (Caring for Me – CFM) to determine the feasibility of delivering GMT remotely via the web.

Participants and Methods: Participants (N=4) with evidence of executive dysfunction were recruited. GMT was delivered in ten 2-hour sessions over 5 weeks via the CFM interface. GMT teaches formal problem-solving techniques, employed to define a goal, make a plan, and monitor progress. To determine feasibility and compliance with the in-class training protocol, open-coding of both in-class and web-based GMT sessions were done by recording evidence from participant interaction, deriving grouped categories and establishing themes.

Results: Similar themes arose from both delivery methods (e.g. 'slips', 'forgetfulness'). In both groups highly overlapping categories of comments emerged including: real-world instances of slips, reasons for making slips and their consequences. Moreover, participant involvement and the number of supporting comments for core themes were equivalent between delivery methods. This provides strong evidence that engagement in the learning materials was similar, irrespective of delivery mode.

Conclusions: Interactive, group-based cognitive rehabilitation has not heretofore been administered via a web-based platform. Our results demonstrate that GMT can be remotely delivered without compromising the therapeutic integrity of the training protocol. We believe this novel approach will have significant impact on the design and accessibility of cognitive rehabilitation programs.

Correspondence: *Halla Fahmi, MSc, University of Toronto, 47 Daleside Crescent, Toronto, ON M4A2H7, Canada. E-mail: halla.fahmi@alumni.utoronto.ca*

M.B. FERLAND, J. LARENTE, J. ROWLAND & P. DAVIDSON. Errorless Learning and Electronic Cueing Device Use for Training Daily Living and Diabetes Management Routines in a Young Woman with Initiation and Episodic Memory Impairments Following an Acquired Brain Injury.

Objective: To train a subject with severe initiation and memory disturbances in daily living skills and diabetes self-management using errorless learning and an electronic cueing device.

Participants and Methods: Participant: 22 year-old woman with diabetes who suffered a ruptured frontal lobe and corpus callosum arteriovenous malformation.

Method: She took part in a residential brain injury program at 7 months post injury. Psychometric testing at 5 months post injury showed an in-

ability to recall information more than a few minutes. In-vivo observations revealed a failure to initiate daily routines without human prompts and a need for maximal assistance managing her diabetes. First, the client was trained in the steps of a morning and evening hygiene routine as well as one for management of her diabetes, both using an errorless learning approach. The second stage involved the use of a CADEX multi-alarm cueing watch, along with a daily agenda, to independently trigger the routines among a range of daily activities.

Results: By six months of treatment, the subject was able to carry out both her daily hygiene routines and diabetes management with nearly 100 % success. Through family training the routines were successfully transferred from the treatment centre to home. Post-treatment standardized memory testing again showed significant deficits, indicating that functional gains did not rest on overall improved episodic memory abilities.

Conclusions: A brain injured person with severe initiation and memory disturbances can be successfully trained in daily routines and management of diabetes through the combined use of errorless learning and an electronic cueing system.

Correspondence: *Mark B. Ferland, Ph.d., Psychology, The Robin Easey Centre of The Ottawa Hospital, 125 Scrivens, Ottawa, ON K2B6H3, Canada. E-mail: maferland@ottawahospital.on.ca*

C. FYOCK, A.Y. STRINGER & B.M. HAMPSTEAD. Increased Strategy Use is Associated with Subjective Memory Improvement Following Cognitive Rehabilitation.

Objective: The Ecologically-Oriented Neurorehabilitation of Memory (EON-Mem) program is a compensatory-based cognitive rehabilitation program for patients with memory impairment. A component of EON-Mem is a Memory Strategies and Concerns Questionnaire (MSCQ) on which patients rate their subjective memory difficulty and report memory strategies used across seven ecologically-relevant content areas (numbers, future tasks, object location, oral information, written information, routes, and biographical information).

Participants and Methods: Here, we present pre- and post- EON-Mem MSCQ data from a mixed neurological sample ($n = 23$, 44% with moderate-severe memory impairment). Because EON-Mem focuses training on areas patients identify as important, we were able to compare changes in MSCQ ratings and strategies in trained vs. untrained areas.

Results: Compared to baseline, patients reported using more strategies across all areas after EON-Mem, significantly more so within the trained than untrained areas. Similarly, patients reported experiencing less memory difficulty after EON-Mem, with the magnitude of decline significantly greater for the trained than untrained areas. There was a significant inverse correlation between the number of strategies reported and difficulty ratings that was specific to the trained areas during the post-EON-Mem evaluation.

Conclusions: The current study suggests that after completing EON-Mem, patients use more mnemonic strategies and experience less difficulty within their everyday lives. These findings compliment our earlier report of objective memory improvement following EON-Mem (Stringer, 2011).

Correspondence: *Courtney Fyock, Neuroscience, Psychology, Dickinson College, 2700 Orbison Ave, Huntingdon, PA 16652. E-mail: fyock@dickinson.edu*

G. GRIFFITHS & M.M. SOHLBERG. Same Complaint, Different Profiles: An Examination of Reading Comprehension and Recall Deficits in Individuals with Acquired Brain Injury.

Objective: Adults with mild to moderate acquired brain injury (ABI) frequently complain that difficulty with high level reading comprehension and retention of text interferes with academic and vocational pursuits. Despite the prevalence of acquired reading comprehension and retention deficits in the ABI population, our understanding of factors that predict difficulty is limited. In an earlier study, we hypothesized readers with ABI would perform worse than uninjured matched controls on

sentence verification and free recall tasks following the reading of expository text. Results suggested different subgroups of impairment within the ABI population that could not be explained by cognitive profiles and were not seen in the matched, non-injured group. For the proposed paper, we describe results of a follow-up analysis investigating the hypothesis that subgroups would emerge in the ABI group based on differential performance on measures designed to capture inferencing ability.

Participants and Methods: After controlling for age, education, gender and cognitive performance on standardized tests, we conducted differential function analysis to predict subgroup membership for 17 adults with mild-to-moderate ABI based on results of the sentence verification tasks. We compared participants' performance on a sentence verification task as well as on free-recall verbal summaries using the ratio of causal verbs to causal participles, a metric known to reflect inferencing performance in discourse.

Results: The analysis yielded two distinct subgroups.

Conclusions: The results further our understanding of factors that contribute to high level reading impairments in people mild to moderate ABI. Correspondence: *Gina Griffiths, M.S./PhD Student, Communication Disorders and Sciences, University of Oregon, 5284 University of Oregon, 241 HEDCO Education Building, Eugene, OR 97403. E-mail: ginag@uoregon.edu*

M.D. GRILLI & E.L. GLISKY. Self-Knowledge and the Self-Imagination Effect (SIE) in Free Recall: Implications for Cognitive Rehabilitation and Memory Disorders.

Objective: Self-knowledge is relatively preserved in memory-impaired individuals with neurological damage. Therefore, mnemonic strategies that take advantage of self-knowledge may be successful in this population. Recent research has demonstrated that self-imagining (the imagination of an event from a personal perspective) enhances recognition and cued recall in memory-impaired populations more than other strategies—a mnemonic advantage that Grilli and Glisky (2010, 2011) have hypothesized may be attributable to mechanisms associated with the self.

Participants and Methods: In this study, 15 memory-impaired individuals with neurological damage intentionally encoded personality trait adjectives under five conditions: a) self-imagining, b) a self-descriptiveness task thought to rely on access to self-knowledge (i.e. decide whether this trait describes you), c) an autobiographical memory task requiring retrieval of a self-relevant episodic memory (i.e. remember a time when you acted out this trait), d) a semantic elaboration task (i.e. think of a definition for this trait), and e) a phonemic processing task.

Results: Recall following self-imagining was greater than in all other conditions. Furthermore, recall following the semantic self-descriptiveness task was greater than recall following the episodic retrieval task, and the latter did not differ from the non-self-related semantic retrieval task. Words that were judged as self-descriptive were recalled better than words that were judged as not self-descriptive, but only in the self-imagining and self-descriptiveness conditions.

Conclusions: These findings demonstrate that the SIE extends to free recall, suggest that the advantage of self-imagining in memory-impaired individuals depends on mechanisms associated with preserved self-knowledge, and provide further support for the usefulness of self-imagining in memory rehabilitation.

Correspondence: *Matthew D. Grilli, Psychology, University of Arizona, 1503 E University Blvd, PO Box 21006S, Tucson, AZ 85721. E-mail: mdgrilli@u.arizona.edu*

A. HUNT, D. DAWSON, G. TURNER & H. POLATAJKO. Executive Function, Self-Regulation, and Attribution in Acquired Brain Injury: A Scoping Review.

Objective: The objective of this review was to examine what is known about the relationship between executive function, self-regulation and attribution in acquired brain injury. Impairments in these constructs have all been implicated in reduced participation in daily life in this population, however, there is minimal literature that explicitly addresses this relationship and how it is affected by brain injury.

Participants and Methods: Scoping review methodology, as described by Arskey & O'Malley (2005), was used to provide a broad perspective of existing literature by summarizing research across multiple domains. The review encompassed cognitive neuroscience, neuropsychology, rehabilitation, educational and social psychology literature from 1985 to 2011. Of 593 papers identified, 53 were chosen for more in-depth review. Data were extracted from qualitative and quantitative papers and examined for inter-relationships.

Results: The reviewed literature provided definitions of the constructs and insight into the relationships between them according to neural underpinnings and conceptual models. Empirical data suggests that acquired brain injury impacts these relationships in a negative manner. These data also provided for the development of a model that illustrates the relationship between the constructs.

Conclusions: This review and the model developed, Performance Model of Self-Regulation, provide unique insight into the influence that attributional factors have on executive function and self-regulation. Attribution appears to be of considerable importance for individuals with acquired brain injury as they are prone to making misattributions contributing to impaired self-regulation, executive function and reduced participation in daily life. Interventions that enable these individuals to make appropriate attributions should be considered in addition to training in self-regulation and executive function.

Correspondence: *Anne Hunt, PhD (Candidate), Rehabilitation Science, University of Toronto, 88 Mason Blve, Toronto, ON M5M3E1, Canada. E-mail: anne.hunt@utoronto.ca*

M.A. MACHADO, C.P. AIELLO, S.R. HAGE & M.M. TABAQUIM. Neuropsychological cognitive-linguistic analysis post-intervention program in daycare educators and children in Brazil.

Objective: To investigate the effectiveness of an intervention program for daycare teachers in Brazil, referring to the cognitive functions of language semantics and pragmatics.

Participants and Methods: 04 educators from daycare (D1 and D2) and 08 children, both sexes, aged 24 to 48 months, 02 teachers and 04 children from the D1 and 02 teachers and 04 children of D2. In pre-testing was applied to the record of systematic observation, through filming, teacher-child ratio in spontaneous situations, and the application of a protocol with emphasis in Language and Audiology of the two daycare educators (D1 and D2). With children, we used the Pragmatic Protocol Profile and Scale Development (Gesell and Amatruda, 1990). The teachers of D1, intervening in program, participated in 05 workshops over a period of two months. In post-testing, the procedures were replicated from pre-testing. Data were analyzed quantitatively and qualitatively.

Results: Comparing the dialogic situation, it was observed that children of D1 had total verbal turns, suppression of non-verbal turns and shifts unintelligible significant decrease in average higher than D2. The children answered the D1 shift and kept the conversation simple and consistent, higher than D2. The cognitive-linguistic communicative functions had been greater divergence of appointment, informative and interactive, between D1 and D2.

Conclusions: The program was effective, considering the performance indicators of teachers and children of D1, suggesting that systematic educational intervention to promote cortical organization and regulation. Correspondence: *Maria A. Machado, University, Speech Therapist, University of São Paulo, Al. Octávio Pinheiro Brisolla, 9-75, Bauru 17012-901, Brazil. E-mail: cidamachado@usp.br*

S. MCCANN, K. O'TOOLE & L. GOLDEN. An Abbreviated Version of an Established Cognitive Remediation Program (CRP) Improves Alternating Attention Abilities in Children with Neurological Disorders.

Objective: Attention problems are common sequelae in pediatric medical conditions. There is a lack of brief, evidenced-based, individualized interventions that are applicable to children with neurological problems in an outpatient setting. The purpose of the current study was to examine the effectiveness of a brief, clinic-based CRP targeting attention problems in children with various neurological disorders.

Participants and Methods: Participants were 12 children ages 6 through 15 years with various neurological disorders who were drawn from a general outpatient neuropsychology clinic patient population. Attentional problems were documented during outpatient evaluations and children were referred to the program as part of routine care. All parents and children participated in pre- and post-treatment assessment sessions which consisted of performance-based measures of attention and parent-report of behavior. Treatment consisted of nine, 1-hour, cognitive remediation sessions, the content of which was based on a modified version of the Cognitive Remediation Program developed by Butler, et al.

Results: Dependent measures t-tests were used to evaluate changes from pre- to post-treatment on the outcome measures. Significant improvement was demonstrated on measures of alternating attention on the TEA-Ch (Creature Counting Total Correct, $t=2.41$, $p=.037$, $r=.37$; Opposite World, $t=4.73$, $p=.01$, $r=.67$). Parent ratings were significant for decrease in attention symptomatology on the Attention Questionnaire ($t=3.02$, $p=.032$, $r=.33$), but not on the BASC-2.

Conclusions: Findings from the current study revealed clinically and statistically significant improvements across measures of alternating attention and attention symptomatology per parent-report. Implications and future directions will be discussed.

Correspondence: Sarah McCann, Ph.D., Neuropsychology, Children's Healthcare of Atlanta/Emory, 2626 Peachtree Rd NW, Suite 1608, Atlanta, GA 30305. E-mail: sarah.mccann@choa.org

L.A. MILLER & K. RADFORD. Evaluating Memory Training in Patients with Stroke.

Objective: Previous studies of group-based, memory strategy training have revealed improved anterograde memory in patients with traumatic injury (Ryan & Ruff, 1988), epilepsy (Radford et al., 2011) or mild cognitive impairment (Belleville et al., 2006), but few significant changes in normal older adults (Craik et al., 2007). In the present study, we tested its effectiveness in stroke patients with memory complaints.

Participants and Methods: A pseudo-randomised, wait-list crossover design was used, with three assessments at 12-week intervals. Outpatients referred to Neuropsychology, aged 18-70 and 3-56.4 months post-stroke were invited; 16 in the Early Training Group participated in the Making the Most of your Memory program (Radford, et al., 2010) between Assessments 1 and 2, whereas 16 in the Late Training Group underwent 2 baseline assessments before the intervention. Alternative forms of the Rey Auditory Verbal Learning Test (RAVLT), Complex Figures and Royal Prince Alfred Prospective Memory Test as well as the Comprehensive Assessment of Prospective Memory (CAPM; "Self-" and "Other-" perspectives) were administered. Age, baseline memory, premorbid IQ, depression score, months since stroke, lesion side and lesion site were investigated as possible predictors of outcome.

Results: Groups did not differ at Assessment 1 and there were no significant changes in memory over repeated baseline assessments. Training gains were found on RAVLT (learning and delayed recall) and CAPM-Other. Shorter time since stroke and lower baseline score were correlated with prospective memory improvement but no other predictors reached significance.

Conclusions: Hence, a relatively short intervention can improve memory for a variety of patients with a history of stroke.

Correspondence: Laurie A. Miller, PhD, Neuropsychology, Royal Prince Alfred Hospital, Missenden Rd, Camperdown, NSW 2050, Australia. E-mail: laurie.miller@sydney.edu.au

H. NAOYUKI, M. YOKOGAWA, T. YAMAZAKI & T. NAKAGAWA. Effects of Intensity of Transient Aerobic Exercise on Cognitive Function.

Objective: This study investigates the effects of transient aerobic exercise at varying intensity on cerebral blood flow and cognitive function in healthy young adults.

Participants and Methods: Participants were 30 male university students. Participants were randomly assigned to groups that exercised on

an ergometer bicycle at an intensity of 60%, 40% or 20% of peak oxygen intake (60%MVE, 40%MVE, 20%MVE, respectively), and a control group that did not exercise. Cerebral blood flow was measured using near-infrared spectroscopy during exercise and participants underwent the paced auditory serial addition test (PASAT) and psychomotor vigilance task (PVT) to determine cognitive function before and after exercise.

Results: Cerebral blood flow in the bilateral frontal lobe area was significantly increased in the 60%MVE group compared with the other groups. The 60%MVE group answered significantly more PASAT questions correctly after than before exercise. The 40%MVE group answered significantly more consecutive questions correctly in the PASAT after than before exercise, but reaction time in the PVT was significantly lengthened after exercise.

Conclusions: These results suggest that transient aerobic exercise at 60%MVE enhances the cognitive function of healthy young adults with increasing cerebral blood flow in the frontal lobe area.

Correspondence: Hashimoto Naoyuki, MS, Kanazawa University, 11-80 Kodatuno5, Kanazawa 920-0942, Japan. E-mail: nao_hashimoto531@yahoo.co.jp

K.M. O'DELL, K. O'BRIEN & T. VERAMONTI. Defining Meaningful Change in Supervision Level Using the Supervision Rating Scale: A Comparison of Two Methods.

Objective: The Supervision Rating Scale (SRS) measures the intensity and duration of supervision an individual requires after acquired brain injury (ABI). When individuals are rated on this one item, 13-point, ordinal scale, they are also automatically categorized into one of five supervision levels. A "clinically meaningful" change in supervision level can be defined as transition from one level to another. Alternatively, others have used a reliable change methodology to define (statistically) meaningful change in supervision needs using the 13-point scale. The current study compares these two methods.

Participants and Methods: 157 individuals with ABI who participated in either a residential program (RP), an outpatient day program (OPDP), or a combined program (CP) at a PABIR facility in Houston, TX were rated on the SRS at admission and discharge. The relative frequencies of individuals who demonstrated a positive change in supervision level from admission to discharge were calculated using both a "clinically meaningful" and reliable change methodology.

Results: From admission to discharge, 44.3% of those in the RP demonstrated a reliable change, while 57.0% demonstrated a "clinically meaningful" change. A similar pattern was seen for those in the OPDP and the CP (46.7% vs. 56.7% and 22.9% vs. 39.6%, respectively).

Conclusions: The "clinically meaningful" method of defining change appeared to capture important changes in supervision needs that were not captured using a reliable change method. Furthermore, the supervision level transitions captured by the "clinically meaningful" method are both relevant and communicable to patients, caregivers, and payors.

Correspondence: Keira M. O'Dell, MA, Psychology, University of Houston, 2210 W. Dallas St., Apt. 2013, Houston, TX 77019. E-mail: kmodell2@uh.edu

M. SIMARD, S. THIVIERGE, C. HUDON & L. JEAN. Results of a 24-week Randomized Cross-Over Controlled Study on Cognitive Training of Instrumental Activities of Daily Living in Alzheimer's Disease.

Objective: Sitzer et al. (2006) demonstrated that cognitive training (CT) is effective to improve cognition in Alzheimer's disease (AD). Errorless Learning (EL), supporting the encoding of new material, and Spaced Retrieval (SR), supporting recall of new learned material, were also reported to be most promising paradigms for training memory in AD. However, AD patients also experience difficulties with Instrumental Activities of Daily Living (IADLs). According to the Adaptive Control of Thoughts model (Anderson, 1982), episodic and working memory,

as well as executive functions, are involved in the first phases of procedural learning. This model thus supports the utilization of EL and SR for rehabilitation of IADLs. This study was aimed at assessing the efficacy of CT using EL and SR to re-learn forgotten IADLs in AD using a block-randomized single-blind cross-over controlled design.

Participants and Methods: Group 1 (n=7) first received CT on an IADL during 4 weeks followed by post-CT evaluation, and 2 follow-ups (FU) until week 13, when Group 2 (n=7), on waiting list until then, started receiving CT for 4 weeks, followed by post-CT and 2 FU until week 24. The Direct Measure of Training (DMT) developed from the DAFS (Lowenstein et al., 1989) measured the CT effects (in %).

Results: Repeated analyses of variance showed that Group 1 (mean=87.6; SD=7.8) performed better than Group 2 (mean=68.5; SD=14.9) on the DMT only at post-CT evaluation-week 5 (p=.011). There was no other significant difference between the 2 groups after week 5.

Conclusions: CT of IADLs in AD is efficacious and can be maintained for several months. However, a ceiling effect may partly explain the absence of difference between the performance of the 2 groups at FU1 & FU2, when Group 2 was still on the waiting list.

Correspondence: *Martine Simard, Ph.D., École de psychologie, Université Laval, Pav. F.-A. Savard, 2325 rue des Bibliothèques, Quebec City, QC G1V 0A6, Canada. E-mail: Martine.Simard@psy.ulaval.ca*

V. STAMENOVA, J.M. JENNINGS, L.A. WALKER, A.M. SMITH & P.S. DAVIDSON. **Recollection training in healthy older adults.**

Objective: Memory decline in normal aging includes difficulty recollecting the details of when and where something occurred. With this in mind, Jennings et al (2005) developed a yes-no continuous recognition task that repeats new items during the test phase at increasingly long intervals. After training with this repetition-lag task, older adults improved on several non-trained working memory and executive tasks. We aimed to replicate this finding and extend it to similar tasks.

Participants and Methods: We randomly assigned forty-four older adults to either the repetition-lag (n = 23, mean age = 67 years) or a control recognition task (n = 21, mean age=69 years), and administered digit span, the California Verbal Learning Test (CVLT-II), the Brief Visuospatial Memory Test – Revised, and an experimental source memory test before and after training (three 30-minute sessions a week for two weeks).

Results: Repetition-lag participants reached an average lag of 24 items, suggesting an overall improvement. Separate MANOVAs comparing groups pre- and post-training showed some improvement on the transfer tasks over time, but few cases in which the repetition-lag training group improved to a greater degree than the recognition group.

Conclusions: On the one hand, we did not find strong evidence that the repetition-lag procedure is particularly beneficial to memory as measured by the transfer tasks used here. On the other hand, the recognition condition also may have helped participants improve (perhaps for non-specific reasons such as general cognitive or social stimulation, or a greater sense of comfort in the post-training assessment).

Correspondence: *Vessela Stamenova, PhD, University of Ottawa, 217 markland Cres, Nepean, ON K2G5Z9, Canada. E-mail: viussi@gmail.com*

J.F. SUMOWSKI, V.M. LEAVITT, A. COHEN, N.D. CHIARAVALLOTI & J. DELUCA. **Retrieval Practice as a Memory Intervention in Multiple Sclerosis.**

Objective: Persons with multiple sclerosis (MS) suffer memory impairment, but effective memory treatments have eluded clinical researchers. Retrieval practice (RP) is a powerful memory strategy discovered in healthy persons whereby retrieving information (quizzing oneself) leads to better memory than restudying the information multiple times. We examined the impact of RP on short and long delay recall in MS patients with severe memory impairment.

Participants and Methods: Ten MS patients with severe memory impairment (\leq 2nd percentile) were directed to learn 48 verbal paired as-

sociates (VPA) divided across three learning conditions: massed restudy (MR; three consecutive exposures), spaced restudy (SR; three intermittent exposures), RP (initial exposure followed by two intermittent retrieval attempts). Memory for half of VPAs was assessed after 45 minutes, and the other half after one week.

Results: There was a large effect of learning condition after the short delay ($p < .0001$; $\eta^2 = .93$), with patients recalling 77.5% of VPAs studied through RP, but only 15% through MR and 25% through SR. This effect remained after the long delay ($p < .0001$; $\eta^2 = .67$), as patients recalled 27.5% of VPAs studied through RP, but only 1.25% through MR and 5.0% through SR. Note, RP was the most effective strategy for each and every patient after both short and long delays. The probability of this occurring by chance alone is less than one in one billion.

Conclusions: RP improved memory much more than restudy strategies in MS patients with severe memory impairment, even after a week-long delay. RP is a relatively simple strategy to employ, making it easy for patients to use RP in real-life situations. Taken together, RP holds considerable promise as a memory aid among memory-impaired MS patients, and likely other memory-impaired neurologic populations as well. Correspondence: *James F. Sumowski, Ph.D., Neuropsychology & Neuroscience Laboratory, Kessler Foundation Research Center, 300 Executive Drive, Suite 70, West Orange, NJ 07042. E-mail: jsumowski@kesslerfoundation.org*

L.A. WHITMAN, M.C. MARSH, M. VASSERMAN, L. VAURIO & W.S. MACALLISTER. **Feasibility of a Non-Pharmacological Working Memory Intervention (Cogmed) in Children with Epilepsy.**

Objective: Working memory deficits are common in children and teens with epilepsy. Recently, cognitive neuroscientists in Sweden developed a computer-based working memory remediation program (Cogmed). Although this program shows promise in treating working memory deficits in children with ADHD (Holmes et al., 2009) and has demonstrated effectiveness in other neurologic populations (e.g., stroke; Westerberget al., 2007), there are no available data for children with epilepsy. Given the multitude of cognitive and psychological risks that characterize this population, posing potential obstacles to the completion of a time-intensive cognitive intervention program, the feasibility should be examined.

Participants and Methods: The current investigation is a case study of a 7 year-old boy with epilepsy who successfully completed the 25, ~45-minute, Cogmed sessions.

Results: Calculation of reliable changes indices across pre- and post-neuropsychological evaluations reflected improved performance with regard to sustained attention (Connor's CPT-II omissions RCI = 5.7). Parent report (BRIEF) of the child's executive functioning skills reflected improvement with regard to working memory (RCI = 5.5), ability to shift between activities (RCI = 2.7), and initiation (RCI = 3.4). Qualitative observations from the child's mother suggest that he seemed "less anxious" about school and more willing to try new activities since program completion.

Conclusions: Although antiepileptic medication changes during the 5-week program may account for some of the improvements seen, the current case study provides preliminary evidence of the feasibility and potential effectiveness of this non-pharmacological intervention in treating working memory deficits in children diagnosed with epilepsy. A larger randomized placebo-controlled study is underway.

Correspondence: *Lindsay A. Whitman, Ph.D., Comprehensive Epilepsy Center, New York University, 406 15th St., Apt 2A, Brooklyn, NY 11215. E-mail: lindsayallenuhitman@gmail.com*

R. WILSON & G.A. ESKES. **The Effects of Distractors on Working Memory.**

Objective: Working Memory (WM) is used to hold and manipulate information in an active, short-term store while performing a range of daily tasks such as reading, mental arithmetic and problem solving. These tasks must be completed in the face of distractors, which appear

to become increasing difficult to ignore as we age (e.g. Gazzaley et al., 2005). The purpose of this study was to investigate the effect of distractors on both the maintenance and manipulation components of WM performance. We predicted that WM performance would be most disrupted by distractors when the task required continuous updating of the active short-term store.

Participants and Methods: Eight healthy young adults (mean age = 24.13; 5 female) completed a series of n-back WM tasks designed to assess the effects of task-irrelevant distractors on WM performance. Analysis of both reaction time (RT) data and accuracy was conducted using mixed effects modeling with updating (maintenance vs updating) and distractors (present vs not present) treated as fixed effects.

Results: Accuracy was high across all conditions (94-96%). The presence of task-irrelevant distractors increased RT in both maintenance (RT=514ms vs 634ms for absent vs present distractors respectively) and updating n-back tasks (679 ms vs 769 ms, respectively), although the increase was smallest during the updating tasks.

Conclusions: Contrary to our prediction, these results suggest that increased task difficulty can reduce attention to task irrelevant distractors, perhaps due to the need for greater attentional control. These data suggest that the role of distractors in WM deficits that accompany aging or brain damage deserve investigation.

Correspondence: *Ryan Wilson, MA, Psychology, Dalhousie University, Life Sciences Research Institute, Dalhousie University, 1348 Summer Street, North Tower, Halifax, NS B3H 4R2, Canada. E-mail: ryan.wilson@dal.ca*

M. YUTSIS, S. HANNA & T. BERGQUIST. The effect of Cognitive Rehabilitation Delivered via Telemedicine on Functional Independence in Persons with Severe Traumatic Brain Injury: A randomized Clinical Trial.

Objective: We examined whether cognitive rehabilitation delivered via the Internet improved daily functioning and independence in persons with moderate to severe traumatic brain injury (TBI).

Participants and Methods: A total of 15 out of consented 22 (8 males and 7 females) adults with medically documented TBI completed this study. Participants completed a total of 30 sessions of calendar training in a cross-over study design with half of the randomized individuals receiving active treatment first while the rest were waitlisted. All sessions were conducted using an instant messaging system. Measures of cognitive functioning, neurobehavioral functioning, and compensation techniques use were gathered from participants and family members at baseline and after treatment and control conditions. Dichotomously coded scores on the Vocational Independence Scale (VIS) and Independent Living Scale (ILS) were used to classify patient independence vs. dependence and were the primary outcome variables following treatment for this study.

Results: There were no differences in demographic, cognitive, or independent functioning variables between the treatment and control conditions. At baseline, 50% of participants were employed and 83% percent rated themselves as independent. In comparison to the control group, significant changes were observed in the employment level ($p=.01$) and independent functioning ($p=.04$) after active treatment. In the control condition, unemployment rate increased and 64% of participants were now unemployed as opposed to 50% of persons who were employed after treatment. After treatment, independent functioning status improved compared to both the baseline and control group with 86% of participants rating themselves as independent.

Conclusions: These results suggest that delivering cognitive rehabilitation via the Internet may be an effective means to improve functional independence and consequently diminish disability in persons with TBI. Correspondence: *Maya Yutis, Ph.D., Multicare Good Samaritan Hospital, 401 15th Ave. SE, Puyallup, WA 98372. E-mail: datomaya@yahoo.com*

D.G. NEMETH, A.L. GREMILLION & L. WHITTINGTON. The Importance of Affective Stabilization in Neurorehabilitation.

Objective: Affective lability can greatly interfere with brain-behavior recovery, especially on an outpatient basis. When brain-injured patients

are very angry, depressed, and/or distressed, they are unable to focus on their neurorehabilitative work. Therefore, affective stabilization is seen as crucial to recovery. Nuedexta was initially developed to treat pseudobulbar affect, which is defined as sudden outbursts of involuntary emotional displays (laughing or crying) that cannot be controlled (pbainfo.org). When affective control was not achieved via psychotropic medication, would the use of Nuedexta be helpful? This was the clinical question.

Participants and Methods: Individuals who exhibited extreme cases of affective and behavior disinhibition were given a trial of Nuedexta after routine psychotropics failed to achieve efficacy.

Results: After beginning the trial of Nuedexta, affective stabilization was achieved within a short period of time. Case examples will be given.

Conclusions: Nuedexta appears to be quite effective for achieving affective stabilization regardless of the etiology of an individual's neuroaffective lability. In our small clinical sample, wherein other psychotropic medications failed to achieve affective stabilization, the use of Nuedexta has offered new hope to patients and their families. Not only have patient been successful at managing their anger, depression, and/or distress, but they have also been able to attend and concentrate more in their outpatient neurorehabilitation program, thus improving recovery.

Correspondence: *Darlyne G. Nemeth, Ph.D., M.P., M.P.A.P., The Neuropsychology Center of Louisiana, LLC, 4611 Bluebonnet Blvd, Ste. B, Baton Rouge, LA 70809. E-mail: dgnemeth@gmail.com*

Memory Functions

D.G. NEMETH, L. WHITTINGTON & A.L. GREMILLION. Using Music to Enhance Memory Recovery in Outpatient Neurorehabilitation.

Objective: According to Patel (2008), "Music has the power to change the brain" via shared neural sources (p.12). Brain activation improves speech and communication and involves the temporal lobes, frontal lobes, limbic system, basal ganglia, and cerebellum, all of which transmit information via the corpus callosum (Sachs, 2007). But, can music be used in a creative way to improve memory functions in the brain?

Participants and Methods: Two impaired individuals, both in their 20's, who sustained brain injuries, received 6-8 sessions of psychomusicotherapy to improve speech, communication, and memory. The following procedures were utilized: 1.) Select familiar pre-trauma song, 2.) Change the words, 3.) Pair new words with pre-trauma melody, 4.) Practice several times a week, 5.) Rehearse before falling asleep at night, and 6.) Repeat upon awakening in the morning. Examples of new and old lyrics will be cited.

Results: Significant improvement in the following areas was achieved: 1.) Memory Functions, 2.) Affect and Mood, 3.) Expressive Speech and Communication, 4.) Sleep Patterns, 5.) Cognition and Attention, and 6.) Energy Level.

Conclusions: One of the main difficulties in memory rehabilitation is generalizability. By using a therapeutic agent, such as music selected by the patient, emotions, associations, and nostalgia are evoked (Sachs, 2007). This enhances motivation and practice compliance. Ego involvement in the rehabilitation process is seen as a key component to recovery of brain functions.

Correspondence: *Darlyne G. Nemeth, Ph.D., M.P., M.P.A.P., The Neuropsychology Center of Louisiana, LLC, 4611 Bluebonnet Blvd, Ste. B, Baton Rouge, LA 70809. E-mail: dgnemeth@gmail.com*

J. CRANE & B. MILNER. Memory for Scenes and Designs: Medial Temporal-Lobe Contributions.

Objective: The critical role of the medial temporal-lobe region in episodic memory is now undisputed. This study explores the contributions of specific structures within this region to memory for designs and for different features of scenes.

Participants and Methods: The medial temporal area was segmented, using magnetic resonance images, to yield separate volumes for the amyg-

dala, the hippocampus and the perirhinal, entorhinal, parahippocampal and temporopolar cortex in each hemisphere. The subjects were 37 patients with unilateral resection from the temporal lobe for intractable epilepsy (15 left and 22 right). The volumes were correlated with behavioural scores on two tasks, the Recurring Figures Test and a scene-memory task.

Results: For the Recurring Figures Test, the Net Score ("Hits" minus "False Alarms") was significantly related to the volume of right entorhinal cortex ($r=0.40$, $p=0.015$) and "Hits" was correlated to the right amygdala volume ($r=0.42$, $p=0.011$). For the scene task, recognizing spatial displacement and object switches were each related to the right hippocampal volume ($r=0.37$, $p=0.025$; $r=0.44$, $p=0.006$, respectively), and the variation in the location-exchanges measure was best explained by a model incorporating both the right hippocampal volume and the right perirhinal volume ($r=0.51$, $p=0.007$).

Conclusions: These results suggest that the structures of the right medial temporal region play different roles in distinct aspects of visual memory. Correspondence: *Joelle Crane, Ph.D., Neuropsychology, Montreal Neurological Hospital/Institute, 3801 University Street, Montreal, QC H3A 2B4, Canada. E-mail: joelle.crane@mcgill.ca*

M. DÉJOS, H. SAUZÉON, P. ARVIND-PALA, A. FALIÈRE & B. N'KAOUA. The identification of the four cognitive patterns with a unique virtual tool: a pilot study.

Objective: In order to achieve qualitative differential diagnosis, neuropsychological assessment should answer several clinical objectives such as the identification of impaired and preserved cognitive functions. Nowadays the increasing interest given to disability and to everyday life cognitive difficulties, even without objective disorders, encourages development of naturalistic evaluation tools. In this context, we propose to assess the quality of an evaluation tool based on a 3D environment representing the insight of an apartment. This tool provides memory and executive clues in naturalistic context and our goal is to evaluate its diagnostic value by comparing the profile of different patient populations.

Participants and Methods: A virtual replica of the CVLT simulates a visit in the apartment composed of four rooms. According to the traditional CVLT, different indications are exploited: learning, free recall, strategic processing, proactive interference, false recognitions, intrusion, and perseverations. The performances of 4 groups of subjects [young ($n=15$), elderly ($n=15$), Alzheimer ($n=17$) and traumatic brain injury ($n=7$) patients] are compared to those of traditional CVLT.

Results: The results show that the virtual-CVLT offers a sensitivity and reliability similar to the traditional version. Moreover, compared to traditional CVLT, virtual-CVLT presents a better selectivity, diagnostic value and naturalistic validity, insofar as it allows distinguish clearly the cognitive patterns of elderly (executive pattern), Alzheimer (memory pattern) and traumatic brain injury (executive pattern) patients.

Conclusions: These first results demonstrate that a neuropsychological evaluation can be more naturalistic without decrease in its psychometric quality.

Correspondence: *Marie Déjos, PhD Student, lab EA4136 - "Handicap & Système Nerveux", university Bordeaux Segalen, 146 rue Léo Saignat, bât 1B-1er étage, Bordeaux 33076, France. E-mail: marie.dejos@u-bordeaux2.fr*

R.L. ERICKSON, L.K. PAUL & W.S. BROWN. Visual Memory in Agenesis of the Corpus Callosum: Faces and Visual Reproduction.

Objective: Individuals with Agenesis of the Corpus Callosum (ACC) and generally-intact intellectual functioning demonstrate a constellation of neuropsychological and psycho-social deficits, including diminished verbal memory. Although case studies in the literature reported contradictory findings on visual memory tasks, we hypothesized that across a large sample of individuals with ACC we would find visual memory impairments consistent with verbal memory.

Participants and Methods: Thirty-four adults with complete and partial ACC (FSIQ > 78; age 16-55) and 29 age- and FSIQ-matched controls were given the Faces (FA) and Visual Reproduction (VR) subtests from the Wechsler Memory Scales: Third Edition

Results: For FA, a group by time (immediate vs. delayed) ANOVA found significantly worse ACC performance overall $F(1, 62) = 4.89$, $p = .03$, $\eta^2 = .07$, with a greater difference from controls on the delayed condition (Group by Time Interaction) $F(1, 62) = 5.05$, $p = .02$, $\eta^2 = .08$. The ACC group also scored significantly worse than controls on VR overall, $F(1, 62) = 4.19$, $p = .04$, $\eta^2 = .063$, but did not exhibit a group by time interaction.

Conclusions: These findings indicate a general visual memory deficit is associated with ACC, aligning well with previous studies showing deficits in verbal learning and memory. While memory was impaired for both faces and abstract figures, it appears that individuals with ACC have even greater difficulty correctly recalling faces after a long delay. This deficit can be understood in terms of ineffective facial emotion recognition and scanning (Bridgman, 2007).

Correspondence: *Warren S. Brown, Ph.D., Fuller Graduate School of Psychology, Travis Research Institute, 180 N. Oakland Ave, Pasadena, CA 91101. E-mail: wsbrown@fuller.edu*

R. FAMA, M.J. ROSENBLUM, S.A. SASSOON, W.C. HAWKES, T. ROHLFING, A. PFEFFERBAUM & E.V. SULLIVAN. Striatal, Limbic, and Cerebellar Substrates of Visuomotor Learning in Alcoholism+HIV Infection Comorbidity.

Objective: Frontostriatal, limbic, and frontocerebellar systems contribute differentially to components of visuomotor learning: fast learning relies on frontocerebellar systems; consolidation (latent learning) relies on limbic system integrity; and slow learning (continued practice over days) relies on frontostriatal systems. These brain systems are affected by alcoholism (ALC) and HIV infection (HIV); each condition may differentially disrupt visuomotor learning.

Participants and Methods: We examined visuomotor learning in 23 HIV, 28 ALC, 26 alcoholics comorbid for HIV infection (ALC+HIV), and 19 unaffected controls on rotary pursuit learning (2 learning sessions on each of 2 testing days, one week apart). We obtained 3T MRI structural data for volumetric analysis.

Results: All groups showed significant learning (time on target) but with different patterns: whereas HIV showed steep learning within same-day sessions, both ALC groups showed greatest learning between days (consolidation period). Only the ALC+HIV showed relations between learning, which spanned the consolidation period, and regional brain volumes. Less time on target for sessions 3 minus 1 (poorer consolidation) correlated with smaller globus pallidus ($r=.45$, $p=.021$) and larger third ventricle ($r=-.40$, $p=.044$) volumes, together accounting for 25% of the performance variance. Less time on target for sessions 4 minus 1 (poorer consolidation+ further learning) correlated with smaller volumes of the thalamus ($r=.52$, $p=.007$) and superior cerebellum ($r=.42$, $p=.031$), accounting for 33% of the performance variance, with thalamic volumes contributing independently ($p=.032$) over cerebellar volumes ($p=.155$).

Conclusions: Despite significant learning, individuals affected by ALC+HIV comorbidity are at heightened risk for brain structural insult potentially diminishing visuomotor learning capacity. Support: AA017347, AA010723, AA017168, EB008381.

Correspondence: *Rosemary Fama, PhD, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 94305. E-mail: rfama@stanford.edu*

S. HEMANI, R. HESS, S. ALI, C. BOWDEN & B.M. HAMPSTEAD. Complementary hippocampal-caudate interactions during navigation of well-learned and novel environments.

Objective: Previous research has suggested both a complementary and competitive interaction between the hippocampus and caudate nucleus during route learning that may depend on environmental familiarity and the functional integrity of these structures. Therefore, we examined activity in these regions within healthy elderly controls (HEC) and patients with amnesic mild cognitive impairment (aMCI), as they encoded novel and well-learned routes.

Participants and Methods: Six HEC and six aMCI subjects were trained on a series of T-mazes, which were selected due to their robust history in animal models and because their simple design should yield high performance even in aMCI. The participants received mass exposure to some mazes so that they became well-learned. Following this training, participants underwent fMRI scanning while encoding novel and well-learned mazes using a block design. Given our interests in hippocampal-caudate interactions, we developed masks of these areas and extracted beta weights, which were used in subsequent analyses.

Results: Behaviorally, HEC and aMCI performed comparably regardless of maze type (Diagnosis effect: $p=.42$) and, as expected, memory was significantly better for the well-learned than novel mazes (Maze-type: $p=.002$; interaction: $p=.96$). Despite these behavioral differences, hippocampal and caudate betas were significantly and positively correlated during encoding of both novel and well-learned mazes. Importantly, activity in these regions was unrelated to that within theoretically distinct regions (primary visual and motor cortices).

Conclusions: These initial results suggest that the hippocampus and caudate are part of a cohesive neural network that is engaged during spatial navigation, regardless of environmental familiarity.

Correspondence: *Salman Hemani, Rehabilitation Medicine, Emory University, 1702 Wintergreen Court, Dalton, GA 30720. E-mail: shemani@msm.edu*

M. IAMPIETRO, C. SETER, J. EPPIG, T. GIOVANNETTI, C. NIEVES, G. WICAS, J. PILLAI & D.J. LIBON. Executive and Encoding Aspects of Memory in Patients with Epilepsy as Assessed by a Novel Scoring System of the 15-item Biber-Glosser Figure Learning Test.

Objective: Prior research with the Biber-Glosser Figure Learning Test (BGFLT) has shown strong criterion and construct validity of a novel scoring system assessing visual serial list learning in epilepsy. However, the scoring system is labor-intensive. Here we evaluated which BGFLT variables could be used to identify specific aspects of visual memory impairment in patients with epilepsy.

Participants and Methods: 33 patients with epilepsy presenting with diverse seizure type and foci (Mage = 45.70 ± 14.31 ; Medu = 13.09 ± 2.54 ; 54.5% female) completed the 15-item BGFLT as part of a comprehensive neuropsychological evaluation. All free and delayed recall test items were scored for figure component accuracy, spatial relation, and various novel error types (e.g., perseveration). A recognition discriminability score was calculated for all participants. Independent measures of executive function and verbal episodic memory also were administered.

Results: Multiple regression to determine the BGFLT measures that were significantly associated with delayed memory revealed that the total number of figures produced during BGFLT free recall trials 1-5 ($\beta = .52$, $p < .01$) and perseveration errors ($\beta = -.34$, $p = .02$) together predicted 42% of the variance in BGFLT recognition discriminability, $R^2 = .42$, $F(2, 30) = 10.89$, $p < .001$. Follow-up stepwise regression analyses to examine the neuropsychological measures associated with these BGFLT indices showed that the total number of figures produced was best predicted by total number of correct responses during free recall trials 1-5 of the CVLT-II, $R^2 = .35$, $F(1, 27) = 14.53$, $p < .01$. Perseveration errors were best predicted by total correct output on verbal fluency (FAS), $R^2 = .43$, $F(1, 27) = 20.14$, $p < .001$.

Conclusions: Both executive and encoding processes influence visual episodic memory in people with epilepsy. The BGFLT scoring system may be streamlined to include 2 target variables that characterize these distinct memory processes in individuals with epilepsy.

Correspondence: *Tania Giovannetti, Psychology, Temple University, Weiss Hall, 1701 N 13th St., Philadelphia, PA 19122. E-mail: tgio@temple.edu*

L.L. JORDAN, W.C. WILEY & S.C. HEATON. Cognitive Factors Contributing to Verbal Memory Performance in a Pediatric TBI Sample.

Objective: Memory impairments and other cognitive deficits (e.g., attention, processing speed) are commonly reported in pediatric trau-

matic brain injury (TBI) patients. However, it is unclear where in memory processes impairments occur and if they are related to other cognitive deficits. Our study aimed to 1. describe the verbal memory profiles (encoding, retention, and retrieval) of TBI patients and orthopedic injury controls, and 2. examine the relationship between other cognitive functions (i.e. verbal knowledge, attention, processing speed, and executive functioning) and verbal memory. We predicted that TBI patients would exhibit worse verbal memory encoding and retrieval than orthopedic patients. Moreover, attention, processing speed, and working memory/executive functioning were expected to be significant predictors of encoding and retrieval deficits.

Participants and Methods: Fifty-six patients with history of mild-to-severe TBI ($n=37$) or orthopedic injury ($n=19$), ages 6-16, completed measures of verbal knowledge (WASI Vocabulary), selective and sustained attention (TEA-Ch Sky Search and Score!), processing speed (TEA-Ch Sky Search Time per Target), executive functioning (TEA-Ch Creature Counting), and memory (CMS core verbal memory subtests).

Results: Repeated measure ANOVAs revealed that on the verbal memory tasks TBI patients exhibited significantly worse encoding ($p < .01$), but had similar retention and retrieval compared to orthopedic patients. Multiple regression analyses indicated that verbal knowledge significantly predicted story encoding ($p < .01$); whereas verbal knowledge and processing speed significantly predicted word pairs encoding ($p < .05$).

Conclusions: Taken together, these findings indicate that impairment of verbal memory after pediatric TBI may be due to encoding deficits, which are related to verbal knowledge and processing speed impairments. Correspondence: *Lizabeth L. Jordan, M.S., Clinical & Health Psychology, University of Florida, UF, HSC, PO Box 100165, Gainesville, FL 32610. E-mail: lz1127@phhp.ufl.edu*

E.M. LANE, J. HEAPS, D. LAIDLAW, R. CABEEN, J. MILES, A. MCMICHAEL, T. CONTURO & R. PAUL. The Relationship Between White Matter Fiber Length, Cerebrovascular Disease Markers, and Memory Performance in Older Individuals.

Objective: Previous research has noted correlations between risk factors for cerebrovascular disease and decreased memory performance. Reduced white matter volume is also associated with poorer memory performance, yet it remains unclear whether neuroimaging markers of microstructural changes to the white matter correlate to memory performance in older adults. In the present study we utilized quantified diffusion tensor tractography to examine relationships between white matter fiber lengths, markers of cerebrovascular disease, and performance on memory tests among older adults.

Participants and Methods: Mean temporal lobe fiber length was determined for 77 healthy individuals aged 51 to 85 ($M = 62.22$, $SD = 8.62$) using 3T diffusion tensor imaging (DTI). Memory performance was measured using subtests from the RBANS (list learning, story memory, delayed list recall, delayed story memory, and delayed figure recall). Body mass index (BMI) and blood pressure were measured during the testing period. High cholesterol was determined by self-reported knowledge of high cholesterol or the use of medications to lower cholesterol.

Results: After controlling for age, mean temporal fiber length was modestly correlated with BMI ($r = .271$) and diastolic blood pressure ($r = -.230$). Memory measures failed to correlate with cerebrovascular disease risk factors or mean temporal fiber length. Individual age-corrected regression analyses revealed that BMI and diastolic pressure were both good predictors of mean temporal fiber length.

Conclusions: The results confirm that BMI and diastolic pressure are inversely related to mean fiber length in the temporal lobe. However, these factors appear to have no observable impact on memory performance in healthy older individuals.

Correspondence: *Elizabeth M. Lane, Psychology M.A., Behavioral Neuroscience, University of Missouri - St. Louis, 815 Leland Avenue 1S, Saint Louis, MO 63130. E-mail: emlanc@umsl.edu*

S.A. LECOMTE, I. ROULEAU & S. SIMARD. Impact of cue-action strength of association in prospective memory performance in mild Alzheimer's disease patients.

Objective: Although fundamental to daily functioning, only a few studies have been conducted on prospective memory (PM) in Alzheimer's disease (AD) patients. PM requires that an intention of action be remembered (retrospective component) and that the action be performed at the right moment (prospective component). The objective of this study was to examine the impact of the strength of semantic association between the prospective cue and the intended action on the PM performance in AD.

Participants and Methods: Twenty mild AD patients (MMSE: 26.5) and 20 age and education-matched control subjects participated in the study. The PM task consisted of learning four cue-action pairs (2 highly related, 2 unrelated) through spaced retrieval. The concurrent task was a lexical decision task in which the 4 cues appeared twice. The subject had to produce the correct action when he encountered a cue.

Results: As expected, there was a significant effect of group ($p < .001$) on the PM task (both for cue detection and action retrieval). The strength of association had an impact on action retrieval (better for related cue-action pairs) but not on cue detection. PM performance was not directly correlated with memory or executive functions in the two groups, as assessed by standardized neuropsychological testing.

Conclusions: This study confirms the vulnerability of PM in AD even in the early stage of the disease. The differential impact of cue-action strength on cue detection and action retrieval will be discussed in the context of a multiprocess framework (McDaniel & Einstein, 2000).

Correspondence: Sarah A. Lecomte, Ph.D., CRDP Le Bouclier, 410, boul. L'Ange-Gardien, L'Assomption, QC J5W 1S7, Canada. E-mail: sarahlecomte@hotmail.com

D.M. LOGAN, D. RACKHAM, K. MALOY, K. MIKA & M.J. LARSON. Memory and Attention in Pregnant/Post-Partum Women: Neuropsychological Findings.

Objective: Research related to changes in memory functioning during pregnancy is mixed. Multiple studies report deficits in implicit memory, list learning, and verbal memory in pregnant women compared to non-pregnant/never pregnant controls. Other studies show no differences between groups and that pregnant women may even perform better when stimuli are pregnancy related. One possible explanation for the variability in findings is fluctuations in attention. The objective of the current study was to longitudinally examine attention and memory functioning in pregnant/post-partum women and never-pregnant controls.

Participants and Methods: Neuropsychological testing was completed on 13 pregnant women in their third trimester and repeated three months following childbirth. Results were compared to 13 healthy, never pregnant education-matched female controls retested at the same interval. Tests included the Paced Auditory Serial Addition Test, Verbal Fluency, Digit Span, Trails AB, California Verbal Learning Test – 2nd edition, and Stroop Color-Word Interference Test. Separate 2-Group x 2-Time ANOVAs were used to examine main effects and interactions.

Results: There were no significant main effects of group on measures of memory or attention. A trend-level Group x Time interaction on Digit Span forward [$F(1,24)=4.04, p=.056$] and a significant interaction on Digit Span backward [$F(1,24)=7.00, p=.014$] indicated that pregnant/postpartum individuals showed poorer performance over time on Digit Span forward, but improved performance on Digit Span backward. No other group-related interactions were significant.

Conclusions: Findings suggest small differences over time in attention functioning, but no group differences in CVLT-measured memory. Future research with increased sample size is necessary to understand attention/memory functioning in pregnant/postpartum individuals.

Correspondence: Dustin M. Logan, MS, Psychology, Brigham Young University, 1955 N. 1400 E., Provo, UT 84604. E-mail: logan.dustin@gmail.com

R. PERNA & A.R. LOUGHAN. TOMM Performance in Children with an Intellectual Disability.

Objective: Assessment of test taking effort is essential to ensure accurate evaluation across age groups. The Test of Memory Malingering (TOMM) is being more frequently used for this purpose in pediatric neuropsychological evaluations, though very limited data is available supporting the appropriateness of the adult cutoff for some pediatric groups.

Participants and Methods: This study analyzed TOMM data from 16 children [age = 11.9(3.3), grade = 5.6(3.5), 8 girls, 8 boys] with Intellectual Disabilities [Mean Full Scale IQ = 64.1(10.4)] who completed neuropsychological evaluations.

Results: Mean scores across the three TOMM Trials were 42.0, 46.7, and 45.5. Five out of 16 children (31%) performed below the TOMM cutoff of 45 on Trials 2 or 3. Further analysis showed that those individuals had a mean Full Scale IQ of 60 and impaired immediate and delayed visual memory (CMS) test scores. This was lower than those children who passed the TOMM, a finding suggesting that possibly some children with very limited visual memory skills may find the TOMM a difficult task.

Conclusions: This data suggests that it may be necessary to use caution in interpreting TOMM scores in children with Intellectual Disabilities, especially those children with very limited memory skills.

Correspondence: Ashlee R. Loughan, M.Ed., Walden University, 106 Aulee Ct, Winchester, VA 22602. E-mail: aspicerSS@yahoo.com

Y. MANSOOR & J.A. MOSES. Dimensionalizing the Serial Digit Learning Test Using Baddeley's Model of Working Memory.

Objective: This study analyzed the cognitive domains underlying the nine-digit Serial Digit Learning Test (SDL9) using Baddeley's model of working memory (2000a; 2000b). We proposed that the multi-trial nature of this memory measure could reveal clinically useful information about the process of memory.

Participants and Methods: The sample was composed of 133 male veterans (Age: $M = 48.0$, $SD = 15.2$; Education $M = 13.5$, $SD = 2.3$) with mixed neuropsychiatric diagnoses who presented at a Veteran's Affairs Medical Center for neuropsychological evaluation.

Results: Factor analyses indicated that the SDL9 is a three-stage task with the beginning (Trials 1-4), middle (Trials 3-10) and end (Trials 6-12) representing different constructs (78.0% total variance explained). Hierarchical multiple regressions revealed that performance on early trials was most influenced by the simple attentional capacity of the Phonological Loop (Digit Span Forward) and years of education ($p < .05$). The middle trials were most influenced by the mental manipulations executed by the Central Executive (Arithmetic; $p < .001$). The Episodic Buffer's ability to integrate information and relate it to information in the long-term store (Long Delay Free Recall) predicted performance on the late SDL9 trials ($p < .01$). Age was not a significant predictor of performance at any stage of the SDL9 task.

Conclusions: The SDL9 is a complex measure assessing both the product and component processes of immediate memory. Pattern analysis on the SDL9, resulting in more specific interpretations of memory performance, may prove more clinically useful than use of the summary score.

Based on a manuscript under review at The Clinical Neuropsychologist
Correspondence: Yael Mansoor, Pacific Graduate School of Psychology, Palo Alto University, 15350 Amberly Drive, #3022, Tampa, FL 33647. E-mail: ymansoor@paloalto.edu

M.A. MATTHEWS, M. SEIDENBERG, J.L. WOODARD, S. DURGERIAN, K.A. NIELSON, J. SMITH, M.A. LANCASTER, A.M. BUTTS, N.C. HANTKE & S.M. RAO. Person-Identity Semantics Predicts Cognitive Decline in Cognitively Intact Older Participants.

Objective: Semantic memory (SM) impairment is evident in both Mild Cognitive Impairment (MCI) and Alzheimer's disease (AD). SM tasks vary in their associated lexical-semantic retrieval demands (e.g. naming objects, naming famous people), and this difference is important in

discriminating persons with MCI and AD from normal aging. Here, we compare a general lexical retrieval SM task, identifying similarities and differences between word concepts, with a Famous Name Recognition Task (FNRT) in predicting episodic memory decline in a sample of healthy older adults.

Participants and Methods: Seventy-eight cognitively intact participants, ages 65-90 years, were classified Stable or Declining based on performance change over an 18-month interval on the Rey Auditory Verbal Learning Test (RAVLT) sum of words recalled on Trials 1-5, delayed recall, and Mattis Dementia Rating Scale-2 (DRS-2) total score. Twenty-seven participants met criterion for Declining (> 1 SD reduction from baseline on at least one measure), while 51 remained Stable at follow-up testing. The relative contributions of baseline hippocampal volume, FNRT recognition accuracy, DRS-2 Conceptualization score, and presence of the Apolipoprotein E $\epsilon 4$ allele for predicting declining status were examined using logistic regression analyses.

Results: At baseline, the Stable and Declining groups did not differ on age, education, or RAVLT performance. The best-fitting model, which included baseline FNRT ($p=.03$) and left hippocampal volumes ($p=.03$), produced a LR=17.33, $p=.0006$, pseudo $R^2=.1722$. In contrast, the Conceptualization scale ($p=.667$) failed to provide a significant contribution to the prediction model.

Conclusions: Assessment of person-identity semantics may be useful in the prediction of episodic memory decline among asymptomatic older adults.

Correspondence: *Monica A. Matthews, Rosalind Franklin University of Medicine and Science, 1146 S. Church St, Lombard, IL 60148. E-mail: monica.matthews@my.rfums.org*

J.D. MCKEEVER, C. MORSE, L. ZHAO, T. LEIST & M.T. SCHULTHEIS. Associations Between Self-Reported Prospective Memory Problems and Objective Test Results in Multiple Sclerosis.

Objective: Prospective memory (PM) is the ability to realize intentions in the future, and has emerged as an important everyday functional ability. Investigations of PM impairments among individuals with Multiple Sclerosis (MS) have been limited, often relying on non-PM specific measures and self-report. The study includes both subjective and objective measures specifically targeting PM function. It is hypothesized that PM errors will be related to MS symptom severity, and that self-report of errors will correlate with objective test results.

Participants and Methods: Five community-dwelling individuals with MS (mean age= 51.2 yrs) were seen for a single testing session. Objective measures administered included the MIST (Memory for Intentions Test), the modified Six Elements Test (mSET) with a PM-specific manipulation, and tests comprising the Multiple Sclerosis Functional Composite (MSFC). The subjective measure, the Prospective Memory Complaints Questionnaire (PMCQ), is a novel questionnaire designed to measure domain-specific PM errors. Measures were selected based on the Multi-Phasic Process Model of PM.

Results: Correlational analysis between performance on measures revealed a significant relationship between MS symptom severity (MSFC) and subjective report of PM difficulties (PMCQ total items endorsed), $r^2=.84$, $p<.05$. Intention recall ability and self-reported PM errors were also significantly related, $r^2=.92$, $p<.05$. When grouped by ability to initiate a given task at the correct time (mSET manipulation), groups differed significantly in self-reported PM planning errors, $t(3)=6.7$, $p=.007$.

Conclusions: These preliminary results suggest that PM errors may be a significant concern in the MS population and may relate to disease progression. Initial evidence suggests that the "planning phase" of PM may be particularly troublesome in this population. Though further study is needed, characterizing common errors in PM among individuals with MS can provide guidance for rehabilitation and interventions. Correspondence: *Joshua D. McKeever, B.A., Clinical Psychology, Drexel University, 4232 Spruce St., #4, Philadelphia, PA 19104. E-mail: jdm324@drexel.edu*

S. MENDIZABAL, P. JOLICOEUR & S. LIPPÉ. Developmental differences of visual short-term memory.

Objective: Adults can maintain simultaneously 3 to 4 items in their visual short term memory (VSTM). The capacity of VSTM increases considerably during childhood and is usually measured by span tasks. Past studies focused on developing a panel of tasks in order to evaluate VSTM, but only a few have compared the performance of children according to their ages.

Participants and Methods: The present study aimed to investigate VSTM capacities in three groups : 17 children from 6 to 11 yr, 16 teenagers from 12 to 16 yr and 17 adults of 25 yr; by using two visual matching-to-sample tasks. Experiment 1 began with forty trials of Load 1 (only one item to retain) and the load was progressively increased (40 trials by load; maximum load 6, with six objects to retain.), until the limit of the storage space is reach ($<70\%$ of correct detection). The capacity of the VSTM was computed by using Cowan's k formula.. Experiment 2 was exactly the same as experiment 1 with only one exception: while stimuli were presented in both hemifields, an attentional cue indicated which hemifield the participant had to maintain in VSTM.

Results: The results indicated that the performance for experiment 1 was significantly greater than experiment 2 for all the participants ($p<.001$). Interestingly, the performances of the children for the two experiments were significantly lower than the teenagers ($p<.05$) and the adults ($p<.001$). Teenagers' performances for the two experiments did not differ from those of the adults ($p>.05$). Performances for the two experiments increased with age for the children and the teenagers ($r=.5$, $p<.05$).

Conclusions: To conclude, these results indicate that the capacity of VSTM is always reduced when attention is involved. Overall, it also suggested that VSTM seemed influenced by age, especially when there is an attentional component involved in the task.

Correspondence: *Sandrine Mendizabal, PhD, Psychology, University of Montréal, 7233 bd de l'épée, Montréal, QC H3N2E2, Canada. E-mail: sandrine.mendizabal@gmail.com*

J. NOVITSKI, D. GONZALEZ, L.M. GUIDOTTI BRETING & M. SEIDENBERG. Metamemory for Famous Names in MCI.

Objective: Metamemory, the ability to accurately monitor and evaluate one's own memory, is consistently found to be impaired in Alzheimer's disease. Findings in mild cognitive impairment (MCI) are more mixed and have focused primarily on judgment about episodic memory. We compared MCI and cognitively intact (CI) participants on familiarity ratings for recent and remote famous names, and compared these ratings to objective measures of semantic knowledge (SK) and autobiographical episode recollection (AR) associated with the names.

Participants and Methods: 13 MCI and 15 CI participants were presented with a total of 48 famous names from recent and remote time epochs. For each name, participants were asked if the name was familiar (yes/no), and if so, were asked to provide a rating of the extent of familiarity (1-7), SK, and AR.

Results: The MCI group did not differ from the CI group on recognition or familiarity ratings for either time epoch, but provided significantly less AR for the recent epoch, significantly less SK for the remote epoch ($p's <.05$), and a trend toward lower AR for the remote epoch. Overall, the MCI group was more impaired on AR than SK. Significant correlations between familiarity ratings and recent AR ($r=.53$, $p<.05$) and remote SK ($r=.56$, $p<.05$) were found only for the CI group.

Conclusions: Difficulties in metamemory were found in MCI and extended to both semantic and autobiographical recollection of famous names, regardless of memory age. These findings have implications for clinical management and the use of self-report as an accurate measure of memory ability in MCI.

Correspondence: *Julia Novitski, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 415 Howard St., Apt. 140S, Evanston, IL 60202. E-mail: julia.novitski@my.rfums.org*

V. PARADIS, P. GRAVEL, J. LEROUX, S.M. BRAMBATI, D.K. NGUYEN & I. ROULEAU. Brain Regions Involved in Retrospective and Prospective Memory Retrieval.

Objective: Prospective memory (PM) is the ability to form, maintain and execute intended actions after a delay, in the appropriate context in the future. Despite numerous theoretical links and experimental data suggesting similarities between retrospective (RM) and PM retrieval, only few neuroimaging studies have directly compared the two. The objective of the present study was therefore to examine, using fMRI, the activations generated by RM and PM retrieval.

Participants and Methods: Sixteen subjects were administered a semantic/perceptual decision task, a contextual recollection task and a recognition task, alone and with an added PM task (press a third key when the image is a musical instrument) while in a 3T MRI scanner.

Results: We found common activations during PM and RM retrieval blocks in the left precuneus, the left inferior parietal lobule and left thalamus (pulvinar), which could reflect similar memory processes. The activations in the precuneus could be related to the retrieval of rich contextual information or association, while the inferior parietal lobule could reflect bottom-up attentional processing during memory retrieval. Unique activations were observed during PM retrieval in the medial left precuneus, the left cingulate gyrus, the right thalamus (medio-dorsal) and the right superior frontal gyrus. These regions could support the additional attentional and executive processes responsible for the preparation of goal-directed action, attentional switching and response inhibition allowing an adequate coordination of the ongoing task and the PM task.

Conclusions: These findings suggest that similar processes could support PM and RM retrieval, while additional processes may be uniquely associated with PM.

Correspondence: *Veronique Paradis, M.Ps., Psychology, UQAM, C.P. SSSS succursale Centre-ville, Montreal, QC H3C 3PS, Canada. E-mail: veronicparadis@gmail.com*

T. PRESTON, B.K. LEBOWITZ, A. IYER & G.T. PRESTON. Neurocognitive Correlates of Prospective Memory in Clinically Referred Children.

Objective: Prospective memory is the subject of increasing interest in clinical settings. This study's objective was to investigate the neurocognitive correlates of prospective memory in a wide ranging sample of clinically referred children and adolescents, utilizing a conveniently administered measure of ProM revised by the senior author.

Participants and Methods: Participants were 166 clinically referred children and adolescents, ranging in age from 6 to 17. They presented with developmental learning and attention problems ranging from mild to severe, and had undergone a uniform clinical neuropsychological assessment. They were selected sequentially from an archival clinical database.

Neurocognitive data involved general intellect, attention/executive functions, and learning and memory. Prospective memory was assessed using the PROMS, administered concurrently with achievement testing.

Results: In addition to general intellect, four major independent variables were constructed from the cognitive measures: Response control; attention and cognitive efficiency; short term recall; and long term recall. ProM was significantly related to general intellect ($r = 0.26, p < .001$); attention/efficiency ($p = 0.29, p < .01$); planning ($r = 0.22, p < .05$); and long term recall ($r = 0.22, p < .05$). PROMS results were not significantly associated with either response control or short term recall.

Conclusions: These results are more modest than those previously presented in a study comparing children with moderate ADHD to matched typical children, likely because of the wider range of severity — tending toward milder symptom presentation — in the current sample. Nonetheless, the current study indicates that ProM as measured by the PROMS is associated with expected cognitive constructs involving attention, cognitive efficiency, planning and declarative memory. Results reinforce the usefulness of the revised PROMS as a convenient measure of prospective memory.

Correspondence: *Tom Preston, PhD, Neuropsychology Service, SUNY Stony Brook, 179 Belle Meade Road, Suite 3, East Setauket, NY 11733. E-mail: thomas.preston@sbumc.org*

T. PRESTON, A. IYER, B.K. LEBOWITZ & G.T. PRESTON. Psychosocial and Behavioral Correlates of Prospective Memory in Clinically Referred Children.

Objective: Prospective memory (ProM) is increasingly the focus of interest in work on normal and atypical child development. The objective of this study was to investigate the behavioral correlates of prospective memory in a wide ranging sample of clinically referred children and adolescents, utilizing a conveniently administered measure of ProM revised by the senior author.

Participants and Methods: Participants were 166 children and adolescents with a range of developmental disorders involving learning and attention. They were tested with the revised Prospective Memory Screening (PROMS; Sohlberg et al. 2009) as part of a uniform neuropsychological battery. Parents and teachers completed the Child Behavior Checklist/Teacher Report Form and the Behavior Rating Inventory of Executive Functions as part of each assessment.

Results: Results were notable for significantly stronger relationships between ProM and teacher perceptions of child problems, than between ProM and parent expressions of concern. Significant correlations were observed between PROMS scores and teacher reports of multiple deficits in social skills, self control, working memory, and monitoring on the TRF and BRIEF, with coefficients ranging from -0.18 to -0.44. PROMS scores and parents' reports on the CBCL and BRIEF, on the other hand, were significantly related only with respect to attention, inhibition and monitoring, with coefficients ranging from -0.16 to -0.28.

Conclusions: Prospective memory, known to be utilized far more frequently in everyday life than declarative memory, has been shown in this clinical sample to be related to multiple behavioral measures of children's functions, most particularly as reported by teachers. As hypothesized, these variables involved attention, self monitoring and self control, social skills, and working memory. This study provides further support for the clinical usefulness of the PROMS as a measure of prospective memory.

Correspondence: *Tom Preston, PhD, Neuropsychology Service, SUNY Stony Brook, 179 Belle Meade Road, Suite 3, East Setauket, NY 11733. E-mail: thomas.preston@sbumc.org*

S. RASKIN, G. MILLS, E. JONES, M. ZAMROZIEWICZ, E. KABTIMER & N. KAUR. Methods of Measurement of Prospective Memory.

Objective: Experimental laboratory, naturalistic, and self-report measures have all yielded important information about prospective memory (ProM). However, little is known about the relationship between them.

Participants and Methods: Each measure was administered to 100 healthy adults (HA) and 25 individuals with traumatic brain injury (TBI). The experimental measure required learning six noun-verb pairs, while determining if a noun is manmade or natural. The ongoing task was a Stroop task. The naturalistic task was the Memory for Intentions Screening test (MIST). The questionnaire was the Comprehensive Assessment of Prospective Memory (CAPM).

Results: Comparing measures, total correct on the laboratory task correlated significantly with event-cued items and recognition total on the MIST. The laboratory task was not related to the CAPM. The MIST action response was significantly related to independent activities of daily living (adl) on the CAPM, and total errors on the MIST were significantly related to basic adl and total CAPM. The groups differed on both number correct and false positives on the laboratory measure, total correct, recognition and number of ProM errors on the MIST, and BADL of the CAPM. When the TBI

individuals were separated into low and high performance on the Stroop, the groups differed in false positives, the MIST total correct, recognition and ProM errors but not the CAPM.

Conclusions: These data suggest both areas of overlap and areas of specificity for each of these measures and shed light on when each may be of use clinically and for research purposes. The MIST seems particularly sensitive to individuals with executive dysfunction.

Correspondence: *Sarah Raskin, Ph.D., Psychology, Trinity College, 300 Summit Street, Hartford, CT 06119. E-mail: sarah.raskin@trincoll.edu*

E.W. REYNOLDS, M.K. O'CONNOR, R.G. DEASON & A.E. BUDSON. Imagining is Believing: The Imagination Inflation Effect in Adults With Alzheimer's Disease.

Objective: The imagination inflation effect (IIE) refers to an increase in false memories for actions that are imagined versus those that are not. Research in healthy adults suggests that the IIE may be driven by failures in source monitoring or increases in familiarity for imagined actions. This study examined the IIE in healthy older adults and adults with Alzheimer's disease (AD). We hypothesized that adults with AD would be more susceptible to the IIE given greater impairments in source monitoring and over-reliance on familiarity.

Participants and Methods: Sixteen healthy older adults and 17 adults with AD participated in 3 sessions. Critical items (96) involved the presentation of objects followed by an action statement. Session 1 included 72 statements that subjects were instructed to perform, imagine performing, or simply listen to. In session 2, immediately following session 1, 8 items from each of the 3 presentation conditions and 8 new items were imagined 1 or 3 times. Twenty-four hours later, subjects returned for a recognition and source memory test featuring all of the critical items and 40 filler items.

Results: Results suggest that the IIE exists in both healthy older control subjects as well as adults with AD; however, the effect is more robust in adults with AD. That is, as the number of imaginings increased, the number of false alarms increased as well.

Conclusions: Results could be attributed to adults with AD relying more on familiarity during the test session; however, it could also be that adults with AD are unable to use imagination in the same way as healthy older adults. Alternatively, adults with AD could have such impaired memory that they are simply unable to recall prior study sessions. Functional outcomes could result in the development of strategies for adults with AD to reduce false recognition based on the IIE by creating more robust memories for actions that are actually performed, thereby strengthening global familiarity or helping patients tap into some preserved recollection.

Correspondence: *Erin Reynolds, Psy.D., Bedford VA Medical Center, 200 Springs Rd, 116B, Bedford, MA 01730. E-mail: drerinreynolds@gmail.com*

V. SAMARINA, S.A. BEAUDREAU, PH.D. & R.G. GOMEZ, PH.D.. Executive Functioning and Working Memory as a Unitary Construct are Associated with Delayed Memory in Older Adults.

Objective: There is significant debate whether executive functioning and working memory abilities are separate constructs and if they significantly underline late-life memory performance. This study examined whether a) executive functioning and working memory are dissociable constructs and b) if they are associated with memory in older adults.

Participants and Methods: As part of a larger study (Alzheimer's Association NIRC-09-133592 PI: Beaudreau), 121 community-dwelling older adults (M age = 74.4, SD = 6.7; 65 to 91-years old), mostly college educated (M education = 17.1 years, SD = 3.0) completed a comprehensive neuropsychological battery. In the current study, tests of executive functioning (DKEFS Verbal Fluency, DKEFS Color Word, WAIS-IV Digit Symbol), working memory (WAIS-IV Digit Span), and delayed verbal memory (Rey Auditory Verbal Learning Test (RAVLT)) were examined.

Results: Principal component analysis for all imputed measures of executive functioning and working memory yielded one robust factor (all factor loadings > 0.64). After adjusting for age and education in a multiple linear regression model, the unitary factor of executive functioning was associated with 19.1% of the variance in delayed verbal recall, $F(3, 111) = 8.73, p < .001$. Interactions between executive functioning and age or education were not significant ($ps > .05$).

Conclusions: Results indicate that working memory and executive functions are a unitary construct that predicts delayed verbal memory performance in older adults. This suggests that older adults with excellent executive functioning skills (including working memory) may be able to compensate better for memory problems.

Correspondence: *Viktoriya Samarina, Pacific Graduate School of Psychology at Palo Alto University, 1346 Shoa Drive, San Mateo, CA 94404. E-mail: vsamarina@paloalto.edu*

G.A. SEIDEL, T. GIOVANNETTI, E.R. MOHLER, M.A. ACKER, P. WANG, A. LYON, S. HEVERLY-FITT, M. FANNING & T.F. FLOYD. Cerebral Ischemic Disease, Carotid Stenosis, and Episodic Memory in Older Adults with Aortic Stenosis.

Objective: It remains unclear if carotid stenosis contributes directly to cognitive decline or merely acts as a marker of intracerebral or generalized atherosclerosis. More broadly, the relations between vascular risk factors and memory performance are poorly understood. We investigated relations between cerebral ischemic disease, carotid stenosis, and episodic memory performance in older adults with aortic stenosis.

Participants and Methods: Seventy-three older adult participants with aortic stenosis underwent 1.5 Tesla MRI to obtain multimodal image sets which were used for automatic segmentation and volumization of chronic white matter lesions and nonwhite matter ischemia-like lesions (WML-ILL). Flow velocity in internal vs. common carotid artery was used as a standard measure of carotid stenosis. The Hopkins Verbal Learning Test Discriminability Index (HVLT-DI; delayed recognition hits - false positives) provided a measure of episodic memory performance.

Results: Correlations identified a significant moderate relation between WML-ILL and carotid stenosis ($r = .30, p = .01$). In a hierarchical regression model only WML-ILL emerged as a significant predictor of episodic memory performance ($F(2, 72) = 3.26, p < .05, R^2 = .09$; $\beta(\text{WML-ILL}) = -.30, p = .02, \beta(\text{C-STEN}) = -.03, p = .82$). Analysis of lateralized carotid stenosis showed no differential relations to lateralized WML-ILL measures or to performance on a verbal list learning task.

Conclusions: Although in a sample of older adults with aortic stenosis, ischemic lesion volumes showed a relation to carotid stenosis, only lesion volumes were related to episodic memory performance. These findings suggest that brain imaging may be a stronger indicator of the impact of vascular pathology on cognitive performance than measures of carotid stenosis.

Correspondence: *Gregory A. Seidel, M.A., Psychology, Temple University, 1701 N. 13th St., Weiss Hall, Philadelphia, PA 19122-6085. E-mail: gregory.seidel@temple.edu*

S. SIMARD, M. BOJANOWSKY & I. ROULEAU. Effect of cue salience in event-based prospective memory in patients with a ruptured cerebral aneurysm: role of executive functions.

Objective: The objective of this study was to examine, in patients with a ruptured aneurysm of the anterior communicating artery (ACoA) the implication of executive functions in event-based prospective memory (PM), with special attention to the effect of cue saliency in cue detection.

Participants and Methods: Thirty patients with a ruptured ACoA aneurysm and 20 age- and education-matched control subjects participated in the study. The PM task consisted in a sentence verification task (concurrent task) in which specific cues had to be detected. Salience was manipulated on two dimensions: familiarity (high frequency vs. low frequency words) and perceptual distinctiveness (bold face vs. normal font). Participants also completed standardized executive functions tests leading to four executive factors: Inhibition, Planning, Source Memory and Retrieval.

Results: There was a significant effect of groups on PM performance. The difference between the groups was especially marked when cues were not salient (familiar and in normal font). No significant differences were observed between the groups when cues were highly salient (non-familiar and bold). Although there was a significant correlation between the number of cues detected and Inhibition, Source Memory and Retrieval factors, the regression analysis showed that only Retrieval factor contributed significantly to cue detection.

Conclusions: The deficits observed in ACoA patients in the detection of non-salient cues together with the significant improvement observed when highly salient cues are presented is consistent with a role of executive function in monitoring the environment for cue detection.

Correspondence: *Isabelle Rouleau, Ph.D., Psychology, Université du Québec à Montréal, CP 8888, succ. centre-ville, Montréal, QC H3C 3PS, Canada. E-mail: rouleau.isabelle@uqam.ca*

J.J. TANNER, C.C. PRICE, I. MALATY, M.S. OKUN, D.J. LIBON & D. BOWERS. Verbal Learning Profiles and Entorhinal Cortex Volume in Parkinson's Disease.

Objective: There is growing evidence for reduced medial temporal lobe volume and mixed evidence for verbal memory disruption in Parkinson's disease (PD). We examined hypothesized differences in PD relative to non-PD peers for entorhinal cortex (ERC) volume, learning/memory performances on two verbal serial list-learning tests, and associations between ERC and list-learning recall.

Participants and Methods: With IRB approval, non-demented idiopathic PD (n=40) and age and education matched controls (n=40) completed 2 T1-weighted 3D scans for gray-white matter averaging and two 12-word list-learning tests: the Hopkins Verbal Learning Test (HVLT) and the Philadelphia (repeatable) Verbal Learning Test (PrVLT), a test modeled after the CVLT. FreeSurfer aided with left entorhinal cortex (ERC) segmentation with volumes corrected for brain and head size. Two MANCOVA analyses assessed group differences on ERC, immediate total, delayed recall, and recognition discriminability, covarying for disease severity (UPDRS 3 score).

Results: Groups were demographically matched. HVLT and P(r)VLT indices correlated moderately (r values: 0.23 - 0.62). ERC volume only correlated with PrVLT recognition discriminability (r=0.25, p=0.03). ERC volume in PD averaged 18% smaller (p<.001). Only the P(r)VLT MANCOVA was significant (F=2.56, p<0.05) with univariate differences in ERC and recognition discriminability (p values<0.05; P(r)VLT delay p=0.06).

Conclusions: PD had smaller left ERCs and showed reduced memory on the P(r)VLT relative to matched non-PD peers. Contrary to the HVLT, the P(r)VLT includes an interference test trial and equal numbers of foils: interference, semantic, and unrelated. Findings add to research showing medial temporal structural and functional differences in PD relative to non-PD matched peers.

Supported by NINDS K23NS060660(CP)

Correspondence: *Jared J. Tanner, MS, Clinical & Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610. E-mail: jjtanner@phhp.ufl.edu*

M. TROYANSKAYA, N.J. PASTOREK, R.S. SCHEIBEL, N.J. PETERSEN, E.A. WILDE, S.R. MCCAULEY, H.K. HENSON & H.S. LEVIN. Correlation Between Persistent Memory Impairment Following Mild, Blast-Related TBI and PTSD Symptoms in OEF/OIF Service Members and Veterans.

Objective: According to recent studies, approximately 20% of the returning Operation Iraqi Freedom and Operation Enduring Freedom (OIF/OEF) service members and veterans have been diagnosed with mild traumatic brain injury (mTBI). Between 40% and 63.9% of them are also diagnosed with posttraumatic stress disorder (PTSD). This study investigated the correlation between memory impairment and PTSD symptoms.

Participants and Methods: A measure with documented sensitivity to memory dysfunction in civilian mTBI populations, the Verbal Selective

Reminding Test (VSRT), was used to assess long-term effects of blast-related TBI. The PTSD Checklist-Civilian Version (PCL-C) was used to assess severity of PTSD symptoms. Both measures were administered to 62 subjects who had been exposed to blast and reported alteration of mental status consistent with mTBI. These were compared to 31 control subjects who were never exposed to blast and had no history of TBI.

Results: The groups did not differ in age (TBI: mean=30.9 years, SD=6.8; Control: mean=31.8 years, SD=7.3), education (TBI: mean=13.7 years, SD=1.6; Control: mean=13.8 years, SD=1.6), or time since injury (TBI: mean=1250.3 days, SD= 653.8; Control: mean=1169.2 days, SD=733.3). In regression models, group status (mTBI or control) alone accounted for 4.4% to 6.0% of the variance in consistent long term retrieval (CLTR) and delay recall trials, while PCL-C scores alone accounted for 5.8% to 8.4% of the variance on the same VSRT trials. When both group status and PCL-C scores were included in the same models, however, the effect of mTBI group status was no longer significant.

Conclusions: It is important to consider the severity of PTSD symptoms when evaluating memory problems in this population.

Correspondence: *Maya Troyanskaya, MD, PM&R, Baylor College of Medicine, 1709 Dryden Rd # 1200, Houston, TX 77030. E-mail: mayat@bcm.edu*

D.M. WALD, D. WHITESIDE & L. CABRERA. The Relationship between Visual Spatial Processing, Attention, and Visual Memory.

Objective: Visual spatial processing and attention play an important role in encoding, storing, and retrieving visual information (Cabeza, 2004). Furthermore, deficiencies in either one of these cognitive domains often leads to deficits in visual memory consolidation and recall (Cabeza). The current study demonstrates the necessity of multiple cognitive domains working together to form visual memory.

Participants and Methods: Using correlation analysis, the current study sought to further explore the relationship between attention, visual spatial processing, and visual memory. Participants (n = 166) included consecutive individuals referred for neuropsychological evaluations who met the study criteria which required the participants to be 18 years of age and completed all of the neuropsychological measures used in this study. Attentional measures included the Continuous Performance Test-Second Edition (CPT-II) omissions and commissions, and the Brief Test of Attention (BTA). Visual spatial processing was measured using the Judgment of Line Orientation (JLO), and visual memory was assessed using the Rey Complex Figure Test (RCFT) Delayed Recall (DR) Trail.

Results: Results indicated significant correlations between the RCFT-DR and CPT-II omission errors (r = -.33; p<0.01), BTA (r = .49; p<0.01), and JLO (r = .42; p<0.01).

Conclusions: Because attention and visual spatial processing significantly correlate with visual memory, assessing these domains may enable neuropsychologists to identify the impact these domains have on visual memory functioning.

Correspondence: *Danielle M. Wald, Argosy University, Seattle, 2601-A Elliott Avenue, Seattle, WA 98121. E-mail: d_wald593@hotmail.com*

Multiple Sclerosis/ALS/Demyelinating Disorders

M.R. BASSO, L. BOWEN, D. COMBS & J. JOHNSON. The CMDI Predicts Depression Diagnosis but not Neuropsychological Dysfunction in People with MS.

Objective: Major depressive disorder (MDD) occurs often in multiple sclerosis (MS), lifetime prevalence of MDD in MS approaches 50%. MDD has serious implications, and corresponds with executive dysfunction in MS. Unfortunately, efforts to screen for MDD are problematic, because vegetative symptoms may result in false positives. The Chicago Multiscale Depression Inventory (CMDI) was designed to address this problem. However, its diagnostic validity has not been established, and optimal diagnostic cutoffs for its scales remain undefined.

Participants and Methods: 44 healthy controls and 90 patients diagnosed with MS were administered a neuropsychological battery, the CMDI and the Mini International Neuropsychiatric Inventory (MINI), a structured diagnostic interview of mental illness. Consistent with prior single-point prevalence data, 15% of the patients met diagnostic criteria for MDD. **Results:** A receiver operating characteristic analysis of CMDI scales was conducted, and diagnostic accuracy was assessed. The Mood subscale achieved the largest area under the curve (.93). Optimal cutoffs for the Mood scale achieved 80% sensitivity, 93% specificity, and 92% overall accuracy. Regression analyses revealed that MDD diagnosis predicted poor executive function and working memory, but CMDI scores did not. **Conclusions:** The Mood subscale of the CMDI possesses better diagnostic validity than the Evaluative, Vegetative, or Total scores, and it has good sensitivity and excellent specificity using the optimal cutoff score. This study is the first to establish diagnostic validity as well as empirically derived cut-off points for the CMDI. Although a valid predictor of MDD, however, the CMDI did not predict neuropsychological dysfunction, whereas MDD diagnosis did. Consistent with assertions from the psychiatric literature, these data imply that diagnoses of MDD are qualitatively different from self-reported distress. Cognitive impairment in MS coincides with categorical diagnosis rather than self-reported distress.

Correspondence: *Michael R. Basso, Ph.D., Psychology, University of Tulsa, 800 South Tucker Drive, Tulsa, OK 74104. E-mail: michaelbasso@utulsa.edu*

A. MILLER, M.R. BASSO, E. ESTEVIS, D. COMBS & J. JOHNSON. Depressive Symptom Dimensions and Neuropsychological Impairment in Multiple Sclerosis.

Objective: Depression occurs commonly in people with Multiple Sclerosis (MS), and its occurrence corresponds with neuropsychological impairment, especially in executive functioning. However, prior results have been inconsistent across studies, and this might be due to the heterogeneity of depressive symptoms. By focusing on specific symptom dimensions, a clear delineation of what aspects of depression predict neurocognitive dysfunction may be obtained. Some have asserted that mood disorders may be defined across three facets: negative affect, anxious arousal, and anhedonia (Watson et al., 1990). The current study aimed to investigate the unique contributions of these facets to neuropsychological impairment in a sample of MS patients.

Participants and Methods: The sample included 98 patients with a diagnosis of MS (77 females and 21 males; age: $M=45.37$, $SD=10.59$; education: $M=14.40$, $SD=2.29$) and 48 controls (33 females and 15 males; age: $M=42.90$, $SD=11.49$; education: $M=14.25$, $SD=2.19$). All were administered the Mood and Anxiety Symptom Questionnaire-Short Form (MASQ), a validated tri-partite measure of mood symptoms, and a battery of neuropsychological tests.

Results: Correlations revealed that anhedonia correlated more frequently with executive functioning than other depressive dimensions. Anxious arousal and anhedonia correlated with executive functioning more than depressed mood and than anxious-worry. Worry failed to correlate with neuropsychological performance.

Conclusions: These data suggest that specific components of depression, specifically anhedonia and anxious arousal, lead to greater neurocognitive morbidity than depressed mood alone. These findings may explain inconsistent findings in previous research, because other studies may not have delineated specific domains of depressive symptoms. The results conform well with emerging neuroimaging data that reveals a frontal lobe substrate of anhedonia.

Correspondence: *Michael R. Basso, Ph.D., Psychology, University of Tulsa, 800 South Tucker Drive, Tulsa, OK 74104. E-mail: michaelbasso@utulsa.edu*

M.L. BEIER, E. FARRELL, M. SHUMAN, M. PICONE, R. HOLTZER & F. FOLEY. Is There a Relationship Between Alcohol and SDMT Performance?

Objective: Few studies have looked at alcohol prevalence in outpatient multiple sclerosis populations and fewer have explored effects alcohol

use on cognition. While one study did compare alcohol use to cognitive performance, it did not examine the relationship of drinking to the Symbol Digit Modalities Test (SDMT), a test of processing speed, working memory, visual scanning and divided attention. The SDMT is highly correlated with cognitive decline and MS brain pathology. Recent studies suggest the SDMT may be a useful screening tool for cognitive dysfunction in MS patients. The purpose of the current study was to expand the scope of previous research by exploring the relationship between alcohol use and the SDMT in an MS outpatient population.

Participants and Methods: 171 MS patients completed questionnaires assessing mood, cognition, alcohol use and an objective measure of cognitive functioning (SDMT).

Results: Hierarchical multiple regression was used to assess the ability of the AUDIT-C (alcohol use) to predict processing speed (SDMT), after controlling for the influence of demographics. Preliminary analyses were conducted to ensure no violation of assumptions. Simple correlations determined which demographic variables; mood symptoms or disease factors (e.g. ISS scores) were correlated with processing speed. The significant items (gender, marital status, race and employment) were entered at Step 1, explaining 16.4% of the variance in processing speed, $F(4, 85) = 4.17$, $p < .005$. After entry of the AUDIT-C at Step 2 total variance explained by the model was 18.1%, $F(5, 84) = 3.71$, $p < .005$. In the final model only two control measures were statistically significant, with employment status recording a higher beta value (beta = .310, $p < .005$) than race (beta = -.26, $p < .01$).

Conclusions: The model predicted variability in processing speed, however alcohol use was not found to be an independent predictor of SDMT scores when controlling for demographic variables.

Correspondence: *Meghan L. Beier, MA, Yeshiva University, 2 E Gittings St., Baltimore, MD 21230. E-mail: meghanbeier@gmail.com*

M.L. BEIER, E. FARRELL, M. SHUMAN, V. D'ORIO, J. SPAT, M. PICONE & F. FOLEY. Alcohol Use in an Outpatient American MS Sample.

Objective: To date there has never been a study examining the prevalence of alcohol use among persons with multiple sclerosis in a United States outpatient population that was not a mailed survey. Furthermore, previous studies have focused on only lifetime prevalence. The purpose of the current study was to explore current prevalence of clinically significant alcohol use in an outpatient MS population, to determine the demographic make-up of alcohol abusers, and to explore the utility of the AUDIT-C questionnaire in an American outpatient MS sample.

Participants and Methods: During a scheduled medical appointment, 171 multiple sclerosis patients completed questionnaires to assess cognition, mood, drug and alcohol use. Current alcohol use was measured using the AUDIT-C (clinically significant drinking = 4 for men and 3 for women).

Results: When asked about current drinking, 73.7% of participants completed the questionnaire and 41.3% of responders met criteria for clinically significant drinking with no significant difference between men and women. Women problem drinkers were more likely to be married, Caucasian and were less likely to be diagnosed with depression. Male problem drinkers were more likely to be single, Caucasian and less depressed.

Conclusions: Our outpatient sample has higher prevalence rates of current alcohol use than the general population and other reported rates in the MS literature. There appear to be gender differences in the demographic make up of problem drinkers.

Correspondence: *Meghan L. Beier, MA, Yeshiva University, 2 E Gittings St., Baltimore, MD 21230. E-mail: meghanbeier@gmail.com*

J. BERARD, L.A. WALKER, V. BHARADIA, M. BOWMAN, H. LEE, M.S. FREDMAN & H.L. ATKINS. Neuroimaging Correlates of Cognitive Change Following Immunoablative Therapy and Bone Marrow Transplant in MS: A Pilot Study.

Objective: Individuals with MS who undergo immunoablative therapy and bone marrow transplant (BMT) have shown a median decrease in

total brain volume of 3.2% over 2.4 months. Some areas of cognition show a decline during this time. Currently, it was hypothesized that the atrophic changes noted would parallel those areas of cognition which declined. White (WM) and grey matter (GM) volumes were examined. The potential effect of the chemotherapeutic agent on cognitive performance was also explored.

Participants and Methods: Seven individuals with rapidly progressing MS and poor prognosis underwent high dose immunosuppression and subsequent autologous BMT. Individuals completed neuropsychological testing and MRI scans at baseline and 2 months post-procedure.

Results: A median decline of 1.91% in total brain volume was noted 2 months post-BMT in this sample. Significant decline was noted in performance for some areas of executive functioning (concept formation, problem solving, initiation) and levels of depression worsened for some individuals. No significant correlations were found between areas of cognitive decline and change in imaging variables; however, white matter volumes correlated with performance on information processing speed measures (though neither changed over time). The chemotherapeutic agent used correlated with performance on one cognitive task (phonemic verbal fluency).

Conclusions: Some aspects of cognition appeared to have changed due to the treatment procedure. Given that these changes show little relationship to the observed changes in brain volume, declines may have also been related to factors other than those examined (e.g. general malaise/higher levels of fatigue post-procedure).

Correspondence: *Jason Berard, Psychology, The Ottawa Hospital, 501 Smyth Road, Ottawa, ON K1H 8L6, Canada. E-mail: jasonberard@hotmail.com*

J. BERARD, L.A. WALKER, M. BOWMAN, H.L. ATKINS & M.S. FREDMAN. Cognitive Fatigue in Individuals with Multiple Sclerosis Undergoing Immunoablative Therapy and Bone Marrow Transplant.

Objective: Individuals with MS show greater susceptibility to cognitive fatigue (CF). CF is presently defined as an inability to sustain task performance throughout the duration of a continuous information processing speed task. Currently, performance between the first and second half on the Paced Auditory Serial Addition Test (PASAT) was examined in a group of MS patients who underwent bone marrow transplant (BMT) to evaluate the procedure's impact on levels of CF. As the sensitivity of the PASAT in detecting CF differs depending on the methodology used, performance was examined using 3 scoring methods (total correct, dyad, and % dyad scores).

Participants and Methods: Twenty-three individuals with rapidly progressing MS and poor prognosis underwent high dose immunosuppression and subsequent autologous BMT. Individuals completed the 3rd and 2nd PASAT pre-BMT and 6/12/18/24 months post-BMT.

Results: Across all three scoring methods, performance on the second half of the task was worse than performance on the first on both ISIs at all time points. CF was observed at both ISIs and at all time points for both the dyad and % dyad scores. Examination of the total number of correct responses, however, showed no effect of CF at 6 month follow-up on the 3rd ISI. No significant difference was noted between the degree of CF observed pre-and post-procedure.

Conclusions: It is unlikely the procedure negatively affected levels of CF given that individuals generally exhibited a similar pattern of CF both pre-and post-BMT. Unlike previous research, % dyad scores did not increase the sensitivity of the PASAT in detecting CF.

Correspondence: *Jason Berard, Psychology, The Ottawa Hospital, 501 Smyth Road, Ottawa, ON K1H 8L6, Canada. E-mail: jasonberard@hotmail.com*

L.A. WALKER, J. BERARD, M. BOWMAN, H.L. ATKINS & M.S. FREDMAN. PASAT Performance Before and After Immunoablative Therapy and Bone Marrow Transplant in Individuals with MS.

Objective: A median decrease in total brain volume of 3.2% over 2.4 months has been shown in individuals with MS who undergo immunoablative therapy and bone marrow transplant (BMT). The poten-

tial impact of this decrease in brain volume on cognition is less clear. To address this, performance on the Paced Auditory Serial Addition Test (PASAT) was examined pre- and post- BMT to evaluate the impact of the procedure on information processing speed (IPS). Given that PASAT sensitivity is affected by the methodology used, performance was examined using three scoring methods (total correct, dyad, and % dyad scores).

Participants and Methods: Twenty-three individuals with rapidly progressing MS and poor prognosis underwent high dose immunosuppression and subsequent autologous BMT. Individuals completed the 3rd PASAT at baseline and 6/12/18/24 months post-BMT.

Results: Across all three scoring methods, a mean decline in performance was noted between baseline and 6 months post-BMT. This change, however, was not to a clinically significant degree (as assessed by reliable change analyses). Minor declines initially noted were offset by an overall trend for improvement at 12 months and above regardless of scoring method used. Level of impairment at baseline did not influence the likelihood for improvement over time. No differences in demographic variables were noted between those who showed improvement and those who did not.

Conclusions: While an initial decline in IPS was noted 6 months post-procedure, there were no lasting effects of treatment given the overall trend for improvement noted at 12 months and above. The scoring method used did not impact PASAT sensitivity.

Correspondence: *Jason Berard, Psychology, The Ottawa Hospital, 501 Smyth Road, Ottawa, ON K1H 8L6, Canada. E-mail: jasonberard@hotmail.com*

L. BERRIGAN, J. LEFEVRE, L. REES, L. WALKER, J. BERARD & M. FREDMAN. Cognition in Early Relapsing-Remitting Multiple Sclerosis: Consequences May Be Relative to Working Memory.

Objective: Patients with multiple sclerosis (MS) have reported that the disease affects their ability to think. According to the Relative Consequence Model (DeLuca et al., 2004), patients with MS have a fundamental difficulty in processing speed that, in turn, compromises other cognitive functions. However, previous research examining the hypothesis suffers from several methodological flaws. For example, most studies employed processing speed measures that are confounded by working memory. The objectives of the present study were to: (1) investigate the relations between processing speed and other cognitive abilities while addressing methodological flaws in previous work and (2) examine whether working memory may contribute to cognitive deficits.

Participants and Methods: Seventy adults with relapsing-remitting MS and disease duration of no more than ten years and 72 controls completed multiple measures assessing processing speed, working memory, learning, and executive functioning. Structural equation modeling was used to test the separate hypotheses of the mediating roles of processing speed and working memory in the relations between group membership and the other cognitive functions.

Results: Group membership did not predict processing speed, thus, the mediating role of processing speed could not be examined. With working memory assigned as a mediating variable, group had a significant direct effect on working memory but only indirect effects on the other cognitive functions via working memory.

Conclusions: The results do not support the Relative Consequence Model in patients with early relapsing-remitting MS and they challenge the notion that working memory impairment only emerges at later disease stages. The results do support the mediating role of working memory in the relations between MS and other cognitive functions.

Correspondence: *Lindsay Berrigan, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S5B6, Canada. E-mail: lberrigan@toh.on.ca*

L. BERRIGAN, J. LEFEVRE, L. REES, L. WALKER, J. BERARD & M. FREDMAN. The Performance of Individuals with Multiple Sclerosis and Controls on the Symbol Digit Modalities Test and the Paced Auditory Serial Addition Test: More than Just Processing Speed.

Objective: Slowed processing speed is one of the most commonly reported cognitive deficits for individuals with multiple sclerosis (MS).

However, the measures used to assess processing speed are often confounded by other cognitive abilities, such as working memory and learning. The objectives of the present study were to determine the contributions of different cognitive functions to performance on two measures commonly used to assess processing speed in MS: the Symbol Digit Modalities Test (SDMT) and the Paced Auditory Serial Addition Test (PASAT).

Participants and Methods: Seventy adults with relapsing-remitting MS and disease duration of no more than ten years and 72 controls completed the SDMT, PASAT, and multiple measures assessing processing speed, working memory, and learning. Hierarchical regression analyses were used to examine the contributions of group membership, factor scores representing the cognitive functions, and their interactions to the SDMT and PASAT.

Results: Processing speed and working memory generally contributed to performance on the PASAT and the SDMT, with learning additionally contributing to SDMT performance. Furthermore, PASAT performance was not influenced by processing speed for individuals with high working memory ability whereas processing speed became increasingly more important as working memory declined to average and low levels. Processing speed was only associated with SDMT performance for patients with MS and not controls.

Conclusions: The findings are consistent with the multifactorial interpretation of the SDMT and PASAT, which may facilitate their usefulness as screening measures but prevents them from identifying specific cognitive functions affected. These findings also suggest a general link between levels of working memory ability and processing speed influences the contributions of these functions to PASAT performance.

Correspondence: *Lindsay Berrigan, Carleton University, 1125 Colonel By Drive, Ottawa, ON K1S5B6, Canada. E-mail: lberrigan@toh.on.ca*

E. DAGENAIS, I. ROULEAU, M. DEMERS, C. JOBIN & P. DUQUETTE. Subjective and Objective Prospective Memory Measures in Patients with Multiple Sclerosis.

Objective: Patients diagnosed with multiple sclerosis (MS) often report prospective memory (PM) deficits. Despite the importance of PM in daily functioning, few studies have examined PM deficits in MS, mostly due to a lack of available standardized PM measures. Hence, the objective of this study was to directly compare subjective and objective PM measures among MS patients.

Participants and Methods: Seventeen patients with relapsing-remitting MS were paired with 17 healthy controls according to age, gender and education. Performances on the Prospective and Retrospective Memory Questionnaire (PRMQ) (Smith et al., 2000), the envelope test (Huppert et al., 2000) and the SAVR task (Guimond et al., 2008), a multi-tasking computerized simulation of professional activities of daily living, were compared between groups.

Results: Analyses showed that the PRMQ confirmed MS patients' subjective PM complaints, especially on self-initiated conditions. On the other hand, when performing a simple yet objective task (envelope), 4 out of 17 MS patients failed to complete the required actions in contrast to the successful performance observed in all healthy controls. On a more complex PM task (SAVR), initial analyses failed to demonstrate between-group differences. However, significant differences on the time-based (TB) PM component (TB-PM) were revealed when healthy controls were compared to a dichotomized MS group on the basis of their memory composite score (low vs high memory functioning). Specifically, low-memory MS patients had more difficulty completing the TB-PM task than high-memory MS patients and healthy controls, who did not differ.

Conclusions: These findings confirm PM deficits in MS using subjective and objective measures and underline the importance of PM evaluation in clinical setting. The envelope test is a simple and valid task that can be used in clinical setting, as a screening instrument along with the PRMQ. Correspondence: *Emmanuelle Dagenais, Université du Québec à Montréal, 2662 av. Jeanne-D'Arc, Montréal, QC H1W 3J9, Canada. E-mail: emmanuelle.dagenais@gmail.com*

M. ENSLEY, A. FEDIO, J. SEXTON, M. QUIG & J. SIMSARIAN. The Differential Effects of Disease Severity on Cognition, Depression, and Fatigue in Multiple Sclerosis.

Objective: MS is a heterogeneous disease that encompasses a range of clinical characteristics, including cognitive, somatic, and affective symptoms. Duration of disease is often linked to deficits in processing speed and working memory, as well as increased depression and fatigue. This study evaluated the effects of disease severity in MS on cognition, depression, and fatigue.

Participants and Methods: Twenty-one participants had a definitive diagnosis of MS (mean age = 37.19; 15 females; 13 RRMS, 7 SP/PP "other" MS). Participants were administered a brief neuropsychological screen, BDI-II, and the SF-36. This study used a MANOVA to explore the relationship between severity of disease and depression, fatigue, and cognitive function in MS patients.

Results: Results indicated a significant large effects for attention, $\eta^2p=.26$, $p = .03$; encoding, $\eta^2p=.21$, $p = .05$; retrieval, $\eta^2p=.25$, $p = .03$; recognition, $\eta^2p=.27$, $p = .02$; depression, $\eta^2p=.30$, $p = .02$. Cognitive deficits for RRMS were specific to processing speed, but more global for other MS types. RRMS reported no or mild depression (BDI=8), while other MS types reported major depressive symptomatology (BDI=18).

Conclusions: When considering severity of disease, statistical comparison of RRMS and other MS supported a progression of diminished cognitive performance, mood, and quality of life. Individuals classified as RRMS were impaired on a single measure of processing speed, and endorsed significant but smaller concerns on measures of fatigue and general health. Other MS participants evidenced more global and significant cognitive and affective decline. Increasing symptomatology with MS progression highlights the need for comprehensive evaluation to inform treatment.

Correspondence: *Megan Ensley, MA, Portland VA Medical Center, Portland VA Medical Center, P3MHDC-Ensley, 3710 SW US Veterans Hospital Road, Portland, OR 97239. E-mail: megan.ensley@va.gov*

J. EPPIG, C. NIEVES, A. XU, D. TABBY, J. DELUCA & D. LIBON. Clock Drawing in Multiple Sclerosis: Relationship with Executive Functioning and Episodic Memory.

Objective: Though well validated in other populations, little research has examined the utility of clock drawing in Multiple Sclerosis. The current study demonstrates the relationship between clock drawing performance in MS with neuropsychological measures of executive control and episodic memory.

Participants and Methods: 29 MS patients were administered Clock Drawing, WAIS-III Digit Symbol, Letter Fluency ('FAS'), and the CVLT-II. Clock drawing performance was coded with a 10-point error scoring system and total errors (0-20) were calculated. Letter fluency output was converted to a z-score after adjusting for age, education, and race. CVLT-II variables of interest included delay free recall and delayed recognition discriminability.

Results: The age and education [Mean (SD)] of patients was 43.83 (12.98) and 13.14 (1.71) years, respectively. A regression model indicated that letter fluency and digit symbol performance explained 51.2% of the variance [$R^2 = .547$, $F(2, 28) = 15.710$, $p < .001$]. Digit symbol output significantly predicted total clock drawing errors [$\beta = -.780$, $t(28) = -5.578$, $p < .001$], as did letter fluency z-scores [$\beta = .332$, $t(28) = 2.371$, $p < .025$]. A regression analysis using CVLT-II delay free recall and recognition discriminability did not explain any variance [$R^2 = .061$, $F(2, 28) = .842$, $p < .442$] and neither predictor was significant [$\beta = -.062$, $t(28) = -.251$, $p < .803$; $\beta = -.202$, $t(28) = -.816$, $p < .422$; respectively].

Conclusions: Clock Drawing provides useful neuropsychological information among MS patients; total clock errors are related to measures of executive control but not episodic memory. Thus, Clock Drawing appears to be a valuable and efficient tool for screening dysexecutive impairment in MS. Correspondence: *Joel Eppig, B.A. in psychology; Neurology, Drexel University College of Medicine, 2404 Aspen Street, Philadelphia, PA 19130. E-mail: joel.eppig@temple.edu*

E.M. FARRELL, M. BEIER, M. PICONE & F. FOLEY. Relationship of Anxiety, Depression, and Information Processing Speed for Individuals with Multiple Sclerosis (MS) at an Outpatient Clinic.

Objective: There is limited research on anxiety for individuals with multiple sclerosis, and fewer studies examining the relationship of anxiety and cognitive difficulties for this population. Limited research has demonstrated anxiety is commonly comorbid with depression, and anxiety may occur with greater frequency than depression. Cognitive dysfunction also appears frequently reported in MS, however the relationship of cognition and anxiety is not clearly understood. Information processing speed is a commonly affected domain in MS and the Symbol Digit Modalities Test (SDMT) is a sensitive measure to detect cognitive deficits in MS. This study assessed rates of anxiety, depression and cognitive impairment, and examined the relationship of anxiety and cognition in MS.

Participants and Methods: 110 MS patients completed questionnaires assessing mood (Hospital Anxiety and Depression Scale) and processing speed (SDMT).

Results: Prevalence of clinically significant anxiety symptoms was 39.1% and 26.4% for depression. Frequency of processing speed deficits (SDMT) was 40.9%. Significant correlations were found: anxiety and depression ($p < 0.01$), anxiety and SDMT ($p < 0.1$), and depression and SDMT ($p < 0.05$). Multiple regression assessed the ability of anxiety to predict processing speed, after controlling for demographics and disease severity. Demographics (Step 1) explained 7% of variance in processing speed. After disease severity (Step 2), variance explained was 18%. After entry of anxiety (Step 3), total variance explained by the model was 19%, $F(5,104) = 4.84, p < 0.05$. Disease severity ($\beta = -0.36, p < 0.05$) and gender ($\beta = 0.19, p < 0.05$) were the only statistically significant control measures.

Conclusions: Anxiety, depression and cognitive difficulties were frequently reported in this MS sample, however anxiety was not found to be an independent predictor of processing speed. There is a need to further examine anxiety, depression and cognition in MS to help screen individuals who may be at greater risk and benefit from early intervention. Correspondence: *Eileen M. Farrell, M.A., Ferkauf Graduate School of Psychology, Yeshiva University, 400 East 89th Street, Apt. 11K, New York, NY 10128. E-mail: eileen.farrell@gmail.com*

L.M. FORD-JOHNSON, J. LENGENFELDER, E. ELOVIC, N. MOORE, J. DELUCA & N.D. CHIARAVALLI. Modafinil for Improving Attention in Multiple Sclerosis.

Objective: To examine the effect of Modafinil, a cognitive enhancing agent, on tests of attention in an MS sample.

Participants and Methods: 16 age and education matched individuals diagnosed with MS received either a single oral dose of Modafinil (200 mg) or placebo for 2 weeks in a randomized, double-blinded, crossover design. Participants were administered Digit Span, Digit Vigilance Test, Letter-Number Sequencing, and Symbol Digit Modalities Test at baseline and follow-up.

Results: Modafinil did not have a significant main effect on tasks of attention relative to the placebo except for one attention task, Letter-Number Sequencing $F(1, 14) = 5.052, p = .041$. However, participants receiving Modafinil did show modest trends toward improvement in performance on all attention measures from time 1 to time 2. Although not significant, performance on several of the measures of attention had moderate effect sizes, suggesting that these trends may become significant in a study with increased sample size.

Conclusions: Modafinil significantly improved attentional set shifting. However, Modafinil only resulted in trends toward significance on performance in other areas of attention relative to the placebo. These findings suggest that Modafinil may have the potential as an important therapy for enhancing aspects of attention in MS and may be an important adjunct in clinical rehabilitation interventions.

Correspondence: *Lawanda M. Ford-Johnson, Psy.D., Neuroscience & Neuropsychology Lab, Kessler Foundation Research Center, 300 Executive Drive, Suite 70, West Orange, NJ 07052. E-mail: lfordjohnson@kesslerfoundation.org*

K. FUCHS, A.T. MCDERMOTT, V.A. ODELL & C. MANNING. The TVSC Differentiates Healthy Controls and MS Patients.

Objective: The Test of Visuospatial Construction (TVSC) was designed as a motor-free assessment of visuoconstruction and has been shown to correlate with commonly used measures of visuospatial skills as well as to differentiate between healthy controls and individuals with dementia or other neurologic conditions. This measure could be valuable in the assessment of persons with MS as their ability to draw or quickly manually manipulate stimulus materials is often impacted by the disease. The purpose of this study is to examine the use of the TVSC in individuals with MS.

Participants and Methods: Participants included 33 healthy volunteers and 29 persons with MS. The groups were matched for age (mean = 47 years) and education (mean = 15 years). All participants were evaluated with the Block Design (BD) subtest from the WAIS-III as well as the TVSC. A subgroup of MS patients also completed the Repeatable Battery for the Assessment of Neuropsychological Status.

Results: The controls performed significantly better on the TVSC ($p < .05$) as well as BD ($p = .001$). The magnitude of group performance discrepancy was greater for BD. Within the MS group, there was no significant correlation between the TVSC and the RBANS figure copy or line orientation subtests.

Conclusions: Similar to previously presented data, these results suggest that the TVSC is a valid measure of visuoconstruction that can discriminate between healthy controls and individuals with MS. Further, it appears to measure visuoconstructive abilities beyond those captured by a drawing task or a visual orientation task.

Correspondence: *Kathleen Fuchs, PhD, Neurology, University of Virginia, PO Box 800394, Charlottesville, VA 22908-0394. E-mail: klf2n@virginia.edu*

A. FUENTES, L. COLLINS, D. GARCIA, J. SLED, S. NARAYANAN, R. GHASSEMI, B. BANWELL & C. TILL. Relationship Between Memory Outcomes and Normalized Regional Brain Volumes in Pediatric-Onset Multiple Sclerosis Patients.

Objective: Children and adolescents with multiple sclerosis (MS) are at risk of learning and memory impairment. Studies in adult MS have associated regional brain abnormalities with memory impairment, yet little is known about the underlying neural substrates associated with learning and memory function in pediatric MS. The current study examined the associations between memory performance and volumetric measures of the whole brain, hippocampus, amygdala, and thalamus. It was hypothesized that children with MS would demonstrate impaired performance on measures of verbal and visual memory, and that memory deficits would correlate with reduced hippocampal, amygdala, and thalamic volumes.

Participants and Methods: We measured verbal and visual memory in 32 children and adolescents with MS and 30 age- and sex-matched healthy controls using the Test of Memory and Learning – Second edition (TOMAL-2). MR volumetric measures of the whole brain, hippocampus, amygdala, and thalamus were normalized for age and sex by transforming absolute brain volumes into z-scores using MRI data from the National Institutes of Health MRI Study of Normal Brain development.

Results: Memory impairment was revealed in 3 of 32 (9.4%) patients on measures involving verbal encoding and retention and visual recognition. The MS group compared with controls showed reduced volume in the whole brain ($p < 0.001$), amygdala ($p < 0.005$), and thalamus ($p < 0.001$), but not in the hippocampus. Visual recognition was associated with thalamic volume ($r = .48, p < .01$), whereas verbal list learning was associated with whole brain volume ($r = .52, p < .01$) and hippocampal volume ($r = .43, p < .01$) in the MS group.

Conclusions: Memory function in children with MS is associated with structural changes to brain regions other than the hippocampus. Further understanding of the temporal progression for regional brain atrophy and emergence of memory dysfunction in pediatric MS will require longitudinal follow-up.

Correspondence: *Amanda Fuentes, M.A., Psychology, York University, 25 Winnett Avenue, Toronto, ON M6C 3L2, Canada. E-mail: amanda19@yorku.ca*

H.M. GENOVA, G. WYLIE, A. BINDER, J. DELUCA, M.J. HOPTMAN & N. CHIARAVALLOTI. Decline in Trail-Making Performance Correlates with White Matter Integrity Reduction in MS.

Objective: Progressive cognitive decline is often observed in Multiple Sclerosis (MS) and contributes to poorer quality of life, difficulty with interpersonal relationships, and early retirement. However, the neural correlates underlying this progressive cognitive decline remain unclear. Unfortunately, variables measured with conventional MRI, such as lesion load, are inconsistent in their ability to predict cognitive decline. New neuroimaging techniques, such as Diffusion Tensor Imaging (DTI) have recently been used to examine progressive pathological changes in MS, but few have examined the relationship between cognitive decline and white matter changes.

Participants and Methods: In the current study we examined the relationship between white matter integrity using DTI and performance on the Trail-Making test at two time points separated by 3 years in a sample of subjects with Relapsing-Remitting MS.

Results: We found that declines in Trail-Making performance was predicted by reduced Fractional Anisotropy (FA) at time point 1 in several brain regions including the inferior fronto-occipital fasciculus, the corticospinal tract, the inferior longitudinal fasciculus and the cingulum.

Conclusions: These findings indicate that DTI may be a valuable biomarker for cognitive decline in MS. The ability of FA to predict cognitive decline may lead to a better understanding of the pattern and causes of cognitive dysfunction in MS. Further, clinicians may be able to identify “at-risk” individuals based on their FA levels, and provide preventative treatments which could improve white matter integrity and cognitive status.

Correspondence: *Helen M. Genova, Ph.D., Kessler Foundation Research Center, 300 Executive Dr., Suite 70, West Orange, NJ 07052. E-mail: hgenova@kesslerfoundation.org*

Y. GOVEROVER, N. CHIARAVALLOTI & J. DELUCA. Task meaningfulness and cognitive impairment affect self-generation in improving learning and memory in Multiple Sclerosis.

Objective: Self-generation has been shown to improve memory performance in persons with MS. Items self-generated by an individual, such as words or concepts, are remembered better than items simply provided (i.e., read or heard). The purpose of this study was to examine whether the meaningfulness of a task (i.e., functional tasks vs. laboratory-based tasks) and levels of cognitive impairment influences the effectiveness of self-generation for improving learning and memory in persons with MS.

Participants and Methods: participants included 37 MS participants with moderate to severe memory impairments, and 37 MS participants with no to mild impairments.

Participants were presented with four functional tasks, and were then asked to choose the most meaningful two of the four tasks. For the laboratory-based task, participants had to remember words that were presented within sentences. In a within subjects design, MS participants learned both the functional and laboratory tasks in both generated and provided conditions. Recall was assessed immediately, 30 minutes and 1 week following initial learning.

Results: In both MS groups, significantly more words were recalled from the generated condition relative to the provided condition. This was true for both the functional and laboratory tasks.

Conclusions: Self-generation during learning can significantly improve subsequent recall of information for a broad range of tasks in persons with MS, both with and without learning impairments. Implications of these findings for cognitive rehabilitation in MS will be discussed

Correspondence: *Yael Goverover, PhD, Occupational Therapy, New York University, 35 West 4th Street, 11th Floor, New York, NY 10012. E-mail: yg243@nyu.edu*

Y. GOVEROVER, H. WOOD, N.D. CHIARAVALLOTI & J. DELUCA. Intellectual and online awareness in Multiple Sclerosis.

Objective: Recent models of self-awareness distinguish between intellectual awareness and online awareness of errors. The present study examined both types of self-awareness in people with multiple sclerosis (MS). The goal of this study was to examine the relationship between intellectual awareness and online awareness and how each relates to functional performance. In addition, we sought to examine whether or not experience with a functional task impacts online awareness.

Participants and Methods: Participants included 18 individuals with MS and 16 healthy controls (HC) between the ages of 27 and 60. Intellectual awareness was represented as a discrepancy score, computed for both the participants and their informants using the Functional Behavioral profile. Online awareness was examined via functional tasks. Specifically, participants were asked to predict their performance, and then perform the actual task. Participants were then asked to assess how they performed the task. The difference between the prediction and the performance represented online awareness.

Results: MS participants showed significantly lower levels of intellectual awareness relative to HCs. Groups did not differ, however, in their on-line awareness. Interestingly, after functional task performance, significantly more participants with MS were able to accurately assess their task performance than prior to doing the task. Significant correlations were observed between performance of functional task, and on-line awareness

Conclusions: This study highlights the need to adopt a multidimensional approach to assessing the multifaceted phenomenon of awareness of deficits in MS. Specifically, the data suggests that different types of awareness are impacted differently by the disease and by experience with functional tasks. Correspondence: *Yael Goverover, PhD, Occupational Therapy, New York University, 35 West 4th Street, 11th Floor, New York, NY 10012. E-mail: yg243@nyu.edu*

E.S. GROMISCH, V. ZEMON, R.H. BENEDICT, N.D. CHIARAVALLOTI, J. DELUCA, M. PICONE, S. KIM & F.W. FOLEY. Using a Highly Abbreviated CVLT-II to Detect Verbal Memory Deficits: An ROC Analysis of Three MS Cohorts in the US.

Objective: Multiple sclerosis is a demyelinating disease of the central nervous system, in which more than half of patients experience cognitive dysfunction. One issue in screening and monitoring for cognitive dysfunction in MS is the time required to administer reliable and valid assessments. In this study, we focused on the California Verbal Learning Test, second edition, a valid test of verbal learning and memory widely used in MS. We hypothesized that administering one to two trials of the CVLT-II word list would detect verbal memory problems in MS accurately.

Participants and Methods: Using CVLT-II data from three cohorts, we performed ROC analyses of trial one raw data (N = 572), trial two raw data (N = 568), and trial one and trial two raw data combined (N = 568) against standardized total scores, choosing both 1.5 and 2 standard deviations from the mean as cut-offs for impairment.

Results: At 1.5 standard deviations from the mean, the first two trials combined were 96.3% accurate, while at 2 standard deviations from the mean, the first two trials combined were 97.5% accurate.

Conclusions: The results show that administration of only the first two trials of the CVLT-II can detect verbal memory deficits with excellent sensitivity and specificity.

Correspondence: *Elizabeth S. Gromisch, Ferkauf Graduate School of Psychology, Yeshiva University, 1300 Morris Park Ave, Bronx, NY 10468. E-mail: gromisch@yu.edu*

M.M. HOOGS, M.A. VOLKER, A.M. SMERBECK, B. WEINSTOCK-GUTTMAN & R. BENEDICT. Executive Function Mediates the Relationship Between Disease Severity and Disinhibition and Euphoria in Multiple Sclerosis.

Objective: Despite the high prevalence of cognitive impairment in multiple sclerosis (MS), little is known about its bearing on neuropsychi-

atric symptoms such as behavioral disinhibition and euphoria. In prior pilot work we found a significant correlation between cognitive disorder and neuropsychiatric symptoms, although this study was limited by small sample size and a limited range of cognitive tests. The current study sought to investigate these relationships in a larger sample using a comprehensive neuropsychological battery validated in MS research.

Participants and Methods: Participants were 150 MS patients and 68 healthy controls. Groups were roughly equivalent across age, gender, and level of education. Overall level of neurological disability was assessed using the Expanded Disability Status Scale (EDSS), cognition was assessed using the Minimal Assessment of Cognitive Function in MS (MAC-FIMS) battery (Benedict et al., 2002), and psychiatric symptoms were assessed using the Neuropsychiatric Inventory (NPI) with a reliable informant. NPI Factor I (Fishman et al., 2004) constitutes symptoms of agitation/aggression, irritability/lability, disinhibition, and euphoria.

Results: Compared to processing speed and memory, executive function was most strongly associated with NPI Factor I ($r = -.343$, $p < .001$), where impairment in executive function was associated with increased psychiatric symptoms. Mediation analyses further showed that executive function accounted for a significant portion of the relationship between EDSS and NPI Factor I (Sobel statistic: $z = 2.84$, $p = .005$).

Conclusions: Results are consistent with the hypothesis that it is largely via executive dysfunction that disease severity leads to psychiatric symptoms associated with frontal lobe dysfunction in MS. Given these findings, multi-symptom assessments including both patient and informant data may facilitate clinical management for patients with MS. The mediating effect of executive function also suggests a possible point of intervention.

Correspondence: *Marietta M. Hoogs, State University of New York at Buffalo, 409 Baldy Hall, University at Buffalo, Buffalo, NY 14260. E-mail: mmhoogs@buffalo.edu*

C. MORSE, J. MCKEEVER, L. ZHAO, T. LEIST & M. SCHULTHEIS. Unemployment in Multiple Sclerosis: A Novel Cognitive Perspective.

Objective: Unemployment following multiple sclerosis (MS) is reported at 50 to 80% within 10 years of diagnosis. Research with traditional neuropsychological measures has provided limited insight into the relationship between cognitive impairment and employment. The current study employed novel experimental measures of multitasking and planning and examined the contribution of these cognitive domains to vocational functioning.

Participants and Methods: Community dwelling persons ($n = 5$) with clinically defined MS completed a measure of multitasking ability (Six Elements Test) and planning (Zoo Map Test). A novel structured vocational questionnaire was used to evaluate job requirements and the presence of multitasking impairments at work. Results of the cognitive measures and vocational interview were compared between individuals who reported reducing their hours since diagnosis and individuals whose work hours have remained unchanged.

Results: Individuals who have reduced their work hours reported significantly more multitasking impairments at work ($t(3) = -3.68$, $p = .04$) and took a significantly longer time to complete a complex planning task ($t(3) = -3.41$, $p = .03$) than those whose work hours have remained unchanged. Analysis of general job responsibilities demonstrated that individuals who have reduced their work hours spend significantly less time performing routine processes ($t(3) = 6.7$, $p = .01$) and significantly more time troubleshooting new problems ($t(3) = -3.01$, $p = .05$) at work than individuals who have not reduced their work hours.

Conclusions: The results provide some preliminary insight into the impact of multitasking deficits on vocational functioning. Specifically, individuals with MS who have reduced their work hours demonstrate greater impairment with multitasking. In addition, these individuals also reported engaging in fewer routine processes and more novel processes. Further investigation will continue to elucidate the cognitive factors contributing to unemployment in MS.

Correspondence: *Chelsea Morse, Drexel University, 2200 Benjamin Franklin Parkway, West 1014, Philadelphia, PA 19130. E-mail: chelseamorse@gmail.com*

A. WIECHMANN, R. ASHLEY, K. NOLL, S. TAYLOR, B. GREENBURG & L. LACRITZ. Test-Retest Reliability and Practice Effects of the Symbol Digit Modality Test in Patients with Demyelinating Disease.

Objective: The Symbol Digit Modalities Test (SDMT) has been found to be sensitive to the processing speed, attention, and working memory difficulties often seen in patients with demyelinating disease. This study examined the test-retest reliability of both the Oral and Written SDMT in demyelinating patients.

Participants and Methods: Written and Oral versions of the SDMT were administered to 52 demyelinating disease patients as part of a larger study of cognition (M age=44.4 (12.5), M Edu=15.7 (2.3), Caucasian=90%, Female=87%). Administration of the Written version immediately preceded the Oral, and patients were re-tested within 6-weeks (M=20.0 days). Intraclass correlations (ICCs) and Pearson product-moment correlations were used to examine test-retest reliability. Practice effects were examined with independent samples t-tests, and reliable change indices (RCIs) were calculated.

Results: Test and retest performances were highly associated ($p < .001$) for both SDMT forms (Written: $r = .89$, $ICC = .89$; Oral: $r = .91$, $ICC = .86$). A significant practice effect at retest was observed for both Written [M improvement=4.22 (7.1), $t(51) = 4.27$, $p < .001$] and Oral [M improvement= 5.84 (7.2), $t(51) = 5.83$, $p < .001$] forms. The 90% confidence interval RCI for raw scores was [-6.79, 15.23] for the Written form and [-8.39, 20.07] for the Oral.

Conclusions: Both SDMT forms exhibited excellent test-retest reliability in this demyelinating disease sample. Significant practice effects were noted, and RCIs were derived to allow for more accurate assessment of change with repeated administrations. RCIs for the oral form were greater than RCIs derived for a stroke sample [-5.29, 10.89] (Chin-Lin, K. et al., 2011), suggesting that practice effects can vary by clinical population.

Correspondence: *April Wiechmann, Ph.D., Neuropsychology, UT Southwestern Medical Center, 2206 Red Bluff Dr., Carrollton, TX 75007. E-mail: aprilwiechmann@my.unt.edu*

K.R. NOLL, D. DENNEY, S. TAYLOR, B.G. GREENBERG, E. FROHMAN & L.H. LACRITZ. Relationships between Retinal Nerve Fiber Layer Thickness and Cognitive and Motor Functioning in Multiple Sclerosis.

Objective: Examine relationships between functional measures and retinal nerve fiber layer (RNFL) thickness, a biomarker of disease burden in multiple sclerosis (MS).

Participants and Methods: RNFL thicknesses (μm) were obtained with Spectralis optical coherence tomography (OCT) in 53 MS or clinically isolated syndrome patients (Age=43.3; Edu=15.7), who completed a battery of cognitive/motor tests [BVMt-R, CVLT-II, SDMT, PASAT, Judgment of Line Orientation, Stroop Color and Word Test, WRAT-4: Reading, Texas Card Sorting Test, 9-Hole Peg Test (9HPT), and Timed 25-Foot Walk (T25FW)]. Pearson correlations and independent samples t-tests (to examine cognitive/motor functioning by low and high RNFL thickness) were used.

Results: Significant associations ($p < .05$) were observed between overall and temporal RNFL thickness and BVMt-R Learning ($r = .42$ to $.44$), and Delayed Recall ($r = .32$ to $.43$), and temporal RNFL with T25FW ($r = .42$) and 9HPT ($r = .28$). Low overall RNFL subjects performed lower on the PASAT [$t(51) = -2.47$, $p = .02$], SDMT [$t(51) = -2.58$, $p = .01$], and BVMt-R Learning [$t(51) = -3.81$, $p < .001$] and Delayed Recall [$t(51) = -3.15$, $p < .01$] than the high group. Low temporal quadrant RNFL subjects had lower scores on BVMt-R Learning and Delayed Recall ($p = .001$), CVLT-II Short Form Learning [$t(51) = -2.56$, $p = .01$], 9HPT [$t(51) = -2.71$, $p < .01$], and T25FW [$t(51) = -3.16$, $p < .01$].

Conclusions: RNFL thickness was associated with a number of cognitive and motor measures, and memory, attention, and processing/motor speed were lower in the low versus high thickness groups. These results support the utility of RNFL thickness as a biomarker of disease burden in MS that is less expensive and easier to obtain than other imaging markers.

Correspondence: Kyle R. Noll, Ph.D., PM & R, Baylor College of Medicine, 1333 Moursund, Houston, TX 77030. E-mail: krn216@nyu.edu

E.H. O'DONNELL, E. BRAATEN, M. COLVIN PUTNAM, N. BARUCH & T. CHITNIS. Pediatric Demyelinating Disease: A Description and Comparison of Neuropsychological Profiles of Patients with MS, CIS and ADEM.

Objective: Pediatric multiple sclerosis (MS) (onset < 18) may constitute up to 5% of MS cases. 25% of pediatric patients with clinically isolated syndrome (CIS) and 15-20% with Acute Disseminated Encephalomyelitis (ADEM) develop MS. Cognitive impairment is a source of underrecognized morbidity in pedMS (frequency 30-75%). Early research suggests that areas most affected in pedMS are working memory, complex attention, processing speed, executive function, and language skills. Few studies have provided comparisons of demyelinating diseases. Here, we compare neuropsychological profiles of patients with MS, CIS and ADEM to inform support for these patients.

Participants and Methods: Data were collected on 71 patients (22 males, mean age = 14, 48 MS, 9 CIS, 14 ADEM) seen at one of 6 nationally recognized Pediatric MS Centers of Excellence. All patients underwent neuropsychological assessment as part of routine clinical care in a multidisciplinary clinic, using a standardized battery. Data were collected on areas of cognition found to be impacted in pedMS using the Wechsler Scales, DKEFS, EOWPVT, CPT and BRIEF to replicate previous studies. Data were also collected on areas noted clinically to be impacted (e.g. fine motor speed and dexterity on Grooved Pegboard GPB) and on educational correlates using the WIAT.

Results: Impairment was found across diagnoses on GPB (> 2 SD's below mean). MS patients showed the greatest impairment (2.8 to 3 SD's < mean compared to 1 SD < in CIS and ADEM). In general, CIS patients were higher functioning than those with MS or ADEM. Further analyses explore similarities and differences in neuropsychological profiles; comparing 3 groups of 9 demographically matched patients with MS, CIS, and ADEM.

Conclusions: Results expand on published studies on cognitive sequelae and functional impact of pedMS. Findings are used to discuss best clinical practices for pediatric demyelinating disease and underscore the need for multidisciplinary care.

Correspondence: Ellen H. O'Donnell, Ph.D., LEAP Program, Massachusetts General Hospital, 151 Merrimac Street, 5th Floor, Boston, MA 01742. E-mail: ehodonnell@partners.org

A.D. RADOMSKI, C. POWER, K.G. WARREN, I. CATZ, S.E. PURDON, D.J. EMERY & E. FUJIWARA. Decision Making with Explicit Rules in Patients with Multiple Sclerosis.

Objective: We examined decision making with the Game of Dice Task (GDT) in a mixed sample of patients with multiple sclerosis (MS) of the relapsing-remitting or the secondary progressive subtype. The GDT is a short (<8 min.), computerized, neuropsychological test assessing decision making. The GDT explicitly displays decision rules and probabilities and therefore focuses on aspects of decision making that should rely more on executive than implicit/emotional functions. We hypothesized that a) MS patients are impaired in decision making compared to controls, b) GDT deficits are related to executive dysfunctions, c) GDT deficits reflect brain atrophic processes in MS.

Participants and Methods: The GDT, a standard neuropsychological battery, questionnaires on mood, fatigue and disability were administered to 27 patients and 25 healthy controls. Patients' enlargement of the third and lateral ventricles was studied by applying three linear measurements on axial 5-mm T1-weighted MRI images.

Results: GDT netscores (risky minus safe decisions) were lower in patients than controls. This was partly due to patients' problems with utilizing response feedback. GDT performance was related to disease severity, but not to mood or fatigue. Relationships with executive functions were marginal. In patients, brain atrophy (intercaudate nucleus distance) was related to risky choices in the GDT, even when controlling for disease severity.

Conclusions: In a mixed sample of MS patients, the GDT revealed decision making impairments that covaried with disease severity and atrophic brain changes. Future studies may include more sophisticated structural neuroimaging methods to corroborate these structure-function relationships.

Correspondence: Ashley D. Radomski, M.Sc. Psychiatry, Psychiatry, University of Alberta, #1S2, 240-222 Baseline Rd., Sherwood Park, AB TSH1S5, Canada. E-mail: adr2@ualberta.ca

J.S. RANDOLPH, J.J. RANDOLPH, S. CRONENWETT, B. OLIVER, L. KASPER & H.A. WISHART. Cigarette Smoking and Cognition in Multiple Sclerosis.

Objective: Research has indicated that smoking has a negative effect on cognition in general. However, few studies have investigated this effect in neurological patient populations. The present study examined the effects of smoking on cognition in individuals with multiple sclerosis (MS) while controlling for depression, fatigue and demographic variables. We were particularly interested in examining the effects of smoking on processing speed given the frequency of processing speed impairment in MS.

Participants and Methods: 26 currently smoking MS patients were compared to 93 non-smoking MS patients. Outcome measures included a composite cognitive mean z-score (Symbol Digit Modalities Test-Oral, DKEFS Trails condition 4, California Verbal Learning Test-II learning and long delay), a composite processing speed mean z-score (SDMT-Oral, DKEFS Trails 4), and z-scores for SDMT-Oral and DKEFS Trails 4. Logistic regression analyses were employed to calculate odds ratios (OR) and 95% confidence intervals for impairment ($z < -1.0$) on each outcome measure for current smokers relative to non-smokers. Adjusted ORs were calculated accounting for the effects of depression (BDI-II), fatigue (Fatigue Severity Scale), education, and gender.

Results: Smoking and non-smoking patients were similar in age, disease/symptom duration, EDSS score, gender and MS subtype, although non-smoking patients had significantly higher educational attainment. Currently smoking MS patients demonstrated elevated crude and adjusted ORs for all cognitive outcome measures. Adjusted ORs and 95% confidence intervals were 1.64(0.44-6.09) for the composite cognitive score, 3.02 (0.82-11.14) for the processing speed score, 4.44 (1.16-13.02) for SDMT-Oral, and 3.15 (0.70-14.15) for DKEFS Trails 4.

Conclusions: Smoking appears to negatively impact cognition in MS, particularly processing speed, based on the present findings. Further research should assess for dose-response relationships and any interactive effect of smoking and MS disease status.

Correspondence: Jennifer S. Randolph, MSc, Department of Psychiatry, Dartmouth Medical School, Dartmouth-Hitchcock Medical Center, Lebanon, NH 03756. E-mail: jennifer.randolph@dartmouth.edu

J.J. RANDOLPH, J.S. RANDOLPH & H.A. WISHART. Correlates Of Real World Compensatory Cognitive Strategy Use In MS.

Objective: Objective and subjective cognitive dysfunction are common features of multiple sclerosis (MS). However, little is known about the use of daily compensatory cognitive strategies in MS, and how such strategy use relates to cognition or secondary factors such as depression and fatigue. The present study examined correlates of compensatory strategy use in MS patients and matched controls.

Participants and Methods: 29 MS participants and 20 age- and education-matched controls were administered measures of compensatory strategy use (MFQ-Strategy Use scale), subjective (PDQ) and objective (SDMT, CVLT-II, DKEFS Trails Condition 4) cognitive functioning, depression (POMS-D), and fatigue (FSS). MS participants were divided into thirds corresponding to high, moderate, and low compensatory strategy use. A composite z-score was computed to determine objective cognitive functioning across domains.

Results: Findings indicated that while MS participants and controls did not differ on reported use of compensatory strategies, MS participants

as a group reported considerably more cognitive complaints ($p < .05$). Further, high strategy use MS participants did not differ from low strategy use patients on a composite cognitive function score or secondary factors, but did have longer disease duration and reported more subjective cognitive complaints ($p < .05$). Across the entire sample, compensatory strategy use correlated positively with cognitive complaints and CVLT long delay scores but not other cognitive or secondary factor measures.

Conclusions: These results suggest that compensatory strategy use in MS relates to perceived cognitive deficits and disease duration but generally not to objective cognitive dysfunction or to secondary factors. Individuals with MS may benefit from training in compensatory strategy use to enhance self-efficacy and bolster active coping skills.

Correspondence: *John J. Randolph, Ph.D., Randolph Neuropsychology Associates, PLLC, 20 W. Park Street, Suite 215, Lebanon, NH 03766. E-mail: john.randolph@randolphnp.com*

E.J. REILLY, H.A. WISHART, J.C. FORD, A.J. SAYKIN, B.C. McDONALD, S. CRONENWETT, J.S. RANDOLPH, B.J. OLIVER, E.C. LALLANA & L.H. KASPER. Exploring the Relationship between Pain and Altered Task Induced Deactivation of the Default Mode Network in Patients with Multiple Sclerosis.

Objective: Chronic and acute pain is experienced by more than half of patients with multiple sclerosis (MS; Ehde et al. 2006). Disruption in resting state activity within the default mode network (DMN) and reduced task-induced deactivation (TID) has been evidenced in chronic pain syndromes (Baliki et al., 2008; Tagliazucchi et al., 2010) and pain stimulation alters DMN connectivity (Mantini et al., 2009). MS patients show decreased and more dispersed TID compared to healthy controls (Morgen et al., 2007; Genova et al., 2009) and dysfunction of DMN regions during resting state fMRI (Rocca et al., 2010; Bonavita et al., 2010). Despite prior findings of disrupted TID in chronic pain and the prevalence of pain associated with MS, the possible contribution of pain to altered TID in MS has not yet been investigated. Hypothesis: TID within the DMN during performance of an fMRI working memory task varies dependent upon pain level in MS.

Participants and Methods: 34 participants with relapsing-remitting MS rated their overall pain level experienced during the prior month using a 10-point scale and completed an N-back task during 3T fMRI. Following detrending, images were realigned, normalized, and smoothed using SPM5. Simple effect maps of rest > task contrasts were created to evaluate overall TID. Pain self-ratings were regressed against image intensities at each voxel to assess the relationship between pain and TID (cluster level corrected, $p < .001$, $k = 3$).

Results: Pain self-ratings ranged from 0 to 10 with a mean 3.74 (2.83 SD). Simple effect maps revealed expected TID within the DMN, as well as more dispersed TID in areas outside of the DMN. Higher levels of pain were correlated with increased TID in the anterior cingulate extending to the medial and superior medial frontal lobe bilaterally. Lower pain was associated with increased TID in the cerebellum and left insula.

Conclusions: These findings suggest that pain is related to altered TID patterns in MS and will be discussed in the context of the emerging literature.

Correspondence: *Evelyn J. Reilly, Psy.D., Neuropsychology, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756-0001. E-mail: evlyn.j.reilly@dartmouth.edu*

B.L. ROBERG, J. BRUCE, L. HANCOCK, M. SOMOGIE & C. LOVELACE. Perceived Memory Difficulties Are Associated With Performance on Tests of Executive Functioning in MS.

Objective: Studies examining the association between self-reported memory difficulties and objective measures of memory find conflicting

results. A recent study suggested that self-reported memory correlates strongly with single-trial list learning, but not overall measures of learning and memory. The current study examined the association between self-reported memory, objective memory tests and other cognitive tests in a sample of multiple sclerosis (MS) participants.

Participants and Methods: MS and control participants were recruited through an advertisement in the local MS society newsletter and by word-of-mouth as part of a larger study examining psychophysiological correlates of cognition and fatigue in MS. Participants were given a neuropsychological battery that assessed memory, executive function, attention, speed of processing, and perceived cognition.

Results: MS patients ($N=41$) reported significantly more memory difficulties than controls ($N=25$, $t(62.44) = 5.703$, $p < .001$). Self-reported memory difficulties were not significantly associated with single-trial initial list learning or other measures of learning and recall. In contrast, self-reported memory difficulties were associated with more errors of commission on the CPT II ($r = .59$, $p < .01$), lower scores on the FTT ($r = -.37$, $p < .05$), and worse performance on the Stroop ($r = -.31$, $p < .05$).

Conclusions: In contrast to a recent study, self-reported memory difficulties were not associated with single-trial initial list learning. However, self-reported memory was associated with performance on measures of executive functioning and gross motor speed. Further knowledge of these associations can help researchers and clinicians better understand the relationship between patient perceptions and objective measures of cognition.

Correspondence: *Brandon L. Roberg, MS Psychology, Psychology, University of Missouri - Kansas City, 2549 Holmes St., Kansas City, MO 64108. E-mail: blrp7c@mail.umkc.edu*

C. TILL, R. GHASEMI, D.L. ARNOLD, S. NARAYANAN & B.L. BANWELL. Clinical and MRI Predictors of Cognitive Changes in Children and Adolescents with Multiple Sclerosis.

Objective: Multiple sclerosis (MS) is an inflammatory demyelinating disorder of the CNS that is being increasingly diagnosed in childhood. Given the progressive neuropathology and high variability in clinical activity associated with MS, detecting change in individual patients is an important goal for understanding the evolution of cognitive impairment. In this study, changes in cognitive function and associated risk factors for decline were evaluated in children and adolescents with MS.

Participants and Methods: Cognitive changes in 28 patients with pediatric-onset MS and 25 age-matched controls were ascertained through repeat assessment conducted on average 15.8 months apart ($SD=2.4$). Change was calculated using the Reliable Change Index (RCI) for 8 neuropsychological tests commonly used in repeat assessment of MS patients. Participants were classified as "decliners" if they showed significant decline on two or more tests based on the RCI. Brain lesion volume data were acquired using a GE LX 1.5T MRI scanner at each cognitive evaluation. Lesions were segmented semi-automatically.

Results: Cognitive decline was revealed in 14.3% of MS participants compared with none of the controls. Decline was most commonly observed on tests of verbal fluency (19.2%), visuo-motor scanning speed (11%), and cognitive flexibility (15%). Significant improvement in cognition was documented in 7.1% of MS patients compared with 8.7% of controls. Patients who showed cognitive decline were more likely to have a younger age at MS onset compared with patients who remained stable or improved ($p=.09$). Brain lesion volume was not associated with changes in cognition.

Conclusions: Cognitive deterioration may occur over time, particularly in younger-onset MS patients and mainly on timed tasks. Importantly, the majority of the pediatric MS sample maintained the same level of cognitive function over the 12-16 month interval. MRI measures of total brain T2 lesion volume in improved, stable and worsened patients did not show any significant differences.

Correspondence: *Christine Till, PhD, Psychology, York Univ, 4700 Keele St., Toronto, ON M3J1P3, Canada. E-mail: ctill@yorku.ca*

G.A. VARGAS, C. ZAKRZEWSKI, H. GENOVA, J. MEDAGLIA, N. CHIARAVALLIOTTI & F. HILLARY. Specific Regions of Gray Matter Atrophy Related to Depression in Multiple Sclerosis.

Objective: Recent research has supported the presence and clinical relevance of gray matter (GM) atrophy in Multiple Sclerosis (MS). The current study uses a data-driven method of measuring brain volume (voxel based morphometry, VBM) to determine whether atrophy in frontal-subcortical regions are related to depression in MS. Additionally we investigate whether distinct profiles of cortical atrophy predict depression, ambulation and cognitive functioning.

Participants and Methods: Thirty-four right-handed patients with MS (82% RR) underwent 3T MRI imaging and completed the Beck Depression Inventory, the Ambulation Index, and several tests of working memory and processing speed (WM/PS). VBM analyses were performed using 3D T1-weighted images to determine regions where atrophy was related to higher levels of depression, ambulation, and WM/PS.

Results: A significant negative correlation was found between depression and volume in several areas in the frontal, parietal and occipital lobes, the precuneus, and the hippocampus and parahippocampal gyrus ($p < .001$, voxel extend=50). These areas remained significant after controlling for ambulation and did not overlap with VBM results using cognition or motor disability as covariates.

Conclusions: Primary findings reveal that the right orbitofrontal region and left hippocampus and parahippocampal gyrus were smaller in depressed patients, which is consistent with dysregulation in the frontosubcortical circuit. Additionally, distinct areas of atrophy were found to be correlated with depression, ambulation and cognitive domains. This study supports the feasibility and utility of VBM in studies of depression in MS; however follow-up studies are needed to determine the influence of specific lesions.

Correspondence: *Gray A. Vargas, MS, Clinical Psychology, Penn State University, 1174 S. Garner St., State College, PA 16801. E-mail: gav111@psu.edu*

**Symposium 1:
Social Outcomes in Pediatric Traumatic Brain Injury: Perspectives from Social Neuroscience and Developmental Psychology**

Chair: Keith Yeates

Discussant: Skye McDonald

4:45–6:15 p.m.

K. YEATES, S. MCDONALD, K. YEATES, L. EWING-COBBS, H. LEVIN, V. ANDERSON & H. TAYOR. Social Outcomes in Pediatric Traumatic Brain Injury: Perspectives from Social Neuroscience and Developmental Psychology.

Symposium Description: Surprisingly little is known about the nature, basis, and consequences of the social problems associated with traumatic brain injury (TBI) in children, despite the significant long-term implications of social development for children's functioning at home, in school, and in the community. This symposium will present state-of-the-art theory and research on social outcomes following childhood TBI. The symposium will begin with a review of a heuristic model of the social outcomes of childhood TBI that draws on both social neuroscience and the study of social competence in developmental psychology. The model will then be illustrated by research from four different laboratories conducting cutting-edge research on the social outcomes of pediatric TBI. Linda Ewing-Cobbs will present a study of gaze and joint attention and its neuroimaging correlates in young children with TBI. Gerri Hanten and Harvey Levin will describe the effects of TBI in adolescents on the anticipation of the consequences of social

actions in a virtual environment. Vicki Anderson will discuss the impact of TBI during childhood across a variety of domains crucial to social competence, including social cognition, communication, and attention/executive function, as well as friendships, peer relationships, and global social functioning and behavior. Lastly, Gerry Taylor will describe the effects of pediatric TBI on peers' perceptions of children's social reputation, likability, and friendships, based on data collected in children's school classrooms. Skye McDonald will provide commentary on the symposium as discussant.

Correspondence: *Keith Yeates, Pediatrics, The Ohio State University, Nationwide Children's Hospital, 700 Children's Dr, Columbus, OH 43205. E-mail: keith.yeates@nationwidechildrens.org*

K. YEATES, E. BIGLER, M. DENNIS, C. GERHARDT, K. RUBIN, T. STANCIN, H. TAYLOR & K. VANNATTA. A Heuristic Model for the Study of Social Outcomes in Childhood Traumatic Brain Injury.

Traumatic brain injury (TBI) is a leading cause of death and disability in youth under the age of 19, and therefore represents a major public health problem. In the United States, more than 700,000 children and adolescents sustain TBI requiring hospital-based care annually, resulting in approximately 60,000 hospitalizations and 6,000 deaths. Surprisingly, the social outcomes of childhood TBI remain largely uncharacterized and poorly understood. However, because of its critical developmental implications, poor social functioning is likely to play a major role in the reductions in quality of life reported following childhood TBI. This presentation will summarize a heuristic model of the social outcomes of childhood brain disorder that draws on models and methods from both social neuroscience and the study of social competence in developmental psychology. The model characterizes the relationships between social adjustment, peer interactions and relationships, social problem-solving and communication, social-affective and cognitive-executive processes, and their neural substrates. The model is intended to promote research regarding the neural and cognitive-affective substrates of children's social development following childhood TBI, and will serve as a context for the research presentations that follow.

Correspondence: *Keith Yeates, Dept. of Psychology, Nationwide Children's Hospital, Columbus, OH 43205. E-mail: keith.yeates@nationwidechildrens.org*

L. EWING-COBBS, M. PRASAD, P. SWANK, L. KRAMER, D. MENDEZ, C. PAYNE & J. BACHEVALIER. Joint Attention after Traumatic Brain Injury in Young Children.

Joint attention (JA) is a fundamental social cognitive developmental process that facilitates learning through interactions with others. We examined the effect of traumatic brain injury (TBI) on gaze and JA in children ages 2-36 months following accidental ($n = 70$) or inflicted TBI ($n = 67$) in relation to a healthy comparison group ($n = 65$) at baseline and 1 year after injury. A semi-structured sequence of social interactions between the child and an examiner was videotaped and coded to characterize the child's gaze and JA in response to and while initiating social overtures. General linear models were used to examine the effect of group and time of evaluation on gaze and JA in both response and initiation contexts. When responding to the examiner's overtures, the accidental TBI group had fewer gazes; all 3 groups engaged in similar JA interactions. For social initiation, gaze was similar across groups. The comparison group initiated more JA interaction than the TBI groups. Gaze frequency was stable across time of assessment. In contrast, initiation of JA increased significantly over time. For a subset of the children with TBI, Pearson partial correlations controlling for age and total brain volume examined the relation of regional corpus callosum surface area from anatomic MRI with JA. Responding to a social overture using JA was significantly and positively correlated with surface area of all regions, except the rostrum. Initiating JA was negatively correlated with surface area of the anterior midbody. TBI altered the social communication of young children, which showed specific relations with callosal regions.

Correspondence: *Linda Ewing-Cobbs, Children's Learning Institute, 7000 Fannin, Suite 2401, Houston, TX 77030. E-mail: linda.ewing-cobbs@uth.tmc.edu*

G. HANTEN, H. LEVIN, E. WILDE, L. COOK, X. LI & S. CHAPMAN. Effects of Moderate to Severe Traumatic Brain Injury on Performance by Adolescents in Anticipating Consequences of Actions.

We compared performance of 15 youth with moderate to severe traumatic brain injury (TBI) (median age = 16.83 years) to that of 13 typically developing (TD) youth (median age = 16.64) in predicting social actions and consequences for teenaged avatars in a virtual microworld environment faced with social dilemmas involving legal or moral infractions. Performance was analyzed in relation to cortical thickness in brain regions implicated in social cognition. Groups did not differ in number of actions predicted nor in the reasons cited for predictions when presented only the conflict situation. After viewing the entire scenario, including the choice eventually made by the avatar, TD children and children with TBI provided similar numbers of short-term consequences, median for TD = 2.50; median for TBI = 2.60 ($Z = -0.1992$, $p = 0.842$, effect size = 0.06). However, TD children provided significantly more long-term consequences than children with TBI, median for TD = 2.71; median for TBI = 1.11 ($Z = 2.5734$, $p = 0.010$, effect size = 1.22). For the Overall qualitative score, TD children's responses were more likely to reflect the long-term impact of the decision made in the scenario than children with TBI, median for TD = 7.0; median for TBI = 6.0 ($Z = 1.9321$, $p = 0.053$, effect size = 0.70). Groups differed in relation of the Overall measure to thickness of right medial PFC/frontal pole and precuneus, with stronger relations for the TD group ($p < 0.01$). For the number of long-term consequences, the relation of predicting long term consequences of actions to the posterior cingulate, superior medial frontal, and precentral regions, and to a lesser extent, the middle temporal region were stronger for the TBI group than the TD group ($p < 0.01$).

Correspondence: *Gerri Hanten, Dept of Physical Medicine & Rehabilitation, 1709 Dryden Rd, ste 1200, Houston, TX 77030. E-mail: ghanten@bcm.edu*

V. ANDERSON, K. YEATES, M. BEAUCHAMP, L. CROSSLEY & C. CATROPPA. Social Skills 6 Months Following Childhood TBI.

Social deficits in childhood have been linked to poor quality of life and psychiatric problems, as well as delinquency and criminal behavior in later life. We examined social cognition and social participation in children with traumatic brain injury (TBI) 6 months post-injury. The sample included children with mild TBI ($n = 69$) and moderate/severe TBI ($n = 35$), aged between 6 and 16 years at time of injury, and age- and gender matched healthy controls ($n = 43$). Children were assessed across domains identified as crucial to social competence: social cognition (e.g., empathy, theory of mind), communication, and attention/executive function. They also completed questionnaires tapping quality of friendships and relationships. Parents completed questionnaires rating children's global social functioning and behavior. Results identified TBI-related social weaknesses on a range of child-based measures at 6 months post-injury. Specifically, for cognitive domains influencing social skills (communication, attention/executive function) and for social cognition measures, TBI groups performed more poorly than healthy controls, although clear dose-response relationships were not evident for TBI severity. Few group differences were identified for either parent or child questionnaires tapping social skills, but quality of life ratings were depressed for children with TBI compared to healthy controls. In conclusion, in the early months post TBI in children, parents and children rate social skills as intact, despite reductions in social cognition, communication, attention/executive function and quality of life.

Correspondence: *Vicki Anderson, Psychology, Royal Children's Hospital, Parkville, VIC 3052, Australia. E-mail: vicki.anderson@rch.org.au*

H. TAYLOR, E. BIGLER, M. DENNIS, C. GERHARDT, K. RUBIN, T. STANCIN, K. VANNATTA & K. YEATES. Peer Perceptions of Friendships, Acceptance, and Social Characteristics among Children with Traumatic Brain Injury.

The current study sought to determine if children with traumatic brain injury (TBI) differ from children with orthopedic injuries (OI) in their reciprocal friendships, peer acceptance, and social characteristics as reported by school classmates. Participants were 8 to 12 year old children, 15 with severe TBI, 38 with complicated mild-to-moderate TBI, and 32 with orthopedic injuries (OI). They and their classmates were asked to nominate three best friends in their classroom, rate all classmates in terms of likability, and complete an Extended Class Play (ECP) in which they nominated classmates for various positive and negative roles. Dependent measures included scores on five dimensions derived from the ECP: Aggression, Shyness/Withdrawal, Rejection/Victimization, Leadership, and Prosocial Behavior. Scores were also derived from the ECP for non-social attributes including illness behavior, academic competence, athletic competence, and physical attractiveness. The groups did not differ in mean total friendship nominations, mean reciprocal friendships, or mean acceptance scores. However, only 47% of children with severe TBI had at least one reciprocal friend, as compared to 88% of the OI group. Children with severe TBI were rated higher on rejection/victimization and illness behavior than the OI group, but did not differ in other social and non-social characteristics. Children with severe TBI are less likely than children with OI to have reciprocal friendships in their classrooms and more likely to be seen as victimized/rejected by classmates. Further research is needed to determine the reasons that children with TBI are socially rejected.

Correspondence: *H. Gerry Taylor, BioEnterprise Bldg., 11000 Cedar Avenue, 4th floor, Cleveland, OH 44106. E-mail: hgt2@case.edu*

**Paper Session 1:
Video, Web, and Computer Technology in
Assessment**

Moderator: Robert Roth

4:45–6:15 p.m.

M. PARIKH, M.C. GROSCH, L.L. GRAHAM, M.F. WEINER, L. HYNAN, J.H. SHORE & C. CULLUM. Consumer Acceptability of Teleneuropsychology.

Objective: While telemedicine and specifically telepsychiatry are becoming accepted methods of interview and evaluation, less is known about the acceptability of videoconference (VC) technology in the assessment of cognitive functioning. To this end, we measured the satisfaction and preferences of individuals who underwent VC-based and in-person (IP) neuropsychological assessment.

Participants and Methods: Forty individuals age 50–87 (21 healthy controls, 7 subjects with Alzheimer Disease, and 12 with MCI) completed a brief cognitive assessment both IP and via VC. Testing condition was counterbalanced and subjects completed alternate forms of a brief dementia assessment (MMSE, HVLT-R, Oral Trail Making Test, Digit Span, Verbal Fluency, BNT-15). Following testing participants completed a Likert-scale survey of their preferences and provided feedback regarding their experience with the testing conditions.

Results: Participants expressed good overall satisfaction with teleneuropsychology. Ninety-eight percent reported that they were satisfied with the VC testing session. No subjects indicated difficulty or dissatisfaction with visual, auditory, equipment functions, and 95% reported no concern about their privacy during the VC session. Overall, 29% preferred in-person assessment, 12% preferred videoconference assessment, and 59% expressed no preference.

Conclusions: Neurocognitive assessment via VC technology appears to be well-accepted by consumers. While small sample sizes, exclusion of individuals with severe vision and/or hearing impairment, diagnostic heterogeneity, and brevity of measures may limit conclusions, these results support teleneuropsychology as a viable and acceptable method for assessing cognitive function.

Correspondence: *Mili Parikh, B.S., B.A., Psychology, UT Southwestern Medical Center at Dallas, 200 Treadway Plaza, Dallas, TX 75235. E-mail: mili.parikh@utsouthwestern.edu*

K.S. GRANT, A.T. SPADACCINI, L.A. RABIN, M.M. CHARCAPE & W.B. BARR. Utilization Rates of Computerized Test Batteries Among Clinical Neuropsychologists in the U.S. and Canada.

Objective: The development of computerized neuropsychological tests and test batteries has increased greatly over the past five years, as computer programs have become more intuitive and sophisticated in their capabilities. Certain advantages may be associated with computerized methods including standardization of administration and scoring procedures, the ability to screen large numbers of people, comfort and openness on the part of the patient/participant, and the ability to capture dimensions of performance not possible with traditional instruments (e.g., latency and variability in response patterns). Despite the potential benefits of computerized assessments in clinical and research settings, it is unclear whether such methods are being utilized by practicing neuropsychologists. The current study surveyed neuropsychologists with regard to utilization of computerized tests and test batteries as part of a larger, 10-year follow-up study of neuropsychological test usage practices.

Participants and Methods: Respondents were 500 doctorate-level psychologists in the U.S. and Canada (25% usable response rate; 54% female) affiliated with the National Academy of Neuropsychology and/or the International Neuropsychological Society.

Results: Results indicated that the average respondent reported “rarely” using computerized test batteries in clinical work as compared to traditional, non-computerized methods. Of the 1304 different instruments reported by respondents <1% were computerized versions of standardized tests and/or computerized test batteries. We will present the top-ranked computerized instruments and also report the practice demographics that affected usage rates (i.e., participant age, years of neuropsychology practice, work setting, typical patient population served).

Conclusions: Possible reasons for the low utilization rates will be offered and the future of computerized assessments within the field considered.

Correspondence: *Laura A. Rabin, Ph.D., Psychology, Brooklyn College/CUNY, 2900 Bedford Ave, Brooklyn, NY 11210. E-mail: lrabin@brooklyn.cuny.edu*

S. MAGASI, P. BLOCK, M. HARNISS, M. MIRZA & M. RASLEY. Computerized Assessment of Cognitive Function: Accessibility and Accommodations for People with Disabilities.

Objective: Technological advances are leading to the development of increasingly sophisticated computer-based assessments of neuropsychological function. The cognition battery of the NIH Toolbox Assessment of Neurological and Behavioral Function uses a computer administered platform to assess multiple cognitive functions. For some people with physical, cognitive and sensory impairments, the human-computer interaction poses accessibility challenges and may limit the interpretability of test scores. We evaluate the usability and accessibility of the NIH Toolbox’s cognition battery for administration to people with traumatic brain injury (TBI), spinal cord injury (SCI) and stroke.

Participants and Methods: Twenty-seven community-dwelling adults with TBI, SCI and stroke completed 2 rounds of iterative contextual usability testing of the NIH Toolbox cognition battery. Accessibility auditors recorded performance metrics and structured observations. Participants completed cognitive briefings about their experiences.

Results: All participants were able to complete the NIH Toolbox cognition battery. Using *The Standards for Educational and Psychology*

Testing’s Strategies for Test Modification as an organizing framework, we identified challenges to computer administered cognitive testing for people with TBI, SCI and stroke. Specifically, presentation of test stimuli using a single sensory modality, such as vision; scoring algorithms that integrate motor response time; and lengthy fast paced assessment batteries may selectively disadvantage users with sensory, motor, and cognitive impairments.

Conclusions: It is important for developers and consumers of computer administered cognitive assessments to be cognizant of how human-computer interactions affect both participant performance and the interpretability of findings. Modifications and reasonable accommodations for cognitive testing using the NIH Toolbox are discussed.

Correspondence: *Phoebe Block, BS, Medical Social Sciences, Northwestern University Feinberg School of Medicine, 625 N. Michigan Avenue, 27th Floor, Chicago, IL 60611. E-mail: p-block@northwestern.edu*

T. DUFFIELD. A Comparison of Paper-Pencil Versus Video-Conferencing Administration of a Neurobehavioral Screening Test.

Objective: This research project will add to the field of neuropsychological assessment by examining if the RNA application of the Cognistat is comparable to the pencil-paper administration. If there is no significant difference found between the administration modalities, individuals who would be potentially unable to participate in a face-to-face neuropsychological screening now would have a convenient possibility to be tested.

It was hypothesized that participants’ neuropsychological data from the pencil-paper administration of the Cognistat will not differ significantly from the neuropsychological data obtained from the RNA administration.

Participants and Methods: The present study employed one independent variable; administration modality as a within-subject factor with two levels (RNA and paper-pencil). The study sample included 15 cognitively intact undergraduate student volunteers. Following acquisition of informed consent, participants were administered the Cognistat using a face-to-face modality; two weeks later the Cognistat was administered via a RNA modality. The order of mode of administration was counterbalanced across participants. The two week test-retest interval was selected to potentially minimize practice effects.

Results: A one-way repeated measures multivariate analysis of variance (MANOVA) was used to analyze the data. The main effect for administration modality was not significant, $F(9, 126) = .375, p = .945$.

Conclusions: The present study demonstrated the utility of a widely used neurobehavioral screening test that provides a differentiated profile of cognitive status can now reliably be used through a video-conferencing administration. The importance of this finding is that a more comprehensive detection of deficits in multiple domains of cognitive functioning for screening purposes is now possible remotely.

Correspondence: *Tyler Duffield, M.A., Clinical Neuropsychology, Brigham Young University, 11251 S. State St., Sandy, UT 84070. E-mail: tduffield2009@yahoo.com*

M. HENRY, C. JOYAL, A. DROUIN-GERMAIN, G. LALONDE, M. BEAUCHAMP & P. NOLIN. The Virtual Stroop: A Novel Approach to Assess Impulsivity.

Objective: Evaluating and predicting impulsivity represents a major challenge in neuropsychology as existing measures either detect long term traits (e.g. questionnaires) or very short term states (e.g. go-no/go paradigms), but generally lack overall sensitivity and predictive value. The goal of this study was to develop an ecological and accessible assessment of impulsivity using virtual reality.

Participants and Methods: A total of 84 healthy persons participated in the study, performing four tasks of impulsivity: 1) The traditional Stroop, 2) the TEA Elevator Task with Distractions (adult or adolescent versions); 3) The Stop-it, and; 4) the Virtual Stroop (ClinicaVR: Apartment-Stroop, DMW) with distractors, performed in the living-room of a virtual apartment.

Results: First, significant correlations emerged between the interference scores of the traditional (number of errors) and the Virtual (number of

commissions) Stroop ($r(80) = 0.30, p = 0.008$). Second, the number of commissions on the interference condition of the Virtual Stroop was inversely correlated with the score of the Elevator Task ($r(80) = -0.23, p = 0.05$). Third, reaction time ($r(80) = 0.23, p = 0.04$), but not the number of commissions on the Virtual Stroop were correlated with the number of commissions on the Stop-it task.

Conclusions: The virtual Stroop is a sensitive measure of impulsivity, showing good content validity (traditional Stroop; Elevator with distractions). However, it assesses a different construct than the Stop-it and future validation studies should explore other types of possible variables more closely associated with motor impulsivity (e.g. eye tracking and head movements).

Correspondence: *Mylene Henry, Dp.S, Psychology, University of Quebec in Trois-Rivières, 3351 boulevard des Forges, Dpt Psychologie, bur 3016 MS, Trois-Rivières, QC G9A5H7, Canada. E-mail: mylene.henry@uqtr.ca*

Invited Address: Reconsidering the Role of White Matter Disease in Cognitive Aging and Dementia

INS Early Career Award Winner: Adam Brickman

5:00–6:00 p.m.

A. BRICKMAN. Reconsidering the role of white matter disease in cognitive aging and dementia.

The prevailing hypothesis about the pathogenesis of Alzheimer's disease (AD) suggests a cascade of biological events that leads to dementia. According to the model, abnormal β -amyloid processing leads to brain amyloidosis, precipitating tau-related neuronal and synaptic dysfunction, and neurodegeneration, which manifest ultimately as cognitive decline and dementia. However, despite fairly consistent observations showing a relationship between vascular disease and AD, vascular factors have not been incorporated formally into the proposed theoretical model of AD pathogenesis or newly proposed research criteria for AD and its antecedent conditions, although most of the major identified risk factors for later development of AD have been vascular in nature. The gradual accumulation of vascular risk factors manifest in the brain as small vessel cerebrovascular disease, visualized as hyperintense signal, or white matter hyperintensities (WMH), on T2-weighted magnetic resonance imaging (MRI). In the current presentation I will discuss the role of WMH in cognitive aging and dementia, reviewing recent cross-sectional and longitudinal findings from our community-based study of aging and dementia, which systematically collected high resolution MRI scans on over 750 participants. I will also discuss research that seeks to understand the pathology underlying WMH in an attempt to highlight the heterogeneous pathways that lead to AD and to link traditional AD pathological features to cerebrovascular disease.

Correspondence: *Adam M Brickman, Taub Institute, Columbia University, 630 West 168th Street, New York, NY 10032. E-mail: amb2139@columbia.edu*

Poster Symposium: Transdisciplinary Advances in Applied Neuropsychology in Venezuela

6:00–6:30 p.m.

A. PIÑA, A. LEON, M.D. CUGLIELMIN, M. MORENO DE IBARRA, A. ROJAS, L.C. PIÑERO, D. NAVAS, A. VASQUEZ & D. GONZALEZ. Transdisciplinary Approach to a Preschooler Case of Attention Deficit Disorder with Hiperactivity (ADHD).

A transdisciplinary team of psychologist, educators and physicians performed comprehensive neuropsychological applied assessment in a 4

years-old boy, who attends preschool level III and was referred to differential diagnosis between autism spectrum disorder and attention deficit disorder with hyperactivity (ADHD). He presented disruptive behaviors with temper tantrums, inattention periods, difficulties complying rules and limits, aggressive behaviors toward parents, teachers and peers. Was done: interviews to parents and teachers; clinical assessment with mental and physical examination and MRI; observation in classroom and tasks directed activities. Were applied the following tests: PsicoEducational Profile-R (PEP-R), Child Neuropsychological Maturity Questionnaire (CUMANIN), Children's Thematic Apperception Test, Goodenough Human Figure, Barkley Scales. It was found that the child has difficulty in attention: control, sustained and focused, discrimination and attention to details; also in perceptual organization; comprehension, verbal fluency and vocabulary don't correspond to age. He also evidenced difficulties in auditory immediate and semantic memory. Were found executive functions disorders: inhibition capacity, working memory, self-regulatory social behavior. For the aforementioned findings a neurobiological correlate was found with an inappropriate management of child behavior by the parents, leading to the diagnosis of ADHD. The intervention and cognitive rehabilitation plan was based on a comprehensive individualized program, involving parents and teachers focused on the strengths to compensate the weaknesses, as well as training for parents to better control the child's behavior. It emphasized the development assessment through the PEP-R in very young children both in the differential diagnosis as to the intervention plan because it allows determining the proximal development zone.

Correspondence: *Ariadna Piña, Universidad Metropolitana Escuela de Psicología La Urbina, Caracas 1073, Venezuela. E-mail: ariadnabpl@yahoo.com*

A. PEREZ, L. BOGRAD, R. PEREZ, E. BLANCO, C. MEDINA, M. MEDINA, M. MORENO DE IBARRA & C. JAYARO. Transdisciplinary Approach to a Teenager Case of Attention Deficit Disorder with Hiperactivity (ADHD).

A comprehensive neuropsychological applied assessment was done in a 15 years-old male, who attends ninth grade in venezuelan parasystem, consulting for poor school performance and impulsivity. He had conflicts with authority figures, is disobedient, disorderly, deceitful. The transdisciplinary team applied the following evaluation: Anamnesis, observation and interview to the young male, neuropediatric examination, EEG, WISC-III, Evaluación Neuropsicológica Infantil (ENI), Bender Visuomotor Gestalt Test, Beery Motor Visual Integration Test, Visual Memory Test Sequences-Images (PHA), pedagogical evaluation of instrumental areas, Machover Projective Test, Wartegg Personality Test, Gfarrar Socioeconomic Rating Scale, DSM-TR-IV. Normal neuropsychomotor development was reported but at 7 years-old, was hit by a car at with mild head trauma. Academic difficulties were evident during seventh grade when also became unruly and began piercing everywhere. The assessment rule out ADAD, obtained a low average intellectual level whose strengths are related to verbal processing, although there were found some limitations on language subdomains affected by frontal lobes executive disfunction, probably secondary to the TBI suffered, specially reflected in the capacity of anticipation, planning, organization, cognitive flexibility, and certain impulsive behaviors. Difficulties in solving tasks and in visuospatial and visuoconstructive tasks were evidenced. Long-term memory is compromised by the limited information received in their environment. The aforementioned had limited the ability to achieve academic competencies required on his grade level. It was recommended cognitive rehabilitation plan to develop executive functions, visuospatial and visuoconstructives skills; leveling academic content through motivation, positive reinforcement and encouragement to achieve; counseling and guidance to the family.

Correspondence: *Analy Perez, Universidad Metropolitana Departamento de Ciencias de la Conducta La Urbina, Caracas 1073, Venezuela. E-mail: analyp@hotmail.com*

L. VEGA, M.C. MORENO, G. COLON, M.I. MACHADO, Y. LOZADA, Y. GALAVIS, M. MORENO DE IBARRA & C. JAYARO. Transdisciplinary Approach to a Case of PDD-NOS.

A Transdisciplinary Applied Neuropsychological team evaluated a 5 years-old boy, using free and structured activities, observation, parental interviews, WPPSI, MOIDI Child Development Sequences, Audioverbal Learning Rey Test, Children Autism Rating Scale (CARS), Bender Visuomotor Gestalt Test, and DDST. Language development was normal until age three. He currently uses complete sentences with peculiar intonation, uncommon words and difficulties articulating certain sounds; is capable of feeding, dressing and undressing himself, caring for his personal hygiene and dislikes to be dirty. He enjoys playing alone, but can play with other briefly, being capable to switch play activities; performs complex tasks briefly. Persists to obtain what he is interested in, with common temper tantrums when frustrated and mood swings. Some loud sounds irritate him, others one might be ignored. He is interested in music, explores textures and temperatures; is attentive to details and objects in motions. He is attached to others. Physical examination revealed motor delay but no dysmorphic features. Cognitive functioning corresponds to a 4-5 years-old boy with significant discrepancies between verbal and performance scales, performing better in visual memory and discriminating stimuli, good visuomotor coordination. He uses synthetic approaches to solve problems. He has difficulties in attention, discrimination and comprehension of auditory information, solving problems through abstract reasoning and judgment and common sense evaluating social situations. Diagnosis of PDD-NOS was done with involvement of temporal lobes, prefrontal and brainstem. The neuropsychological intervention plan considered his strengths to compensate his weaknesses recommending he continues regular schooling with psycho-educational support, speech and occupational therapy.

Correspondence: *Lila Vega, 3601 Av Los Jardines Prados del Este, Caracas 1080, Venezuela. E-mail: lilavegascott@gmail.com*

K. GONCALVES, J. GONZALEZ, A. SANCHEZ, C. SERRANO, S. ROSENDO, S. DIAZ, S. SANCHEZ, A. GRU & C. JAYARO. Transdisciplinary Approach to a Case of Early Onset Schizophrenia.

A transdisciplinary applied neuropsychological assessment was done on an 11 years-old male child, with a history of slow psychomotor development. The present condition began 3 years ago, after moving from Ecuador to Venezuela, to be reunited with his family after a two year period of separation. During this time traumatic conditions and possible child abuse was suspected, but couldn't be documented. After arriving to Venezuela he began to reduce academic performance and speech production until reached selective mutism, and hallucinatory attitude. The assessment integrates medical, psychological, neuropsychological and educational evaluations and included: a complete clinical history, physical examination, with emphasis on neurological and mental examinations and functional performance tests considering age and educational background: Wechsler Intelligence Scale (WISC-III), Goodenough Human Figure, Bender Visual-Motor Gestalt Test, MOIDI Scale (based on Orthogonal Integrated Child Development Model), and a psycho-educational assessment with systematic observation. Both brain MRI and digital EEG brain mapping were reported as normal. The comprehensive assessment of neuropsychological functions found a significant compromise of expressive language, on the maintenance of attentional control and executive functions. This is compatible with the traumatic situation of abuse and neglect suspected to had been suffered by this child and the possible emergence of an early onset schizophrenia. For intervention it proposed an integrative approach that allows the development of more adaptative behaviors and strengthening of roles that allow a better school integration and rehabilitation, with psychological, psycho-educational and occupational therapy, psychotherapeutic support of the family, and an indispensable symptomatic psychopharmacological approach.

Correspondence: *Julio Gonzalez, Clinica El Avila Cons 805 Altamira Av 6, Caracas 1060, Venezuela. E-mail: jagg21@gmail.com*

M.D. GUGLIELMIN, M.C. MORENO, Y. RODRIGUEZ, I. MONTES DE OCA, M. MORENO DE IBARRA & C. JAYARO. Transdisciplinary Approach to a Case TBI.

A female patient age 41 who suffered traumatic brain injury (TBI) resulting from a traffic accident, is referred for a transdisciplinary neuropsychological assessment to design a plan of action to compensate her impaired functions. This was performed by specialists in the fields of medicine, education and psychology and consisted of: an interview with the father and sister; physical, neurological and mental examination, CT Scan, MRI complemented with diffusion technique, Minimental, Luria - DNA, Luria - Christensen / Subtests: motor, receptive and expressive language; Wechsler Intelligence Scale for Adults (WAIS-III), Color and Word Test (Stroop), Rey-Osterrieth Complex Figure, Good-enough Human Figure Test, Wartegg Completion Figures Test, Hamilton Anxiety and Depression Scales. The results of the comprehensive assessment are consistent with frontotemporal syndrome with alterations in: immediate, working and visual memory as well as sustained and selective attention and attentional control and difficulty following instructions and completing various tasks. Gross motor functions were also compromised as well as difficulties in language articulation. The cognitive rehabilitation and intervention consisted of a individualized educational program (IEP) focusing on her strengths and preserved functions to compensate for those cognitive processes that were affected after the accident.

Correspondence: *Maria C. Moreno, Av Caroni Qta Casmore Colinas de Bello Monte, Caracas 1080, Venezuela. E-mail: caro2303@hotmail.com*

Z. HERRERA, C. HURTADO, N. PINTO, M. BARAK, P. GALINDEZ, M. GUERRA, O. YENDYS, C. JAYARO & M. MORENO DE IBARRA. Transdisciplinary Approach to a Case of Craniopharyngioma with Bilateral Vision Lost.

A transdisciplinary applied neuropsychological assessment was done in a 10 year-old girl, who suffered bilateral loss of vision after neurosurgery for craniopharyngioma. Her premorbid personality traits were: caring, loving, obedient, respectful and quiet. After surgery she presented: coprolalia, irritability, physical and verbal heteroagresivity and inability to tolerate frustration. She attends second grade in a special education school, has made progress using the Brailles 's stylus, but not in letter knowledge (spatial dot disposition). Relevant to mental examination: collaborative and sociable attitude, sometimes repetitive language, coherent thought, sometimes persistent. Fixing memory partially interfered with confabulations and recall memory without alterations. Hyperthymic mood directed to joy pole and sometimes non-resonant with motivated laughter but incontinent. The transdisciplinary team used the following comprehensive evaluation: clinical history, mental examination, Child Neuropsychological Assessment (Luria-DNA) and Wechsler Intelligence Scale for Children-IV (WISC-IV), psychopedagogic and special educational assessment. Alterations related to the left hemisphere were found in spoken and written language. The short-term memory and affective disorder indicated a compromise of frontal and temporal lobes with its connection. The low performance in use of abstract symbols of Braille System is seen as an evidence of a compromise of left parieto-occipito-temporal region (angular gyrus). The aforementioned dysfunctions lead to major difficulties on short-term memory, behavior regulation, auditory discrimination, verbal regulation of motor act, which is related to the persistent thought reflected in her repetitive language. All-inclusive guidelines for cognitive rehabilitation were given to parents and school to improve behavioral and educational management.

Correspondence: *Meyrav Barak, 2300 Frederick Douglas Blvd 7K, New York, NY 10027. E-mail: meyrarbarak@gmail.com*

THURSDAY MORNING, FEBRUARY 16, 2012

**Invited Symposium:
Frontiers of Cognitive Neuroscience**

Chair: Michael Cole

9:00–10:30 a.m.

M.A. COLE, A.C. NOBRE, R.T. KNIGHT & M. D'ESPOSITO. Frontiers of Cognitive Neuroscience.

Symposium Description: Neuropsychology figured prominently in the confluence of fields that formed the new discipline of cognitive neuroscience in the late 1970's. After nearly 35 years of rapid maturation, the field of cognitive neuroscience now in turn imparts significant influence on many areas of neuropsychology with its strong focus on theorizing, rigorous experimental design, and heavy reliance on neuroanatomical, neurophysiological and computational perspectives. Three prominent figures in cognitive neuroscience, whose work defines novel frontiers within this field, will present on some central emerging themes related to brain–behavior relationships. Each presenter employs a strong transdisciplinary approach with respect to both methodology and conceptual framework, capitalizing on the organic assets of various disciplines to more effectively probe their empirical questions of interest.

One focus of this symposium will highlight how past experience and long-term memories influence our selective attention. Neural underpinnings of how memories bias moment-to-moment perceptions and predictions about the continually unfolding events we experience will be detailed. Work will also be presented that demonstrates how integration of traditional neuropsychological lesion studies with functional neuroimaging techniques, such as electrocorticography and functional magnetic resonance imaging, can effectively reveal fundamental neural mechanisms underlying cognitive control and goal-directed behavior. These advances in the cognitive neuroscientific understanding of cognitive control and goal-directed behavior lead to identification of targeted neural mechanisms for remediation of executive control deficits. The translation of these advances from “bench-to bedside” via novel pharmacotherapeutic and neurocognitive rehabilitative approaches will also be discussed.

Correspondence: *Michael A. Cole, Ph.D., VA Northern California, 150 Muir Road, Martinez, CA 94553. E-mail: michaelallancole@gmail.com*

A.C. NOBRE. How Memory Predicts Perception.

Perception does not build a veridical copy of external reality for our musings. Instead, it is adapted flexibly and dynamically to deliver highly selective products that are most relevant for our current behavioral goals and survival. ‘Selective attention’ is the domain of psychological enquiry concerned with the selective nature of perception, and with the mechanisms by which perception is made selective. Traditionally, research in this domain has used perceptual cues or instructions to manipulate expectations about the location or identity of target stimuli that are relevant to the current task. Findings using these types of manipulations across several different methodologies have revealed how top-down signals carrying information about current task goals bias neuronal activity according to receptive-field properties to optimize perceptual processing of expected, task-relevant events.

However, despite the undisputed advances of research on selective attention to date, the field has seldom considered the natural and critical role that our long-term memories play in driving expectations about upcoming events. The intimate link between long-term memory and perception is an intuitive one, and has been acknowledged for centuries. Our past experience is arguably the major source of our expectations and predictions about events yet to unfold. In this talk, I will review recent work from our laboratory aimed at understanding the neural sys-

tems and mechanisms by which memories trigger anticipatory predictive signals that optimize perceptual processing of incoming events. The work helps bring together the fields of memory and attention, and casts memory as a proactive function, playing a major adaptive role in optimizing our interactions with the environment.

Correspondence: *Anna C. Nobre, Department of Experimental Psychology, South Parks Road, Oxford OX1 3UD, United Kingdom. E-mail: kia.nobre@ohba.ox.ac.uk*

R.T. KNIGHT. Prefrontal Cortex and Organized Behavior: Evidence from Neurological and Neurosurgical Patients.

EEG data from prefrontal patients and electrocorticographic (ECoG) evidence from intracranial recording in neurosurgical patients supports a central role of PFC in goal directed behavior. For instance, voluntary attention is dependent on PFC control of sensory flow in posterior cortical regions in the first 200 msec of stimulus processing and automatic attention to novel events depends on a prefrontal-hippocampal network engaged within 300–500 msec. Since the 1920's neurophysiological dogma has claimed that the human cortex does not generate activity above 50–60 Hz. However, recent findings report neural activity up to 250 Hz in the human cortex. Indeed, every process we have examined with ECoG including attention, language, memory and motor control generates high gamma activity (70–250 Hz; HG). For instance, during linguistic processing the HG response provides novel insights into the role of Wernicke's and Broca's area in language perception and production. HG also provides new information on the role of PFC in working memory and response selection. HG is phase locked to the trough of theta rhythms and this coupling occurs in a task specific manner with different cognitive tasks eliciting unique spatial patterns of HG-theta coupling. These results indicate that transient coupling between low- and high-frequency brain rhythms provides a mechanism for effective communication in distributed neural networks during cognitive processing. Taken together the results obtained from PFC lesioned patients and ECoG recording support the notion that the human prefrontal syndrome can be viewed as a failure of PFC control of distributed neural networks subserving human behavior.

Correspondence: *Robert T. Knight, 132 Barker Hall, University of California, Berkeley, Berkeley, CA 94720. E-mail: rtknight@berkeley.edu*

M. D'ESPOSITO. Cognitive and Pharmacological Therapies for Deficits in Cognitive Control.

Remediating executive control deficits has proven to be a significant rehabilitation challenge. This may be attributable in part to a limited understanding of how processes contributing to executive (i.e. goal-directed) control are implemented in the brain. A growing body of cognitive neuroscience research has now begun to elucidate these neural mechanisms opening the possibility of measuring treatment response at the level of both brain and behavior. Characterizing training-related outcomes in each of these areas and understanding how they interact broadens our ability to assess treatment efficacy and may lead to the development of increasingly targeted interventions. However, the translation from cognitive neuroscience research to cognitive rehabilitation remains in its infancy. In this talk, I will present several studies of cognitive and pharmacological interventions that target goal-directed attention regulation in patients with traumatic brain injury, and healthy elderly, that are ‘brain-based’, that is, protocols that are explicitly informed by cognitive neuroscience research and include both neural and behavioural outcome measures. I will also address the challenges and benefits of using neural outcome measures to inform cognitive rehabilitation, specifically in the domain of executive control processing.

Correspondence: *Mark D'Esposito, 132 Barker Hall, University of California, Berkeley, Berkeley, CA 94720. E-mail: despo@berkeley.edu*

Symposium 2: Surviving Prosperity: Metabolic Syndrome and the Brain

Chair: **Andreana Haley**

9:00–10:30 a.m.

A.P. HALEY, E.C. LERITZ, J. HASSENSTAB & M.M. CHERRIER. Surviving Prosperity: Metabolic Syndrome and the Brain.

Symposium Description: A staggering 30–40% of mature adults in the world currently fulfill criteria for Metabolic Syndrome (MetS), the occurrence of obesity, hypertension, hyperglycemia and dyslipidemia. These numbers are alarming as MetS and its individual components are associated not only with increased risk for cardiovascular morbidity and mortality, but also with current cognitive dysfunction and risk for future cognitive decline. Cognition is the most important determinant of quality of life and functional ability in older age. With the increased life expectancy, the number of elderly persons requiring substantial assistance due to severe cognitive dysfunction is anticipated to quadruple over the next 50 years, together with the cost of their care, currently estimated at 156.2 billion dollars per year. Due to the current lack of cures for cognitive impairment, preventing or delaying its onset is of utmost importance in preventing an impending social and health care crisis. Prevention and management of MetS-related cognitive impairment should take highest priority due to the high (and climbing) prevalence of the syndrome. In order to successfully intervene to preserve cognition in MetS, however, we need to understand how and when cognitive symptoms develop and what physiological mechanisms underlie them.

The Learning Objectives of this session are to:

1. Increase awareness that physiological factors such as blood pressure, blood glucose and lipoprotein levels, and central adiposity can have effects on brain health and function even in cognitively intact individuals.
2. Introduce imaging methods via which these factors can be studied.

Correspondence: *Andreana P. Haley, Ph.D., Psychology, University of Texas, 1 University Station, A 8000, Austin, TX 78751. E-mail: haley@psy.utexas.edu*

A.P. HALEY. Metabolic Syndrome and the Brain.

The first lecture in this symposium will discuss the prevalence and health impact of Metabolic Syndrome (MetS) and its components. The presentation will include preliminary data on altered cerebral neurochemistry and functional activation in response to a cognitive challenge in cognitively intact middle aged participants with MetS in comparison with healthy controls. The benefits of studying the neural correlates of the individual components of MetS as well as the cluster as a whole will also be discussed.

Correspondence: *Andreana P. Haley, Department of Psychology, University of Texas at Austin, 1 University Station, A8000, Austin, TX 78712. E-mail: haley@psy.utexas.edu*

E. LERITZ, L. LIPSITZ, R. MCGLINCHEY & W. MILBERG. The Relationship of Cholesterol to Brain Structure and Cognition in Metabolic Syndrome.

Dyslipidemia is a primary risk factor for cerebrovascular disease (CVD), cognitive decline, and dementia. Past research on how cholesterol affects the nervous system has been mixed, as cholesterol has both beneficial and detrimental effects. This is in part consistent with our own work; however, we have also found that the presence of metabolic syndrome (MetS), a cluster of risk factors that dramatically increases risk for CVD, may alter the effect that cholesterol has on neural tissue and function. In this session, we will discuss our findings that higher cholesterol levels are associated with globally increased cortical thickness, and with increased episodic memory, suggesting a potential beneficial effect of cholesterol in individuals with MetS.

Correspondence: *Elizabeth Leritz, GRECC (182 JP), VA Medical Center, Building 1, Floor 11, C-Wing, 150 South Huntington Avenue, Boston, MA 02130. E-mail: bleritz@nmr.mgh.harvard.edu*

J. HASSENSTAB. Obesity and Insulin Sensitivity: Impacts on Brain Functioning and Outcomes from Successful Weight Loss.

It is becoming increasingly clear that the metabolic dysfunction caused by obesity has widespread impacts on brain functioning. This presentation will focus on insulin resistance in obesity and its relationship to brain networks that underlie executive control and episodic memory. We will begin with a discussion of surface-based structural MRI and resting state BOLD functional connectivity MRI as they relate to executive control and episodic memory in obese and insulin resistant individuals. We will then discuss how successfully maintaining weight loss may alter the function and structural integrity of the executive control network and may prevent or delay the onset of dementia.

Correspondence: *Jason Hassenstab, Knight Alzheimer's Disease Research Center, Washington University School of Medicine, 660 South Euclid Campus Box 8111, St. Louis, MO 63110. E-mail: hassenstabj@wustl.edu*

M.M. CHERRIER, S.L. WILLIS & K. SCHAIE. Cognitive Change during the Midlife years. An examination of midlife risk factors in the Seattle Longitudinal Study.

Longitudinal studies indicate that on average, cognitive functioning in midlife (40–60 yrs) is stable with reliable age-related decline occurring in the mid-sixties for speeded and abstract reasoning tasks. However, recognition of a preclinical phase to dementia suggests that some individuals may begin to experience cognitive decline in midlife. This session will discuss current research within the Seattle Longitudinal Study (SLS) focused on identifying the subset of midlife individuals experiencing non-normative cognitive decline or continued gain in middle-age and examining midlife predictors of early cognitive change such as cardiovascular disease, lipid levels and presence of the APOE e4 gene.

Correspondence: *Monique M. Cherrier, Dept. of Psychiatry and Behavioral Sciences, University of Washington School of Medicine, S-182 GRECC VAPSHCS, 1660 S. Columbian Way, Seattle, WA 98108. E-mail: cherrier@u.washington.edu*

Paper Session 2: Brain and Systemic Cancer

Moderator: **Sarah Lageman**

9:00–10:30 a.m.

T. BRINKMAN, N. ZHANG, N.J. ULLRICH, D.M. GREEN, P. BROUWERS, L. ZELTZER, K. SRIVASTAVA, M. STOVALL, L.L. ROBISON & K.R. KRULL. Psychoactive Medication Use and Neurocognitive Function in Adult Survivors of Childhood Cancer: A Report from the Childhood Cancer Survivor Study.

Objective: Adult survivors of childhood cancer are at risk for long-term morbidities, which may be managed pharmacologically. Psychoactive medication treatment is associated with adverse effects on specific neurocognitive processes in non-cancer populations, yet little is known about the impact of these medications in childhood cancer survivors. This study examined the association between psychoactive medication use and neurocognitive function in adult survivors of childhood cancer.

Participants and Methods: 7,080 adult survivors of childhood cancer, 17 to 54 years, completed the Childhood Cancer Survivor Study Neurocognitive Questionnaire. Survivors reported prescription medication use and drugs were classified using the American Hospital Formulary Service Drug Information Database (e.g. antidepressants, anticonvulsants).

Results: Multivariable logistic regression models controlling for cranial radiation, pain, psychological distress, and stroke/seizure re-

vealed an association between antidepressant medications and impaired task efficiency (OR=1.80, 95% CI 1.47-2.21), organization (OR=1.83, 95% CI 1.48-2.25), memory (OR=1.53, 95% CI 1.27-1.84) and emotional regulation (OR=2.06, 95% CI 1.70-2.51). Neuroleptics and stimulants predicted impaired task efficiency (OR=2.46, 95% CI 1.29-4.69; OR=2.82, 95% CI 1.61-4.93, respectively) and memory (OR=2.08, 95% CI 1.13-3.82; OR=2.69, 95% CI 1.59-4.54, respectively). Anticonvulsants were associated with impaired task efficiency, memory and emotional regulation, although survivors who use these medications may be at risk for neurocognitive impairment due to seizure disorder and/or underlying tumor location (CNS).

Conclusions: These findings suggest that specific psychoactive medications and/or mental health conditions may impact neurocognitive function in adult survivors of childhood cancer. This underscores the need for future research investigating the effect of psychoactive medications on functional outcomes in a population with established risk for neurocognitive dysfunction.

Correspondence: *Tara Brinkman, Ph.D., Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, Memphis, TN 38105. E-mail: tara.brinkman@stjude.org*

K.R. KRULL, W.E. REDDICK, C. PUI, D. SRIVASTAVA, L.L. ROBISON & M.M. HUDSON. Neurocognitive and Physiological Outcome in Survivors of Childhood Acute Lymphoblastic Leukemia Treated with Prednisone versus Dexamethasone.

Objective: To compare neurocognitive and physiological outcomes in adult survivors of childhood ALL treated with prednisone versus dexamethasone during continuation therapy.

Participants and Methods: Thirty-seven adult survivors of childhood ALL (mean[SD] age=24.8 [3.61] years; time since diagnosis=15.0 [1.80] years) were randomly selected from a cohort treated with only chemotherapy (i.e. no cranial radiation therapy) on one of two standard protocols (21 treated with high-dose intravenous methotrexate [HD-IV MTX] and repeated cycles of prednisone; 16 treated with HD-IV MTX and repeated cycles of dexamethasone). Patients underwent neurocognitive evaluations, brain imaging, physical exams and blood chemistry, including serum cortisol before and after a dexamethasone suppression test.

Results: Groups did not differ on sex ($p=0.73$), current age ($p=0.90$), or cumulative HD-IV MTX ($p=0.68$). The dexamethasone group demonstrated lower vocabulary ($p=0.02$), reading ($p=0.002$), mathematics ($p=0.002$), verbal memory ($p=0.006$), cognitive flexibility ($p=0.02$), and emotional regulation ($p=0.04$). Performance on these neurocognitive measures was significantly correlated to reduced hippocampal volume and reduced cortical thickness in frontal and parietal brain regions. No differences were detected for basal cortisol ($p=0.72$), though survivors treated with dexamethasone had higher systolic blood pressure compared to the prednisone group (mean=128.5 [SD=11.71] vs. 117.7 [13.78], $p=0.02$) and less cortisol suppression (mean=3.32mcg/dl [6.41] vs. 0.94mcg/dl [0.75], $p=0.05$). Systolic blood pressure was also correlated to reduced cortical thickness in frontal and parietal brain regions.

Conclusions: Adult survivors of childhood leukemia treated with repeated cycles of dexamethasone are at increased risk for neurocognitive impairment, which is associated with volumetric indices of brain integrity and occurs in the presence of symptoms of physiological stress.

Correspondence: *Kevin R. Krull, PhD, Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, MS 735, Memphis, TN 38105-3678. E-mail: kevin.krull@stjude.org*

K.E. ROBINSON, J.C. THIGPEN, C.J. CANNISTRACI, K.M. WYMER, S.E. SMITH & B.E. COMPAS. Neurocognitive and Psychosocial Functioning of Survivors of Pediatric Brain Tumors: A fMRI Study of Neurobiological and Behavioral Associations.

Objective: Pediatric brain tumors are the second most common cancer diagnosis in individuals under age 20. Research has documented

significant late effects in neurocognitive, psychosocial, and emotional functioning. Associations among these deficits have yet to be adequately explored, and examination of the neurobiological underpinnings of these deficits through the use of neuroimaging techniques has not been conducted.

Participants and Methods: We assessed neurocognitive, psychosocial, and emotional functioning of 17 survivors of pediatric brain tumors (6 girls, mean age = 12.59 years). Survivors completed a working memory task (N-back) during fMRI, and parent- and child-report measures of psychosocial and emotional functioning (CBCL, YSR) were collected.

Results: Survivors ($p < .002$) and parents ($p < .001$) reported low levels of social competence, and elevated symptoms of anxiety/depression (pparent $< .001$; pchild = .005) and social problems (pparent $< .001$; pchild $< .001$). During the N-back task, survivors recruited increased amounts of oxygenated blood to the superior frontal (SFG) and dorsolateral prefrontal (DLPFC) cortices as task difficulty increased from 0-back to 2-back, and to the anterior prefrontal (APFC) and dorsal anterior cingulate (DACC) cortices, and supramarginal gyrus (SMG), as task difficulty increased from 0-back to 3-back. Correlations indicated that increased BOLD signal was associated with better social competence (APFC, $p < .05$), fewer symptoms of anxiety/depression (SFG, $p < .05$; DLPFC, $p < .01$; APFC, $p < .05$; DACC, $p < .10$), and fewer social problems (SFG, $p < .10$; DLPFC, $p < .10$; APFC, $p < .10$; DACC, $p < .10$).

Conclusions: These findings suggest that brain tumor survivors experience deficits in multiple domains. Increased activation in prefrontal and parietal regions was associated with better psychosocial and emotional functioning. These findings provide a foundation for research exploring these associations and potential mediators of the emergence of deficits in this vulnerable population.

Correspondence: *Kristen E. Robinson, M. S., Psychology and Human Development, Vanderbilt University, 2477 Waterfall Lane, Columbus, OH 43209. E-mail: kristen.e.robinson@vanderbilt.edu*

H.M. CONKLIN, M.A. SCOGGINS, R.J. OGG, J.M. ASHFORD, M.M. JONES, T.E. MERCHANT & Y. LI. Self-Ordered Search as a Probe for Working Memory Impairment among Childhood Brain Tumor Survivors: A Functional Magnetic Resonance Imaging (fMRI) Study.

Objective: Working memory (WM) deficits are emerging as a core cognitive impairment among childhood brain tumor (BT) survivors. These deficits may underlie declines in intellectual functioning and be indicative of neurodevelopmental disruptions, particularly in networks engaging the prefrontal cortex. Accordingly, fMRI was used to investigate neural correlates of WM performance among BT survivors to identify alterations related to disease, therapy and cognitive dysfunction.

Participants and Methods: Thirty four childhood BT survivors (12 low grade astrocytoma, 12 ependymoma, 10 craniopharyngioma) treated with conformal radiation therapy (age= 16.23 \pm 3.54; time since irradiation= 6.50 \pm 2.33) and twenty five healthy controls (age= 25.42 \pm 3.71) participated in fMRI examinations during which experimental self-ordered search (SOS) and prototypical n-back WM tasks were administered.

Results: BT survivors performed significantly worse than controls on SOS (85.11 \pm 15.84 vs. 67.80 \pm 9.28 trials to solution, $p < .01$) and n-back (9.88 \pm 10.20 vs. 2.80 \pm 3.31 omission errors, $p < .01$) tasks, with differences generally remaining after controlling for age. Areas of robust neural activation during SOS included dorsolateral and ventrolateral prefrontal cortices, premotor cortices, dorsal cingulate, and lateral posterior parietal cortices ($p < .05$, FWE corrected for multiple comparisons), with similar patterns for BT survivors and controls. Controls exhibited greater activation in left dorsolateral prefrontal and parietal regions; whereas, BT survivors exhibited greater activation in a retrosplenial region.

Conclusions: Neural networks activated during SOS were comparable to n-back tasks and consistent with the neuroimaging literature. BT survivors performed worse than healthy controls on both WM tasks and demonstrated alterations in neural activation that may explain behavioral differences and guide cognitive remediation approaches.

Correspondence: *Heather M. Conklin, Ph.D., Psychology, St. Jude Children's Research Hospital, 262 Danny Thomas Place, Mail Stop 740, Memphis, TN 38105-2794. E-mail: heather.conklin@stjude.org*

K.R. KRULL, N. SABIN, W.E. REDDICK, L. ZHU, G.T. ARMSTRONG, D. GREEN, D. SRIVASTAVA, M. METZGER, L.L. ROBISON & M.M. HUDSON. Central Nervous System Integrity in Adult Survivors of Childhood Hodgkin Lymphoma.

Objective: To examine neurocognitive and neuroanatomical outcomes in adult survivors of childhood Hodgkin Lymphoma (HL) at risk for cardiopulmonary dysfunction.

Participants and Methods: Sixty-two adult survivors (mean [SD] current age=43.2 [4.79]; age at diagnosis=15.1 [3.31]) were randomly selection from a large cohort treated with thoracic radiation and/or anthracyclines. Patients underwent neurocognitive evaluations, brain MRI (T1, T2, SWI, DTI), echocardiograms and pulmonary function tests. MRI images were also reviewed and systematically coded by a board certified neuroradiologist.

Results: Compared to national norms, HL survivors demonstrated reduced attention span ($p=0.01$), sustained attention ($p=0.01$), short-term memory ($p=0.001$), long-term memory ($p=0.006$), motor dexterity ($p<0.001$), and verbal fluency ($p=0.007$). Clinical coding of MRI's revealed white matter disease (e.g. leukoencephalopathy) in 51.8% of survivors, cerebral atrophy in 68.5% and cerebrovascular abnormalities in 30.0%. Cerebrovascular abnormalities on SWI were associated with thinner cortices in dorsolateral frontal regions ($p=0.006$), and cerebral atrophy was associated with increased radial diffusivity on DTI ($p=0.04$). Attention problems were correlated with cortical thickness in frontal brain regions ($p=0.03$), while leukoencephalopathy was associated with reduced verbal fluency ($p=0.001$). Neurocognitive and neuroanatomical measures were associated with abnormal results on cardiac and pulmonary function tests.

Conclusions: Results suggest adult long-term survivors of HL are at increased risk for neurocognitive impairment, which is associated with reduced brain integrity and symptoms of cardiopulmonary dysfunction. Correspondence: *Kevin R. Krull, PhD, Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, MS 735, Memphis, TN 38105-3678. E-mail: kevin.krull@stjude.org*

**Poster Session 2:
ADHD/Learning Disabilities/Language/Autism**

9:15–10:45 a.m.

ADHD/Attentional Functions

T. ANTONINI, K. O'BRIEN, M. NARAD & J. EPSTEIN. Exploring the Relationship between Performance on Computerized Neuropsychological Tasks and Performance on an Analogue Math Task.

Objective: Children with ADHD exhibit academic difficulties, including lower accuracy and productivity on academic tasks, lower achievement, and higher rates of grade retention than typically-developing children. The cognitive processes that may contribute to these academic difficulties are unclear. Relationships between working memory and achievement test scores have been documented. However, little research has examined neuropsychological correlates of performance on academic tasks. The current study examined which cognitive skills contribute to academic productivity and accuracy on an analogue math test.

Participants and Methods: Ninety-three children with ADHD and 45 typically-developing children completed choice discrimination, n-back, and go/no-go tasks that assessed attention, working memory, and inhibition, respectively. Children also completed a 20-minute analogue nu-

merical operations task. Linear mixed modeling was used to examine the relationship between productivity (i.e., number of problems attempted) and accuracy (i.e., percentage correct) on the math task and performance on the three computerized tasks, for the entire sample of children.

Results: Results indicated that accuracy on the n-back task was significantly associated with productivity, but not accuracy, on the math task. Performance on the other two tasks was not significantly associated with math task accuracy or productivity.

Conclusions: Findings suggest that math productivity is most strongly related to working memory performance. Future research should examine whether this relationship is specific to the type of working memory (visual-spatial vs. auditory) and/or specific to other math skills (e.g., word problems).

Correspondence: *Tanya Antonini, Cincinnati Children's Hospital Medical Center, 615 Rombach Ave., Apt. 2, Wilmington, OH 45177. E-mail: tanya.antonini@gmail.com*

J. BEAN & I. EIGSTI. Visual Attention and Lateralization: A Unique Pattern of Attentional Abnormalities in Autism Spectrum Disorders.

Objective: Visual attention studies in autism spectrum disorders (ASD) yield mixed results (e.g., increased/decreased attentional "stickiness"). Right-sided visual orienting differences suggest possible lateralization effects. This study adds to past findings by disentangling right- and left-sided visual attention processes.

Participants and Methods: Participants ages 7-17 years with ASD ($n = 17$) and typical development ($n = 24$) completed a modified Posner (1984) paradigm; directional cues were manipulated to control for validity (correctly/incorrectly directing attention), competition (disappearing/remaining during target presentation), and response salience (two/four valid cues preceding invalid ones). Repeated-measure MANCOVAs examined group differences in reaction time (RT) as a function of experimental condition and target location.

Results: No accuracy-speed tradeoff or main effects of group RT were found. On both sides, participants responded faster to valid trials, $p < .01$. For right-sided targets: both groups responded faster on trials with disappearing cues, $p = .05$, and low response salience trials, $p < .01$. These effects interacted with group; ASD participants were less impacted by (remaining) competitive cues, $p = .03$, and more impacted by invalid cues (trend), $p = .06$. For left-sided targets: there was an interaction for competitive cues, $p < .01$; the ASD group was again less impacted by remaining cues. Findings were unchanged when excluding left-handed participants.

Conclusions: Both groups demonstrated expected effects of response salience (for right-sided targets) and validity (for left-sided targets); however ASD participants were differentially impacted by validity when targets were in the right visual field and less sensitive to the impact of competitive cues in both visual fields. Visual attention abnormalities in ASD are complex; overarching statements about "stickiness" may not portray subtle discrepancies. Implications for social development will be discussed. Correspondence: *Jessica Bean, M.A., Clinical Psychology, University of Connecticut, 406 Babbidge Rd, Unit 1020, Storrs, CT 06269. E-mail: jessica.bean07@gmail.com*

D. BIERSTONE, R.J. SCHACHAR & A. CHEVRIER. Understanding the Structure of Reaction Time Variability in ADHD using the Ex-Gaussian Distribution.

Objective: ADHD is a common and impairing condition of childhood characterized by developmentally atypical restlessness, inattentiveness and impulsiveness and by a range of deficits in higher level cognitive processing. It is hoped that identification of the key cognitive deficits in ADHD will increase our understanding of the neurobiology of this disorder. Among the common deficits seen in ADHD is marked inconsistency in response latency, but the nature of this deficit is not yet clear. We aimed to identify performance deficits of ADHD children in situations requiring rapid responses and error inhibition, by investigating the structure of reaction time variability on a cognitive task.

Participants and Methods: We used the stop signal task to measure speed, variability, and inhibitory control in 95 ADHD children and 41 normal controls. Response latency distributions were quantified using the ex-Gaussian distributional fit.

Results: ADHD children were more variable and had poorer inhibitory control than normal controls, as measured by within subject go reaction time standard deviation and stop signal reaction time respectively. Ex-Gaussian analysis showed that differences lay entirely in the exponential component of response latency distributions (quantified by τ), but that the Gaussian component (quantified by μ and σ) was similar between groups.

Conclusions: Response latency is thought to be dependent on the efficiency of invoking an appropriate task set during preparatory period. Reaction time distributions are normally distributed when factors involved in invoking task set combine linearly. The similarity of the normally-distributed component of healthy and ADHD Go RT distributions thus indicates that ADHD children often invoke task set similarly to healthy controls. An exponential component in Go RT distributions, however, indicates difficulty in invoking task set on a subset of trials. The amplified exponential component in ADHD suggests that ADHD children have this difficulty more often.

Correspondence: *Daniel Bierstone, Hon. B. Sc., Neurosciences and Mental Health, Hospital for Sick Children, The Hospital for Sick Children, Department of Psychiatry, 555 University Avenue, Elm Wing, Toronto, ON M5G1X8, Canada. E-mail: daniel.bierstone@utoronto.ca*

L.C. BLACK, C.E. TYNER, S.N. ANDERSON & S.C. HEATON. Comparison of Parent-Reported Behavior Difficulties in a Clinical Sample to Attentional Deficits on Neuropsychological Testing.

Objective: The present study sought to examine the relationship between parent-report of child behaviors on the Conners' Parent Rating Scale (CPRS-R:L) and child performance on core subtests from the Test of Everyday Attention for Children (TEA-Ch).

Participants and Methods: One hundred forty-five children aged 6 to 16 diagnosed with ADHD (Combined Type N=65, Inattentive Type N=48) and non-ADHD Clinical Controls (N=32) completed the 4 core subtests of the TEA-Ch, which measure selective, sustained, and controlled attention. Behavioral ratings of attention problems were obtained from the primary caregiver using the CPRS. Multiple regression analyses were conducted to determine if the 7 primary content scales of the CPRS could predict performance on the core TEA-Ch subtests for the entire sample.

Results: Regression analyses revealed that ratings on one CPRS subscale predicted performance on two TEA-Ch subtests. Specifically, Hyperactivity significantly predicted performance on Score! and Score! DT ($p < .05$). Operating characteristics were calculated based on these findings using the clinical cut-off CPRS score ($T \geq 65$) to predict impaired ($SS \leq 7$) TEA-Ch performance. When CPRS Hyperactivity was in the elevated range the operational characteristics were found to be as follows: Score! sensitivity=0.68, specificity=0.47, PPV=0.62, NPV=0.53, odds ratio=1.84 and Score! DT sensitivity=0.72, specificity=0.44, PPV=0.53, NPV=0.65, odds ratio=2.05.

Conclusions: Results provide preliminary evidence that parent reports of behavior can assist in predicting attention test performance in a clinical sample. This finding suggests that behavioral rating scales may be a useful screening method for identifying children who would benefit from further performance-based neuropsychological testing.

Correspondence: *Leah C. Black, Master of Arts, Psychology, University of Florida, 1505 Fort Clark Blvd, Apt 02-309, Gainesville, FL 32606. E-mail: lcblack@phhp.ufl.edu*

M.L. BOLAÑOS, E. MATUTE & O. BARRIOS. Differences in Neuropsychological Profile of Combined and Inattentive ADHD Subtype.

Objective: Efforts characterizing subtypes of ADHD according to performance on neuropsychological tests have shown mixed results. The purpose of this study was to provide new evidence to determine whether DSM-IV subtypes are associated with different neuropsychological profiles.

Participants and Methods: We assessed 33 children aged between 9-12 years, with a ADHD diagnosis through a questionnaire for parents and teachers based on DSM-IV criteria. Sixteen children (12-male, 4-female) presented inattentive-subtype (ADHD-I) and seventeen children (13-male, 4-female) combined-subtype (ADHD-C). The WISC-RM and Evaluación Neuropsicológica Infantil - ENI (Child Neuropsychological Assessment) were administered.

Results: By contrasting the performance between the two subtypes we found in the WISC-RM scores, that ADHD-I subtype underperformed ADHD-C subtype in the verbal scale ($U=71.50$, $p=.019$) and full-scale-IQ ($U=72.50$, $p=.021$). Specifically, we found that ADHD-I < ADHD-C in the following subtests: vocabulary ($U=49.50$, $p=.001$), compression ($U=77.50$, $p=.034$), picture arrangement ($U=65.250$, $p=.010$) and object assembly ($U=73$, $p=.040$). In the Child Neuropsychological Assessment (ENI), the ADHD-I subtype showed a lower performance in reading-speed ($U=55$, $p=.030$) and auditory attention ($U=70$, $p=.030$). The only measure in which ADHD-C subtype underperformed ADHD-I group was in delayed verbal recall ($U=76$, $p=.031$).

Conclusions: These results support the existence of two different neuropsychological entities in ADHD, showing the ADHD-I a more affected profile.

Correspondence: *María D. Bolaños, Master, Neuroscience Institute, University of Guadalajara, Francisco de Quevedo 180, Guadalajara 44100, Mexico. E-mail: psic_lourdesb@yahoo.com.mx*

M.L. COHEN, J. WILLIAMSON, J.C. KWON, B. SCHWARTZ, L. SALAZAR & K.M. HEILMAN. Parkinson Patients' Impaired Disengagement From Focal Attention Impairs The Allocation Of Global Attention.

Objective: Previous research has shown that normally, depending on the task, a person may use focal or global attention or both (e.g., Navon figures). Patients with Parkinson disease (PD), however, are impaired at attending to the global form (Barrett et al., 2001), such that they "see the trees, but not the forest". The present investigation tests the hypothesis that PD patients' deficits in global attention result from difficulty disengaging attention from focal elements.

Participants and Methods: Participants were 16 non-demented patients with idiopathic PD and 5 neurologically healthy, matched controls. There were 2 conditions of attentional switching. In the global-focal condition, participants viewed horizontal lines ($>22\text{cm}$) and were asked to quadrisection (25% of the total distance from the right or left end) these lines (16 trials). In the focal-global condition, participants were shown short lines ($<6\text{cm}$) on the left or right side of the page (16 trials) and instructed to draw a line four times the length of the shown line.

Results: Whereas the groups were equivalent in the global-focal quadrisection condition ($t=.19$, $p=.85$), in the focal-global condition the PD group drew significantly shorter lines than the healthy group ($t=2.6$, $p=.02$).

Conclusions: These results suggest that PD patients' relative difficulty in global attention stems from a difficulty in switching from focal to global processing. However, future research is required to rule out other alternative explanations such as motor hypometria.

Correspondence: *Matthew L. Cohen, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: mlcohen@phhp.ufl.edu*

M.M. TABAQUIM, T.M. ALMEIDA, A.C. FIORETTO & D.S. COELHO. Attention Deficit and Hyperactivity Disorder: Predictive Value of Diagnostic Criteria.

Objective: Evidence shows that the system postulated by the categorical DSM-IV as a single tool, you can not effectively meet the purposes, to contemplate the possibility that the predictive power of the items vary according to the evaluator, with differences in the diagnostic ability of the eighteen criteria. The aim of this study was to analyze the predictive power of diagnostic criteria of DSM-IV for ADHD, according to different assessment tools.

Participants and Methods: In this prospective population study, participated in 123 schools in the region north of the city of Bauru / SP / Brazil, aged 8 to 10 years, both sexes were enrolled in state schools, in the 3rd and 4th st s-graders. The instruments for assessing the intensity and frequency of symptoms were the Protocol Teacher Scale and MTA-SNAP-IV.

Results: The results showed that 75% of the population were male and 24% female, the third grade had the highest incidence with 50% while 49% grade 4. Among the 12 behaviors surveyed in the Protocol of Professor, both series, the factor related to “easily distracted by irrelevant stimuli” had the highest incidence with 83% in both the fourth grade (83%) and in third grade (82%). The second most frequent behavior was “material to be disorganized and school activities”, with 77%. Scale MTA-SNAP-IV, among the 26 behaviors surveyed, both series again distraction with external stimuli had 85% signal, 72% occurred in complaints about careless mistakes in schoolwork or tasks of everyday life. In the analysis of the instruments used, there was a correlation between the findings.

Conclusions: The study showed higher incidence of attentional problems in the population studied, and found the predictive power of diagnostic criteria adopted to distinguish the signs of attention deficit hyperactivity disorder and other diagnoses.

Correspondence: *Maria de Lourdes M. Tabaquim, Department of Speech, Language, Pathology and Audiology, University of São Paulo - USP, Alameda Octávio Pinheiro Brisolla, 9-75, Rua Bandeirantes, 9-60 Apto 61, Bauru 17015-012, Brazil. E-mail: malu.tabaquim@usp.br*

E. DIRENFELD, M. GARCIA-BARRERA, J. HATTER, W.R. MOORE, L. SHAYEGI NICK & E. PEREZ-HERNANDEZ. Examining the Relationships Between Anterior Cingulate Cortex Morphology and Behavior in a Sample of Spanish Children with ADHD.

Objective: Some theories propose that ADHD is caused by a deficit in the interaction of inhibitory control with other executive functions. Studies examining the neural correlates of ADHD at broad levels have led to greater interest on the anterior cingulate cortex (ACC), a complex structure involved in attention, error monitoring and other cognitive processes. To further clarify both the nature of the behavioral and cognitive deficits observed in ADHD and the relationships between these difficulties and their neural substrates with more specificity, volumetric analyses of the ACC were conducted. The relationships between volume and behavior were also examined. It was hypothesized that there would be significant volumetric differences between the two groups and that ACC subregions would have a differential relationship with executive function performance.

Participants and Methods: Ten children with ADHD and 10 matched controls from Spain underwent magnetic resonance imaging and neuropsychological assessment. ANALYZE 9.0 was used to manually trace ACC subregions, followed by between-group statistical comparisons. Correlation analyses were used to examine whether ACC subregions were related to behavior ratings and performance on neuropsychological tasks.

Results: The ADHD group had larger right dorsal ACC volumes relative to controls. Expected cognitive and behavior relationships were observed only in the control group. Larger rostral ACC, for both groups, and larger subgenual ACC, for the ADHD group, were associated with greater susceptibility to interference on the Stroop, while smaller volumes were associated with poorer BASC ratings of attention, hyperactivity, conduct problems, and aggression.

Conclusions: In contrast to previous research, this study found larger ACC volumes in an ADHD group. Based on these findings and observed brain-behavior relationships, the results are indicative of abnormal neuronal maturation of the ACC in Spanish children with ADHD, likely due to delayed pruning, which must be further examined.

Correspondence: *Esther Dierenfeld, Psychology, University of Victoria, P.O. Box 3050, University of Victoria, Victoria, BC V8W3P5, Canada. E-mail: edirenfe@uvic.ca*

A. ELLIS, S. LOO, E. ZIMAK, S. CHANG, M. WU, J. MCGOUGH, J. PIACENTINI & J. MCCrackEN. Executive Functioning Distinguishes Children With Attention Deficit Hyperactivity Disorder and Tic Disorder.

Objective: Neurodevelopmental disorders such as ADHD and Tic disorder (TD) have been conceptualized as syndromes involving frontal dysfunction, as well as associated neurological deficits. Previous research has implicated deficits with attention, behavioral disinhibition and executive function in children with ADHD, but less is known regarding the neuropsychological profile of children with Tic Disorder. This study sought to elucidate differences between ADHD, TC and healthy children on tasks of executive functioning.

Participants and Methods: Children (N=98; M=10.5) were age-matched and diagnosed using clinical interview as ADHD (n=33), TD without ADHD (n=33) or controls (n=32). Children then completed the CPT-II, the Attention Network Task (ANT) and the Spatial Delayed Response Test (SDRT).

Results: To assess attention, ANOVAs revealed group differences (ANT: $F(2, 88)=4.39, p=.02$; CPT: $F(2, 88)=4.11, p=.02$) on omission errors. Follow-up analyses indicated that ADHD committed more errors of omission than TD on both tasks ($p<.01$). For disinhibition, groups differed on ANT incongruent accuracy ($F(2, 91)=5.69, p=.01$), but not on CPT commissions ($F(2, 89)=.47, p=.63$). Follow-up analyses indicated that ADHD had less accurate incongruent responses than controls ($p=.00$) and TD ($p=.03$). For working memory capacity (SDRT load 3), $F(2, 91)=3.23, p=.04$, ADHD displayed less working memory capacity relative to TD ($p=.02$) and less than control ($p=.06$).

Conclusions: Children with ADHD were characterized by greater inattention, disinhibition, and reduced working memory capacity as compared to TD. Interestingly, TD children more closely resembled healthy individuals in their neuropsychological profile. Implications of these results on current neurodevelopmental theory will be discussed. [Support by NIMH 1P50 MH077248 McCracken (PI)]

Correspondence: *Alissa Ellis, M.A., UCLA, UCLA, 760 Westwood Plaza C-8746, Los Angeles, CA 90095. E-mail: aellis@mednet.ucla.edu*

M. GUERRERO, A. GARCIA, C. RAMIREZ, J. CORTEZ & P. VALDEZ. Analysis of the Components of Attention on Simultaneous Performance of Two Tasks.

Objective: Attention has limited capacity, efficiency decreases when two tasks are simultaneously performed. Attention is a basic cognitive process that has four components: tonic alertness, selective attention, phasic alertness and sustained attention. The objective of this study was to analyze the components of attention on simultaneous performance of two tasks.

Participants and Methods: Participants were six voluntary students, 2 males and 4 females, mean age 19.67 ± 3.6 years. A Continuous Performance Task (CPT) was used to assess the components of attention. First, participants responded only the CPT, then they responded the CPT simultaneously with a low cognitive demand task (listening to a story) and finally, the CPT with a high cognitive demand task (narrating a movie plot).

Results: Participants showed less correct responses on three components of attention, when they responded the CPT simultaneously with the high cognitive demand task: tonic alertness (Only CPT: 99.14 ± 0.41 ; CPT and narrating a movie plot: 83.89 ± 4.10 ; Wilcoxon $T=0, p<0.05$), selective attention (Only CPT: 87.19 ± 3.75 ; CPT and narrating a movie plot: 67.59 ± 9.42 ; Wilcoxon $T=1, p<0.05$) and phasic alertness (Only CPT: 93.83 ± 1.95 ; CPT and narrating a movie plot: 63.58 ± 9.78 ; Wilcoxon $T=0, p<0.05$). There were no significant differences on the index of sustained attention used in this study.

Conclusions: In conclusion, simultaneous performance of two high cognitive demand tasks decreases the efficiency on three components of attention: tonic alertness, selective attention and phasic alertness. This result may explain errors and accidents in activities requiring simultaneous performance of two tasks.

Correspondence: *Martha Guerrero, Laboratory of Psychophysiology, Universidad Autonoma de Nuevo Leon, Mutualismo 110, Col. Mitras Centro, Monterrey 64460, Mexico. E-mail: martha.guerrero.valdez@gmail.com*

S. HANNA, R. MANGUM & G.L. ANDREWS. Verbal Executive Functioning Disruptions in Adolescents with ADHD.

Objective: Changes in the frontal lobes due to pruning during adolescence are believed to contribute to behavioral and cognitive challenges. We compared adolescents diagnosed with attention deficit hyperactivity disorder (ADHD) or prenatal exposure to alcohol (PEA) to control participants using verbal executive functioning tasks.

Participants and Methods: We recruited a convenience sample (both males and females) aged 13 to 22 years and administered verbal sections of the D-KEFS (Delis, Kaplan & Kramer, 2001) in one-on-one controlled settings, assessing participants' ability to generate words, formulate and interpret abstract concepts, and engage in deductive reasoning.

Results: Participants performed lowest on word generation from letters compared to other conditions of the Verbal Fluency Test. Participants with ADHD performed more poorly on the Verbal Fluency Test and the Word Context Test than control participants. Diagnosis did not affect performance on Color-Word Interference, Sorting Test, Twenty Questions, or Proverbs.

Conclusions: Male and female adolescents performed similarly on verbal executive functioning tasks. Generating words with a single letter as a cue was the most difficult for all participants. Compared to control adolescents and those with PEA, participants with ADHD struggled with the verbal fluency test, suggesting that ADHD stems from inefficient functioning of the dorsolateral frontal cortex. This group also struggled with deductive reasoning and hypothesis testing skills suggesting dysfunction in the left lateral and medial frontal cortex. Skills involving interpretation of phrases, question formulation, and switching tasks were not impaired by ADHD or PEA. Verbal Executive Functioning appears to be disrupted on a limited basis due to PEA and ADHD.

Correspondence: *Glena L. Andrews, Ph.D., Behavioral Sciences and Cultural Studies, Northwest Nazarene University, 623 S. University Blvd, Nampa, ID 83686. E-mail: glandrews@nnu.edu*

R. MANGUM, S. HANNA & G.L. ANDREWS. Variant Effects of ADHD and PEA on Frontal Lobe Visual Tasks.

Objective: Researchers examine adolescents' executive functions to learn about frontal lobe pruning. We compared executive functioning for visual tasks in adolescents diagnosed with attention deficit hyperactivity disorder (ADHD) and prenatal exposure to alcohol (PEA) to participants without diagnoses.

Participants and Methods: We recruited a convenience sample (both males and females) aged 13 to 22 years and administered visual tasks of the D-KEFS (Delis, Kaplan & Kramer, 2001) in one-on-one settings, assessing cognitive flexibility, inhibition, spatial planning and sequencing.

Results: Participants in both ADHD and PEA groups had significantly lower means than controls for tasks requiring executive functions related to switching, planning, impulsive response inhibition, and sequencing ability. Participants with ADHD had significantly lower means than other groups on the Trail Making Test, except on the switching condition, where those with PEA scored lowest.

Both the ADHD and PEA groups performed lower than control participants on the Tower Test. Those with ADHD had the lowest score on Move Accuracy. Those with PEA had the lowest scores on Mean 1st-move.

Conclusions: Brain development seems to follow variant pathways for adolescents with ADHD and PEA despite overlapping behaviors such as impulsiveness and thought problems. Adolescents with ADHD struggled with accurate spatial planning and impulsive response inhibition, while those with PEA slowed their responding during spatial planning. The ADHD group was slower on visual scanning tasks, while the PEA group had the most difficulty with switching tasks. This suggests that adolescents with symptoms of frontal lobe dysfunction may continue to trail their peers, despite the pruning process.

Correspondence: *Glena L. Andrews, Ph.D., Behavioral Sciences and Cultural Studies, Northwest Nazarene University, 623 S. University Blvd, Nampa, ID 83686. E-mail: glandrews@nnu.edu*

J. HOELZLE, P. MARSHALL, N. NELSON & I. THIRUSELVAM. Self-reported ADHD symptom onset and neuropsychological performance: Does age matter?

Objective: DSM ADHD diagnostic criteria require that symptoms are present prior to age 7. A proposed revision would permit diagnosis when the onset of symptoms occurs prior to age 12. This study was conducted to determine whether neuropsychological profiles differ depending on self-reported onset of symptoms.

Participants and Methods: 191 adults (64% male) were referred for ADHD assessment. A majority of participants reported symptom onset after high school ($n = 75$). Sixteen percent of the sample reported symptom onset during elementary school ($n = 55$) and smaller percentages reported symptoms beginning during high school ($n = 39$) or middle school ($n = 22$). As opposed to investigating a large number of measures, principal components analysis was conducted to identify constructs underlying the test battery. A MANOVA was conducted to determine the effect of group membership on cognitive construct scores.

Results: Four cognitive constructs were identified and reflected (1) general intelligence/working memory, (2) processing speed, (3) memory, and (4) sustained attention. The four groups obtained similar factor scores ($F [12,522] = 0.84, p = .61$). Additionally, there were no group differences on measures of task engagement ($F [12,399] = 0.98, p = .47$).

Conclusions: Overall, adults referred for neuropsychological evaluation in the context of ADHD appear similar on psychometric instruments regardless of reported ADHD onset. Despite similar performances across groups, ADHD was most frequently diagnosed when symptom onset reportedly occurred during elementary school (42%), and was least frequently diagnosed when symptom onset reportedly occurred after high school (19%). This finding is not surprising given the current diagnostic criteria. Supplemental analyses will be presented to further highlight similarities/potential differences between groups that may help explain who receives an ADHD diagnosis. Potential implications of adjusting DSM ADHD diagnostic criteria will be discussed.

Correspondence: *James Hoelzle, PhD, Psychology, Marquette University, Cramer Hall, 317, P.O. Box 1881, Milwaukee, WI 53201. E-mail: james.hoelzle@marquette.edu*

V.V. KERNE, E. WEIZENBAUM, H. BENTON & N.L. NUSSBAUM, PH.D. Social Functioning Variables in ADHD.

Objective: The purpose of this investigation was to evaluate how youth with ADHD appraise their social functioning as compared to their parents' perceptions and to assess which variables better predict poor social functioning. The primary hypothesis focused on the positive illusory bias identified in previous research where children with ADHD overestimated their social competence when compared to ratings made by parents. A second hypothesis expected externalizing behaviors to be better predictors of social problems as compared to internalizing behaviors and measures of social cognition (i.e. affect recognition and theory of mind).

Participants and Methods: Twenty-five youth (18 males and 7 females; Age: $M = 13.59, SD = 1.52$) with diagnoses of ADHD, Predominantly Inattentive (18), ADHD, Combined (4), and ADHD, Not Otherwise Specified (3) completed emotional/behavioral questionnaires and tasks related to social cognition (affect recognition and theory of mind). Ratings of the same emotional/behavioral domains were also completed by parents.

Results: An independent samples t-test was conducted to compare the social problems scale scores for parents and youth. There was no significant difference in scores for parents ($M=62.56, SD=10.23$) and youth ($M=59.7, SD=10.03; t(45) = .940, p=.352$) which did not support the positive illusory bias hypothesis. Multiple regression analyses indicated anxiety/depression made the strongest unique contribution to explain social problems as compared to measures of externalizing symptoms and tasks of social cognition.

Conclusions: The present sample of youth with ADHD had symptoms of anxiety and depression which negatively impacted their ability to form meaningful social relationships. The results suggest that a comprehensive neuropsychological evaluation also include an assessment of emotional functioning in order to rule out the possible negative impact of internalizing or externalizing behaviors on social functioning.

Correspondence: *Valerie V. Kerne, M.A., Counseling Psychology, The University of Texas at Austin, 1 University Station D5800, Austin, TX 78712-0383. E-mail: vanhornkerne@mail.utexas.edu*

J. KLAVER & M.Y. KIBBY. Anatomical Correlates of Executive Functioning in Children with Attention-Deficit/Hyperactivity Disorder and Developmental Dyslexia.

Objective: The purpose of this study was to examine the relationship between caudate size and executive functioning (EF) in children with Attention-Deficit/Hyperactivity Disorder (ADHD) and developmental dyslexia (DD). It was hypothesized that more extreme rightward asymmetry of the caudate nucleus head and leftward asymmetry of the body would be related to ADHD based upon prior literature; the relationship for DD was exploratory given the dearth of research on this topic. It also was expected that children with ADHD and children with DD would be impaired on measures of EF, being a potential source of the comorbidity between the 2 disorders.

Participants and Methods: Participants included 105 children who completed a full-day neuropsychological battery and a structural MRI scan. The caudate was traced following the methods of Filipek et al. (1997). Statistics were conducted using 2 (ADHD or not) X 2 (DD or not) MANOVA.

Results: ADHD had greater rightward asymmetry of the caudate head, but not greater leftward asymmetry of the body, when compared to those without ADHD. There were no differences in caudate asymmetry or size for DD. An exploratory factor analysis of the data revealed 3 EF factors: EF abilities in the home, problem solving/perseveration, and working memory/fluency. ADHD and DD were more impaired than those without each disorder on EF abilities in the home and working memory/fluency. Moreover, left caudate volume was related to verbal working memory, although not significantly so ($p = .06$).

Conclusions: Results indicate that caudate head asymmetry is related to diagnosis of ADHD but not DD. Nonetheless, poor EF may be a shared deficit in ADHD and DD, helping to explain the comorbidity between the two disorders. Thus, further research is indicated on the frontostriatal circuit in DD and ADHD, especially the frontal lobes, to determine biological mechanisms that may underlie the shared EF deficits. The caudate may be a more unique contributor to ADHD.

Correspondence: *Jacqueline Klaver, M.A., Southern Illinois University Carbondale, 1829 Spruce St, Murphysboro, IL 62966. E-mail: jklaver@siu.edu*

T. KORIAKIN, M. RYAN, L. FERENC, S. MOSTOVSKY, M. DENCKLA & M. MAHONE. Increased Intra-Subject Variability (ISV) in ADHD Differs as a Function of Test Format and Stimulus Modality.

Objective: investigate the effects of task format (simple reaction time vs. go/no-go), interstimulus interval (fixed vs. jittered) and stimulus modality (auditory vs. visual) on intra-subject response time variability in children with ADHD.

Participants and Methods: 85 participants (48 with ADHD-28 male; 37 controls-16 male) completed computerized simple reaction time (SRT) and go/no-go (GNG) tests in both visual and auditory modalities, using a "jittered" (variable) interstimulus interval (ISI) format. Participants also completed GNG tests with a fixed interstimulus interval. For visual modality, children pressed the spacebar for green spaceships ("go") but not for red ("no-go"). For auditory modality, children pressed the spacebar for a frog ("go"), but not for a cat sound ("no-go"). SRT tests used only "go" stimuli. For the fixed ISI format, stimuli were presented every 1500 msec; for the jittered, the ISI varied 33% around the 1500 msec anchor (i.e., 1000-2000 msec). All GNG tests used a 3:1 go:no-go stimulus ratio. All six tests were 8 minutes in length and completed over a two-day period. ISV was calculated as (sd/mean) of reaction times for correct "hits".

Results: Separate repeated measures ANOVAs were conducted for SRT, GNG-fixed, and GNG-jittered formats, with stimulus modality as the within groups factor and diagnosis as the between groups factor. For SRT, there was a trend ($p=.06$) for group-by-modality interaction, with significant group differences ISV (ADHD>control) observed in auditory ($p<.05$), but not visual. For both GNG tests, there were significant modality effects (both $p<.05$), with auditory ISV>visual ISV but no significant group or group-by-modality interaction effects.

Conclusions: Children with and without ADHD demonstrate greater intra-subject variability when responding to auditory, compared to visual stimuli, with this effect most pronounced on GNG tests. The greater ISV for auditory stimuli may be a function of these cues being less "over-learned" than the associations with visual stimuli.

Correspondence: *Taylor Koriakin, Neuropsychology, Kennedy Krieger Institute, 1750 E. Fairmount Ave, Baltimore, MD 21231. E-mail: koriakin@kennedykrieger.org*

A.M. LYONS USHER, S.C. LEON, L.D. STANFORD & K.B. SCHELLINGER. Use of Measures of Executive Functioning with Children and Adolescents with Attention-Deficit/Hyperactivity Disorder (ADHD).

Objective: The aim of this study was to assess two measures of executive functioning in a sample of youth with ADHD. The TEA-Ch is a performance-based, objective measure of executive functioning, and the BRIEF is a subjective, parent-report measure. These measures have undergone confirmatory factor analysis (CFA) using normative samples and mixed clinical groups, but neither measure has been examined with an ADHD sample. This is particularly important because of the significant deficits in executive functioning typically exhibited by this population. The current study used CFA to establish the factor structures of these measures, and it was hypothesized that a three-factor model would provide good fit to the data for the TEA-Ch, whereas a two-factor model would be appropriate for the BRIEF.

Participants and Methods: Participants included 181 children and adolescents diagnosed with ADHD ages 6-15 and their parents. Exclusionary criteria included a FSIQ < 75 or a diagnosis of a neurological condition (e.g., seizures). Youth completed the TEA-Ch as part of an assessment battery, and their parents completed the BRIEF.

Results: The factor structure of executive functioning measures was examined using CFA via LISREL 8.80. A measurement model of the TEA-Ch consisting of three correlated factors was supported in the current study. For the BRIEF, a measurement model consisting of two correlated factors was supported; additional model modifications were needed to achieve adequate fit. Thus, a two-factor model that allowed the Monitor subscale to load on both factors, as well as allowed the measurement errors for the Monitor and Inhibit subscales to correlate provided good fit to the data.

Conclusions: Results were consistent with previous research indicating a three-factor model of the TEA-Ch using a normative sample and a two-factor model of the BRIEF using normative and mixed clinical groups. The present study suggests that the use of these measures of executive functioning is appropriate for ADHD samples.

Correspondence: *Amy M. Lyons Usher, Loyola University Chicago, 1032 W Sheridan Rd., Chicago, IL 60660. E-mail: alyons1@luc.edu*

M.E. MCKNIGHT & V.P. CULOTTA. Intellectual, Academic, and Neurocognitive Stability of Neuropsychological Findings in School-Age Children with ADHD.

Objective: Few studies have examined repeat neuropsychological evaluations in children with ADHD who have implemented a variety of interventions. This study assessed test/retest stability in students diagnosed with ADHD by pairing initial evaluations with subsequent re-evaluations and controlling for comorbid conditions. It was hypothesized that there would be no significant discrepancies between the initial and paired neuropsychological profiles.

Participants and Methods: This study examined 37 school-aged children consecutively referred to an outpatient neuropsychological prac-

tice for assessment and subsequently diagnosed with ADHD and re-evaluated over a minimum 3-year interval. Each child implemented either a medicinal, academic, or educational intervention during the interval. Each child's initial scores were compared against his/her scores from reevaluation on measures of intellectual, academic, neuropsychological, and behavioral function. Evaluative measures included the WISC IV, WJ III, GPP, RCF, VMI, WRAML, Word Fluency Test, and CBCL.

Results: Paired two tailed t-tests revealed no statistically significant discrepancies between test/retest reliability for school-aged children diagnosed with ADHD irrespective of intervention type.

Conclusions: Assessment of test/retest stability in children diagnosed with ADHD irrespective of interventions revealed no significant discrepancies over a minimum 3-year interval. This finding counters the notion that children diagnosed with ADHD are at risk for progressive difficulties in the development of intellectual, academic, neuropsychological, and behavioral skills. Discussion will address issues of broader identification, intervention, and prognosis.

Correspondence: *Vincent P. Culotta, Ph.D., NeuroBehavioral Associates, 5565 Sterrett Pl, Suite 320, Columbia, MD 21044. E-mail: vculotta@nbatests.com*

L. MIAMI & E. MOES. Fatigue Enhances Stimulus-Driven Attention.

Objective: Prior studies that have explored the impact of mental fatigue on attention to unexpected stimuli suffer from methodological limitations. Further, the neurochemical mechanisms underlying mental fatigue are not well understood, though insufficient dopamine levels in certain frontal cortical structures may be involved. The current study examined the effect of mental fatigue on stimulus-driven attention using an inattentive blindness (IB) task. It was hypothesized that fatigued individuals would be more distractible, and thus more likely to detect an unexpected stimulus during the IB task than non-fatigued individuals.

Participants and Methods: Eighty-one healthy, well-rested undergraduates were administered baseline measures of fatigue and sleepiness, a dopamine-dependent task (Finger Tapping Test), and a non-dopamine dependent task (single word reading). The experimental group then completed an 80-minute sustained attention task to induce fatigue, while the control group watched neutral videos. Finally, the baseline measures were re-administered to both groups, followed by an IB task.

Results: A clear decrement in performance over time on the sustained attention task was observed, as well as increases in fatigue and sleepiness ratings from Time 1 to Time 2 in the experimental group. The experimental group also reported higher levels of fatigue following the manipulation than the control group, with a trend toward higher sleepiness ratings. On the IB task, fatigued participants were more likely to report seeing the unexpected stimulus than controls. As expected, scores on the reading task stayed the same pre-and-post manipulation, however, there was an unexpected increase in performance on the motor (dopamine-dependent) task.

Conclusions: This study showed that fatigued individuals respond to their environment in a more stimulus-driven fashion than do non-fatigued individuals. This may have implications for treatment with populations affected by fatigue. A possible underlying dopaminergic mechanism is considered.

Correspondence: *Lindsay Miami, Master's, Suffolk University, 35 Sciarappa St., Unit 1, Cambridge, MA 02141. E-mail: lmiarmi@hotmail.com*

A.E. MLODNICKA, S. O'NEILL, D. MARKS, K. RAJENDRAN, R. SCHNEIDERMAN, B. BASU & J. HALPERIN. Longitudinal Impact Of Service Use On Neuropsychological Functioning, ADHD Symptom Severity, And Social Skills In Preschoolers With Inattention/hyperactivity.

Objective: Children with inattention/hyperactivity are large consumers of school-based interventions, including occupational therapy (OT), physical therapy (PT), and speech and language therapy (ST); however, their prospective utility vis-à-vis neurocognition, ADHD symptom severity, and interpersonal functioning has yet to be systematically examined.

Participants and Methods: The current study evaluated the impact of OT, PT, and ST on neuropsychological functioning (NEPSY), parent and teacher ratings of inattention and hyperactivity/impulsivity, and parent- and teacher-rated social skills over a 2-year-period. Preschool children [N = 91; M (SD) age = 4.27(.50) years] with inattention/hyperactivity were recruited into a longitudinal study and divided into those receiving and not receiving OT, PT or ST. None of the children were receiving psychostimulant treatment for ADHD.

Results: Two (school-based intervention) by 2 (time) ANOVAS with repeated measures indicated that neither service provision nor the number of services provided had a positive impact on neuropsychological functioning, inattention or hyperactivity/impulsivity. However, children who received ST showed improvement in both parent- and teacher-rated social skills.

Conclusions: Otherwise, the interventions under study conferred no appreciable benefit to youth with inattention/hyperactivity. These primarily negative results call for further investigation and raise the possibility that policy decisions may need to be modified.

Correspondence: *Agnieszka E. Mlodnicka, B.A., B.S., Psychology, The Graduate Center, CUNY, 65-30 Kissena Blvd, New York, NY 11367. E-mail: amlodnicka@gmail.com*

A. NORRIS-BRILLIANT, A. RUDD-BARNARD, M. NABOZNY & P. PRAMATARIS. A Comparison of Comorbidity in Attention Deficit Hyperactivity Disorder Subtypes in a Low Income Urban Population.

Objective: A number of studies have indicated children with ADHD-combined type have a higher rate of externalizing (ODD, CD) Oppositional Defiance Disorder, Conduct Disorder or other Disruptive Behavior Disorders compared to children with ADHD-inattentive type. Studies have also indicated that children diagnosed with ADHD Combined Type are more likely to be diagnosed with learning disabilities and speech language delays (Weiss et al, 2003; Nolan et al, 2001; DSM, 2004). The current study investigated the presence of comorbidities of internalizing and externalizing behavior disorders, as well as learning disabilities and speech language delays in low income, urban children diagnosed with ADHD-CT and ADHD Inattentive Type. See how the low income, urban population compared to national averages.

Participants and Methods: The participants were all low income, urban children ages 5-17, who were classed into two groups. The groups consisted of children 1) diagnosed with ADHD Combine Type (n=59) and 2) ADHD Inattentive Type (n=41).

Results: The results of the study indicate that children diagnosed with ADHD Combined Type were not more likely to be diagnosed with externalizing or internalizing behavior disorders. However, they were more likely to be diagnosed with Disorder of Written Expression.

Conclusions: Potential etiologies and implications are discussed.

Correspondence: *Ami Norris-Brilliant, PsyD, Lenox Hill Hospital, 210 East 64th St, New York, NY 11215. E-mail: aminorris@gmail.com*

A. RUDD-BARNARD, A. NORRIS-BRILLIANT, M. NABOZNY & P. PRAMATARIS. A Comparison of Cognitive Profiles of Attention Deficit Hyperactivity Disorder Combined Type and Attention Deficit Hyperactivity Disorder Inattentive Type.

Objective: A number of studies have suggested that ADHD Inattentive Type is a distinct disorder from ADHD Combined and ADHD Hyperactive Type and that these patients have a distinct cognitive profile (Millich, Ballentine, & Lynam, 2006). The current study investigated the differences in WISC-IV index scores and BEERY VMI scores in low income, urban children diagnosed with ADHD Combined Type and ADHD Inattentive Type, and whether those differences are suggestive of diagnostic category.

Participants and Methods: The participants were all low income, urban children ages 6-16, who were classed into two groups. The groups consisted of children 1) diagnosed with ADHD Combine Type (n=59) and 2) ADHD Inattentive Type (n=41). Participants were given the WISC

IV, and the Beery Buktenica Test of Visual Motor Integration. Researchers conducted MANOVA to assess group differences. Assignment to a diagnostic category was primarily based upon DSM-IV diagnostic criteria via parent checklist, and when not available based upon patient history and neuropsychological testing.

Results: The results of the study indicate that children diagnosed with ADHD Inattentive Type did not have significant differences in scores on the WISC IV VCI, PRI, WMI, PSI or on the Beery Buktenica VMI. While MANOVA did not reveal significant findings, mean differences between the groups were in the expected directions.

Conclusions: These findings are in contrast to previous studies which support a distinctive cognitive profile for ADHD Inattentive Type vs. ADHD Combined Type. Implications are discussed.

Correspondence: *Ani Norris-Brilliant, PsyD, Lenox Hill Hospital, 210 East 64th St, New York, NY 11215. E-mail: aminorris@gmail.com*

K.M. O'BRIEN, T. ANTONINI, M. NARAD & J. EPSTEIN. Examining the Relationship Between Sluggish Cognitive Tempo and Performance on Computerized Neuropsychological Tasks.

Objective: Experts suggest that sluggish cognitive tempo (SCT) may identify a subgroup of children with ADHD/predominantly inattentive type (ADHD/I). SCT describes persons who seem to be in a fog and are slow to respond. Few studies have been conducted examining neuropsychological correlates of SCT. Of those few studies that exist, results have been mixed possibly due to the variety of tasks used across studies. The present study's objective was to examine the relationship between SCT and performance across five neuropsychological tasks. Mixed literature results prevent us from hypothesizing that those with higher SCT scores would display slower, more variable reaction times and inaccurate responding.

Participants and Methods: Ninety-four children with ADHD/I or ADHD/C subtype, and 48 typically developing (TD) children completed computerized choice discrimination, n-back, go/no-go, flanker, and stop signal tasks. Overall reaction time mean, variability (SD), ex-Gaussian tau, and percent accuracy were computed. Teachers completed a 12-item SCT questionnaire.

Results: Between-group analyses of SCT scores revealed controls had the lowest SCT scores, the ADHD/I group had the highest, and the ADHD/C group was in-between. All groups were significantly different from one another. Linear mixed modeling indicated that SCT scores were not significantly associated with performance measures across the neuropsychological tasks.

Conclusions: Consistent with some literature utilizing teacher ratings of SCT, results show SCT scores are not associated with neuropsychological performance measures. The current study contributes to the small literature on SCT and neurocognitive functioning and highlights the need for research to better define SCT or discover neurocognitive patterns that better correlate with SCT.

Correspondence: *Kathleen M. O'Brien, Bachelor of Arts, Psychology, University of Cincinnati, 6611 Greenfield Drive, Cincinnati, OH 45224. E-mail: kateo2004@yahoo.com*

B. RABINOVITZ, K. RAJENDRAN & J.M. HALPERIN. The Influence of Developing Executive Control on the Relationship Between Temperament and ADHD.

Objective: Research examining neuropsychological factors that mediate the links between early "difficult" temperaments and later ADHD is limited by a cross-sectional approach and the use of the same informant to assess temperament, the purported mediator, and psychopathology. This study utilized longitudinal data and objective neuropsychological measures. It was hypothesized that high levels of negative emotionality during the preschool years would be associated with greater ADHD symptom severity in later childhood. However, executive control, as measured by tests of working memory, would influence the impact of early temperament on later symptom severity.

Participants and Methods: Children (N=148) with and without ADHD were evaluated at three time-points. Parent and teacher ratings of tem-

perament were obtained at ages 3-4, WISC-IV Working Memory Index (WMI) at age 6, and ADHD symptoms assessed by the Kiddie-SADS at age 7. Pearson correlations examined the relations among parent and teacher ratings of negative emotionality, WMI, and ADHD symptom severity over time. Hierarchical linear regression analyses then examined whether working memory mediated the relationship between early temperament and later ADHD symptoms.

Results: All measures were significantly inter-correlated (all $p < .05$). Negative emotionality as rated by parents and teachers significantly predicted ADHD symptoms. Furthermore, both regression coefficients (parent and teacher) between negative emotionality and ADHD severity decreased substantially when controlling for WMI.

Conclusions: These findings indicate that early negative emotionality predicts later ADHD severity and that the development of verbal working memory mediates this relationship. Early preventive interventions aimed at enhancing verbal working memory may diminish later ADHD severity.

Correspondence: *Beth Rabinovitz, Psychology, The Graduate Center, The City University of New York, 365 Fifth Avenue, New York, NY 10016. E-mail: bethrabinovitz@hotmail.com*

B. RENNIE, S. HALL, M. BEEBE-FRANKENBERGER & H. SWANSON. A Three-year Longitudinal Study of Change in Working Memory and Response Inhibition in Elementary-aged Children with ADHD.

Objective: This poster session will present the results of a three-year, longitudinal study conducted in two California school districts. This study investigated the development of cognitive variables with demonstrated importance for children with and without ADHD: working memory (WM) and response inhibition (RI).

Participants and Methods: Students were drawn from a community-based sample of first through third graders who were followed for three years (third through fifth grades). The sample consisted of 35 students who were selected from the overall sample as "at-risk" for ADHD due to elevated scores on ADHD rating scales from multiple raters. These students were matched with 35 students without elevated ADHD ratings from the sample population on the basis of IQ, gender, and grade-level. Assessments utilized in this study included a digit span task to measure WM and a random generation of letters task to assess RI. Scores for both groups were compared at baseline and at two years later.

Results: Several significant findings emerge with respect to cognitive development of children with ADHD. Differences were found between the children with ADHD and controls in both WM and RI, with the ADHD group being significantly lower at both time points on both measures. Additionally, there was a trend that WM declined over time in the ADHD group while RI, although lower, followed a similar trajectory.

Conclusions: Findings enhance our understanding of the relationship between ADHD and cognitive variables and have theoretical and practical implications.

Correspondence: *Brandon Rennie, Ed.S., School Psychology, University of Montana, 509 west alder st Unit 1, 509 west alder st Unit 1, Missoula, MT 59802. E-mail: brandon.rennie@umontana.edu*

H.T. SCHOFIELD & D.M. EASON. Comparison of Two Stroop Color-Word Test Interference Scores in Youth With and Without ADHD.

Objective: Inhibition, including interference control, has been posited as a core deficit in ADHD. The Stroop Color-Word Test has been used to study interference control deficits in ADHD, with inconclusive results obtained across studies partially due to variation in age and ADHD type. We sought to further clarify associations between the Interference score and ADHD, and compare two methods of Interference score calculation: Golden's (1978) method and a new method suggested by Chafetz & Matthews (2004), which claims a stronger emphasis on inhibition, greater control for reading abilities, and developmental consideration. No published studies have compared these two Interference score methods in a child population.

Participants and Methods: Subjects were 85 children who completed neuropsychological evaluations in an outpatient clinic. Exclusion criteria included a Full Scale IQ score < 76, developmental delays, and neurological disorders. Subjects were 7-16 years old, 61% male, and 82% Caucasian. A quarter of the sample was on medication. Results from the Stroop were scored according to both sets of guidelines and converted to T-scores.

Results: Data analyses were completed in SPSS. T-tests indicate that there was a near-significant effect for ADHD status in the Chafetz & Matthews score, with higher scores for non-ADHD youth overall ($t(83) = -1.85, p = .07$) and in unmedicated youth ($t(62) = -1.87, p = .06$). Similar findings were not obtained for the Golden Interference score. There were no significant differences in scores between ADHD types. A one-way ANOVA indicated no significant main effect for ADHD status for either Interference score.

Conclusions: While was some evidence for emerging differences between ADHD and non-ADHD youth (particularly in an unmedicated subsample), larger samples of medication-naïve ADHD and non-ADHD youth should be examined in order to determine whether this new method of score calculation may be of particular use for children and adolescents.

Correspondence: *Hannah-Lise T. Schofield, Ph.D., Department of Psychiatry, Allegheny General Hospital, 4 Allegheny Center, 5th Floor, Pittsburgh, PA 15212. E-mail: htschofield@gmail.com*

E. STAIKOVA, H. GOMES, V. TARTTER, A. MCCABE & J. HALPERIN. And the Snowman Melted: Narrative Discourse Profiles of Children with ADHD.

Objective: To evaluate narrative discourse profiles of children with and without ADHD and their relation to pragmatic language skills.

Participants and Methods: Participants (Mean (SD) age = 8.88 (1.49) years) were recruited from an ongoing longitudinal study of ADHD and were classified as either ADHD ($N = 27$) or typically developing (TD; $N = 36$) based on parent and teacher ratings on the ADHD-RS-IV and the K-SADS-PL parent interview. Children were presented with a wordless picture book "The Snowman" (Briggs, 1978) and asked to produce a narrative describing the story depicted in the book. With parental consent, children's narratives were recorded and subsequently transcribed verbatim and analyzed using the Narrative Assessment Profile procedure (NAP; Bliss, McCabe, & Miranda, 1998). The narratives were rated on topic maintenance, event sequencing, informativeness, conjunctive cohesions, referencing, and fluency. Children were also administered the Pragmatic Judgment subtest from the Comprehensive Assessment of Spoken Language (CASL) and Test of Pragmatic Language, Second Edition (TOPL-2) to assess their pragmatic language skills.

Results: Multivariate analyses of variance indicated that the narratives of children with ADHD were characterized by problems with event sequencing and using proper referencing. These difficulties were consistent with performance on measures of pragmatic language.

Conclusions: Children with ADHD demonstrated poorly organized narratives compared to their typically developing peers providing further evidence of pragmatic language deficits.

Correspondence: *Ekaterina Staikova, M.A., Psychology, The Graduate Center/Queens College, CUNY, 65-30 Kissena Blvd., Flushing, NY 11367. E-mail: ekaterina_staikova@yahoo.com*

M. STERN, A. PALAV & S. PROVENCAL. Incremental Validity of the D-KEFS in Diagnostic Assessment of Adolescents with ADHD.

Objective: Common practice for neuropsychologists in diagnosing ADHD is to assess core symptoms of inattention and hyperactivity as well as executive functioning (EF), though assessment of EF is not mandatory for diagnosis. Given controversy in the community regarding battery length and difficulties in obtaining reimbursement for such evaluations, the purpose of the current study was to assess the incremental validity of several D-KEFS tasks above and beyond briefer measures in diagnosing ADHD in adolescents.

Participants and Methods: Data was taken from a larger database containing clinic patients who presented for neuropsychological evaluations for a variety of presenting problems. The sample included 211 adolescents between the ages of 13-19 who had completed the measures used in analyses. 63% of the sample was male and 107 had a diagnosis of ADHD.

Results: Logistic regressions were utilized to evaluate the relative contribution of various D-KEFS subtests to diagnostic category above and beyond that of other measures (e.g., the BRIEF, CPT, and Conners' Rating Scales). Results suggested that the D-KEFS subtests, including Tower, 20 Questions, and Trails, did not demonstrate adequate incremental validity in determining ADHD group membership within this clinical sample.

Conclusions: In the current analysis the D-KEFS did not add additional information beyond short measures such as the BRIEF in the determination of ADHD in a clinical sample. However, the D-KEFS may offer additional information (e.g., providing data on problem solving skills) that continues to make the measure a useful and viable aspect of a neuropsychological battery. Such issues should be evaluated in further research.

Correspondence: *Melissa Stern, Memorial Hospital, Brown University, 75 S. Union Street, #210, Pawtucket, RI 02860. E-mail: mstern1981@yahoo.com*

K. LUPAS & J. SUHR. Stimulant Medication Does Not Normalize Frontal Lobe Hypoactivation in Adult ADHD.

Objective: Recent studies have suggested stimulant medication normalizes frontal-striatal hypoactivation in children with Attention Deficit Hyperactivity Disorder (ADHD). We examined whether similar findings would emerge in young adults with ADHD.

Participants and Methods: Participants were young adults with ADHD, 10 taking stimulant medications and 17 not, compared to 30 healthy controls. Groups were not different in age or gender. The two ADHD groups were not different in age at diagnosis or self-reported current inattention or hyperactivity/impulsivity symptoms (based on CAARS). All participants completed an n-back task (1-back and 2-back) while having dorsolateral prefrontal cortex oxygenation measured by Near Infrared Spectroscopy.

Results: Collapsed across n-back conditions, those on medications performed worse than controls ($p < .05$). However, all groups showed a similar decline in performance from 1-back to 2 back. With regard to frontal lobe oxygenation at baseline and during each n-back condition, 3 (group) by 3 (condition) mixed measures ANOVA showed a significant effect of condition, $p = .007$ and a significant interaction between group and condition, $p = .05$. Examination of interaction revealed that medication status was generally irrelevant to frontal lobe hypoactivation in ADHD. Both ADHD groups were lower in baseline and 2-back frontal lobe oxygenation. While controls increased in oxygenation across conditions, those off medications showed no change in activation across conditions, while those on medication significantly increased in oxygenation from baseline to 1-back, and then plateaued.

Conclusions: Overall, results suggest that medication status was not related to normalization of frontal lobe hypoactivation patterns young adults with ADHD.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

K. LUPAS & J. SUHR. The Relation of Symptom Subtype to Frontal Lobe Activation in Adult ADHD.

Objective: To our knowledge, there is limited data on differential neuroimaging profiles in ADHD as a function of ADHD subtype. In the present analyses, we examined whether symptoms of Inattention or symptoms of Hyperactivity/Impulsivity were differentially related to dorsolateral frontal lobe oxygenation patterns during the Stroop Color and Word Task, as measured by Near Infrared Spectroscopy.

Participants and Methods: Participants were in 27 young adults diagnosed with ADHD. The sample was first divided into individuals

who reported clinically high ($T=70$ or more) current Inattentive symptoms ($N=20$) versus normal range symptoms, and then was divided by those who reported clinically high Hyperactive/Impulsive symptoms ($N=20$) versus normal range symptoms. Groups were compared on oxygenation during baseline, during Stroop reading, and during Stroop interference tasks.

Results: Individuals with clinically high Inattentive symptoms showed an overall increase in cerebral oxygenation across conditions, while those with low current Inattentive symptoms showed a decrease, interaction $p = .008$. Individuals clinically high in Hyperactive/impulsive symptoms were hypoactive across all conditions, relative to those who were clinically low, $p = -.05$.

Conclusions: Results suggest that different components of ADHD relate differently to cerebral activation patterns in ADHD and add to the increasing evidence that these components of ADHD likely reflect heterogeneous clinical groups.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

C. WEI & J. SUHR. The Effects of Response Expectancies on Task Performance in Adults Concerned about ADHD.

Objective: Stereotype and diagnosis threat literature suggests cueing negative response expectancies can result in diminished performance on cognitive tests. In the present study, we examined whether individuals would perform differently on tasks based on their beliefs about what the task assessed.

Participants and Methods: Participants were 41 college students who were concerned that they might have Attention Deficit Hyperactivity Disorder, reported > 50 th percentile scores on CAARS DSM-IV Inattentive symptoms and did not have high scores on the Inconsistency subscale. Participants were randomly assigned to complete the Speech Sounds Perception Test with instructions that it was a hearing screener to be completed prior to an ADHD measure ($n=15$), versus instructions that it was an attention measure ($n=26$).

Results: Performance on the Speech Sounds Perception Test was divided into "impaired" (scoring > 1 SD above the mean in number of errors relative to the sample) versus "unimpaired." None of the individuals in the hearing condition scored in the impaired range, while 5 of the individuals in the attention condition were impaired (Likelihood Ratio 4.95, $p=.026$). In the hearing group, more errors on the SSPT were related to less concern about having ADHD, $r=-.39$, while in the attention group, performance was not related to ADHD concern, $r=-.06$. In the hearing group, there was no relationship between errors and self-perceived performance, $r=.15$, while in the attention group, more errors were related to lower perceived performance, $r=-.33$.

Conclusions: Results suggest performance on this relatively easy cognitive task was influenced by participant expectancies about the diagnosticity of the test.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

E. BOLINGER, J. DYKSTRA & J. SUHR. Impaired Performance on the TOVA is not Specific to ADHD.

Objective: The Test of Variables of Attention (TOVA) is commonly used in assessment of child and adult Attention Deficit Hyperactivity Disorder (ADHD). Research suggests the TOVA ADHD Score accurately identifies individuals (predominantly children) with ADHD, with 90% specificity to healthy controls. However, accuracy of the ADHD Score in adult ADHD referrals and comparison to clinical control samples is unknown.

Participants and Methods: We compared young adults referred for ADHD and who met diagnostic criteria for ADHD to 1) referred adults who met criteria for probable malingering, 2) referred adults who met criteria for psychological diagnoses, 3) referred adults who met no diagnostic criteria, and 4) healthy controls on the TOVA. All referred adults were administered the TOVA as part of a full neuropsychological assessment; healthy controls were administered the TOVA as part of a full neuropsychological research battery.

Results: The ADHD Score was unable to discriminate among these groups. While the ADHD group did worse than the healthy controls, $p<.004$, so did the malingers, $p<.001$ and the psychological controls, $p<.05$. The ADHD group also performed worse than the no diagnosis controls, $p<.05$, but were indistinguishable from malingers, $p=.68$, and psychological controls, $p=.18$. When using recommended clinical cutoffs for the ADHD Score, 100% of ADHD adults were identified; however, so were 100% of malingers, 64% of psychological controls, 50% of no diagnosis controls, and 11% of healthy controls.

Conclusions: Overall, results suggest that impairment on the TOVA, like other continuous performance measures, is not specific to ADHD, limiting its usefulness in ADHD assessment.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

M. VASSERMAN, P. VEKARIA, E. MILES-MASON, N. HOCHSZTEIN & W. MACALLISTER. Neuropsychological Endophenotypes in Developmental ADHD Versus ADHD in Epilepsy.

Objective: ADHD is a frequently occurring comorbidity in children with epilepsy, occurring perhaps five times more frequently in these children than in the general population. Despite the similarities in behavioral ratings of attention and hyperactivity concerns, researchers have speculated that the neuropsychological endophenotype of developmental ADHD may differ from ADHD as it occurs in the context of epilepsy. The present study examined attention and working memory in these populations to determine the similarities and differences in developmental ADHD and ADHD in children with seizures.

Participants and Methods: Participants included 80 clinically referred children (mean age of 10.87). Sixty-five percent were boys and mean IQ of the group was 100.35 ($SD=15.41$). Participants were divided into four groups: developmental ADHD-Primarily Inattentive Type ($n=20$), developmental ADHD-Combined Type ($n=23$), ADHD-Primarily Inattentive Type with epilepsy ($n=24$), and ADHD-Combined Type with epilepsy ($n=13$). As part of a comprehensive neuropsychological evaluation, participants received an assessment of intellectual function as well as digit span and the CPT-2. Variables included age, IQ, digit span scores, CPT-2 omissions, commissions, and reaction time. Given the small sample size, data were analyzed via a series of independent samples t-tests. Effect size estimates were also considered.

Results: Independent samples t-tests showed that age was comparable across the groups, but the epilepsy sample showed lower IQs in both the ADHD-I and ADHD-C samples ($t = 3.19$, $p = .003$; $t = 3.63$, $p = .001$). Considering neuropsychological endophenotypes, the epilepsy group showed lower digit span forward scores (ADHD-I, $t = 2.72$, $p = .010$; ADHD-C, $t = 3.99$, $p < .001$) and the ADHD-I group with epilepsy showed fewer commission errors on the CPT-2 ($t = 2.194$, $p = .035$).

Conclusions: Though there are many similarities between the presentations of developmental ADHD and ADHD secondary to epilepsy, the neuropsychological endophenotype differs slightly.

Correspondence: *Pooja Vekaria, Ph.D., New York University Langone Medical Center, 577 First Avenue, New York, NY 10016. E-mail: pooja.vekaria@nyumc.org*

K.L. WIHK, K.A. FRENN, A. HERRERA & M.R. GUNNAR. Inhibition, Selective Attention, and Parent Reported ADHD Symptoms in 5-Year-Old Internationally Adopted Children.

Objective: Children internationally adopted into the United States experience a variety of pre-adoptive settings, including institutional/orphanage care and family-based/foster care. Prolonged time in institutional/orphanage care is associated with increased risk for developmental problems, including difficulties with attentional and behavioral control and increased rates of ADHD. While parent and teacher report has been widely used in prior studies, limited research has evaluated post-institutionalized (PI) children's performance on laboratory or clinic-based measures of inhibition and selective attention.

Participants and Methods: The current study examined the performance of a community sample of 5-year-old children ($N=102$, 74 female) on two computerized tasks: a visual continuous performance (go/no-go) task and a color-based flanker task. Parent reported ADHD symptoms on the MacArthur Health and Behavior Questionnaire were also examined. Four groups were compared: PI children adopted at 10-16 months of age (Early PI), PI children adopted at 18-37 months of age (Later PI), children adopted from foster care (FC) at <18 months of age, and non-adopted children (NA). The PI and FC groups were adopted from diverse regions including Asia, Eastern Europe, and Latin America.

Results: Few children in any group were reported to display clinically elevated ADHD symptoms. Early PI children exhibited increased hyperactive/impulsive symptoms per parent report, but these concerns did not translate into difficulties on behavioral tasks. Later PI children displayed poorer accuracy on both attention tasks and slower reaction time on the go/no-go measure, despite no elevation in parent reported ADHD symptoms. The FC group did not differ from non-adopted children on any measure.

Conclusions: Results indicate a complex picture of attention problems in children who have experienced prolonged institutional care. More research is needed to characterize the precise pattern of these difficulties and to identify underlying neural mechanisms.

Correspondence: *Kristen Wüik, University of Minnesota, MMC Box 486, 420 Delaware St. SE, Minneapolis, MN 55455. E-mail: wüik0002@umn.edu*

J.B. WILLIAMSON, B.D. BURTIS, S. HAQUE, M. HARCIAREK, D. ESTALILLA & K.M. HEILMAN. Chronic Left Parietal but not Chronic Right Hemisphere Lesions are Associated with an Ipsilesional Spatial Bias.

Objective: Whereas right parietal strokes often results in left-hemispatial neglect, this rightward bias most often resolves in several weeks. It is, however, unknown how chronic lesions in other areas of the brain impact spatial attention. Thus, in this study, we assessed patients with chronic left parietal strokes for the presence of spatial neglect.

Participants and Methods: We compared bisection performances in patients with chronic strokes (at least 6 months post-onset) including 4 patients with left parietal strokes and 12 patients with right hemisphere strokes. Patients were administered 100 line bisections, some with lateral distracting stimuli (flashing lights) on the left side, right side, both sides, or neither side.

Results: Using a one-way ANOVA, we found that patients with left parietal strokes, in the non-distractor condition, demonstrated significant leftward deviation (right hemispatial neglect), but patients with right hemisphere strokes did not reveal neglect $F(1, 15) = 6.426, p = .024$. Trends were observed in distraction conditions, but were not significant.

Conclusions: We demonstrated that patients with chronic left parietal lesions, when compared to those with chronic right hemisphere lesions have a pronounced ipsilesional deviation. This hemispheric asymmetry of neglect in this more chronic state is opposite to that observed in patients with acute stroke. With line bisections, healthy people demonstrate a leftward spatial bias (pseudoneglect) presumably due to right hemispheric attentional dominance and a chronic injury to the left parietal lobe may enhance this relative right hemispheric leftward spatial bias.

Correspondence: *John B. Williamson, Ph.D., Neurology, University of Florida, 8114 SW 53rd Place, Gainesville, FL 32608. E-mail: john.williamson@neurology.ufl.edu*

J. BRAVO, B. RUBIO & S. HERNÁNDEZ. Psychological profile and executive functions in adults with Attention Deficit and/or Hyperactivity Disorder.

Objective: Attention Deficit Hyperactivity Disorder (ADHD) is one of the most widely studied childhood disorder. However, there are relatively few studies of the clinical and neuropsychological profile of adults with ADHD. The aim of this work is to study executive functions and the psychological profile in a group of adults with ADHD.

Participants and Methods: 13 ADHD (mean age=31.15; SD=9.42) and 10 controls (mean age=30.10; SD=8.71) were assessed. All subjects had normal IQ. The neuropsychological protocol was formed by: Paced Auditory Serial Addition, Digit subtest (WMS-III), visual Span (WMS-III), Tower of Hanoi; Stroop Test; Wisconsin Card Sorting Test; Controlled Oral Word Association Test, Continuous Performance Test and Trail Making Test. The Questionnaire of 90 Symptoms (SCL-90) assessed the psychological profile. A factorial design was implemented, with the independent variable "Group" (ADHD, Control) and the dependent variable "test performance".

Results: Significant differences in verbal and spatial working memory and sustained attention were found. There were no significant differences in the rest of the executive function tests. Besides, only the ADHD group showed a psychological profile with symptoms in all dimensions assessed.

Conclusions: These results suggest that the ADHD subjects developed compensatory cognitive-behavioural strategies allowing them to achieve a normal performance in executive functions. However, these strategies appear to be insufficient to cope with real-life situations. The higher rates of psychopathology might explain the persistence of difficulties arising from nuclear symptoms, where planning, problems solving and inhibition deficits could lead to the typical ADHD profile of personal, family and working problems in the course of their life.

Correspondence: *Jezabel Bravo, Psicobiología y Metodología de las CC, Universidad de La Laguna, Facultad de Psicología, Campus de Guajara, Sin Número, San Cristobal de La Laguna 38207, Spain. E-mail: jebrame@gmail.com*

Learning Disabilities/Academic Skills

R. MARTÍN GONZÁLEZ & S. HERNÁNDEZ. Inhibition Assessment in Reading Disabilities: Stroop Test versus Five Digit Test.

Objective: Stroop Color Word Test (Stroop) is a valid instrument to assess response inhibition. Some difficulties are found for subjects without automatic reading skills (i.e. dyslexics). Five Digit Test (FDT) is a Stroop adaptation. Objective. To compare Stroop and FDT as inhibition tests in normal readers (NR) and readers with disability (RD).

Participants and Methods: Participants: 35 NR and 22 RD, aged 12-19 years old. Materials: Stroop test (Word, W; Color, C; Color-Word, CW) and FDT (P1: Numbers Reading, P2: Counting, P3: Choosing) were administered. Items/time ratios were calculated for each trial.

Results: Significant pairwise Pearson correlations were found for the entire intra-test variables for NR in the Stroop test, while in RD only the C-WC correlation was significant. The FDT variables showed significant correlations in both groups, and WC-P3. MANOVA shows that NR have better achievement in all the variables. Two independent discriminant stepwise analyses were made. In the first analysis, the discriminant function includes two Stroop variables (W and C) and classifies correctly the 82.9% NR and 81.8% RD. The second analysis with FDT variables classifies correctly the 77.1% NR and 68.2% RD and the discriminant function includes P3.

Conclusions: Stroop and FDT share common variance, presumably associated with cognitive inhibition. RD performed worse than NR in both tests. Stroop classification power derives from functions usually altered in RD (reading and naming), while FDT discriminant equation includes only the inhibition component. Therefore, Stroop does not seem to be an adequate inhibition test in people with RD and FDT could be an alternative. Correspondence: *Raquel Martín González, Psychobiology and Methodology, Faculty of Psychology, University of La Laguna, Campus de Guajara, La Laguna 38207, Spain. E-mail: rmarting@ull.es*

N. CADAVID-RUIZ, M.C. QUIJANO, S. JIMÉNEZ & D.C. GONZÁLEZ-ALEXANDER. Relationships Between Visuo-spatial and Reading Skills in a Group of Colombian Children Diagnosed With Poor Reading Garden-variety.

Objective: Garden-variety reading difficulty is a relative new term in Spanish scientific literature. The aim of the present study was to con-

tribute to our understanding of this non-specific poor reading skill in children who learn a native transparent language such as Spanish. Specifically, this work focused on establishing the relationships between visuo-spatial and reading skills in a group of Colombian children with garden-variety poor reading.

Participants and Methods: 52 children from low socio-economic status aged 7 to 9 years old and that assist to a public school in Cali-Colombia were assessed with a visuo-spatial and a reading task.

Results: Results showed a positive correlation between the level of proficiency in the visuo-spatial task and the reading task.

Conclusions: This finding suggests that children with non-specific difficulties in their learning process of reading a transparent language may be related with their poor ability to process visuo-spatial information.

Correspondence: *Natalia Cadavid-Ruiz, PhD, Social Sciences, Pontificia Universidad Javeriana, Calle 18 No. 118- 250, Cali —, Colombia. E-mail: ncadavid@javerianacali.edu.co*

N. CADAVID-RUIZ, M.C. QUIJANO, S. JIMÉNEZ & D.C. GONZÁLEZ-ALEXANDER. Phonological Awareness and the Development of Reading Abilities in a Group of Colombian Children with Non-specific Poor Reading Skills.

Objective: Traditionally, phonological awareness deficits have been studied as a key factor to explain specific reading difficulties in Spanish. The present study investigated if the levels of phonological awareness of children with non-specific reading difficulties play a role in their poor reading skills.

Participants and Methods: For that purpose 52 children from low socio-economic status aged 7 to 9 years old and that assist to a public school in Cali-Colombia were assessed with a phonological awareness task, a reading processing speed task, a reading precision task and a reading comprehension task.

Results: The results showed that the level of proficiency of phonological awareness of Colombian children with non-specific difficulties relate with their poor reading abilities.

Conclusions: In this sense, phonological awareness seems to function as a prerequisite to ensure the appropriate acquisition of reading skills: precision, comprehension and processing speed.

Correspondence: *Natalia Cadavid-Ruiz, PhD, Social Sciences, Pontificia Universidad Javeriana, Calle 18 No. 118- 250, Cali —, Colombia. E-mail: ncadavid@javerianacali.edu.co*

A. CAO. Neurobiological Correlates of Sentence Comprehension in Children with Specific Reading Comprehension Disability.

Objective: This study investigated the neurobiological correlates of sentence comprehension in adolescents who struggle with reading comprehension despite adequate word recognition (reading comprehension disability, RCD). These children often have language and executive functioning deficits, but thus far have not been investigated neurobiologically.

Participants and Methods: We acquired fMRI data for eleven RCD participants and sixteen participants with typically achieving readers (TA). Participants performed two in-magnet tasks: 1) single word reading task (SWR), in which participants determined whether the words were real or made-up; and 2) a sentence task (SENT), in which participants determined whether sentences were meaningful or not. Data were processed in SPM8 using a p-value of .005 and a cluster size of 70.

Results: During the SENT task, the RCD group showed diffuse right hemisphere activation in occipital (BA 17 and 18), temporal (BA 41 and 13), frontal (BA 4, 8, and 9) and limbic regions (BA 19, 27, and 30) as compared to TA. The TA group showed greater activation in right inferior frontal (BA 47) and superior temporal (BA 38) regions. Few differences were observed between groups for SWR.

Conclusions: These results demonstrated that the RCD group showed increased diffuse right hemisphere activation for sentence comprehension in brain regions related to learning, working memory, planning and visual functions; in contrast, fewer differences were observed for SWR, providing support for a specific reading comprehension deficit evident at the neurobiological level.

Correspondence: *Aize Cao, Vanderbilt, 1161 21st Ave South, Nashville, TN 3. E-mail: aize.cao@vanderbilt.edu*

D. DEWEY, L. LANGEVIN & S.G. CRAWFORD. One more step: Does walking impact adding?

Objective: Developmental coordination disorder (DCD) is a motor skills disorder with a prevalence of six to 10 percent. Dyscalculia or math disability is a mathematical skills disorder that has a prevalence of five to seven percent. DCD and dyscalculia often co-occur with other developmental disorders, including attention deficit hyperactivity disorder (ADHD) and reading disability (RD). This co-occurrence suggests an underlying relationship among these disorders; however, no studies have investigated the association between DCD and dyscalculia. The primary objective of this study was to examine the comorbidity of DCD and dyscalculia.

Participants and Methods: Ninety-six children aged six to 18 years (59 boys, 37 girls; average age=10.9 yrs; FSIQ > 80) participated in a study examining motor, attention and learning problems. Participants who obtained a score \leq 16th percentile on the Movement Assessment Battery for Children 2nd edition were classified as displaying DCD. Participants who obtained a score \leq 16th percentile on the Numerical Operations subtest on the Wechsler Individual Achievement Test were classified as displaying dyscalculia. Children were also assessed for ADHD and RD.

Results: In this sample, the prevalence of DCD was 60.4% and the prevalence of dyscalculia was 34.4%. Thirty children did not meet criteria for either disorder. Dyscalculia was significantly more common in children with DCD, $\chi^2(1)=4.95$, $p=0.03$. A significant association was found between number of developmental disorders co-occurring with DCD and prevalence of dyscalculia, $\chi^2(4)=12.66$, $p=.01$.

Conclusions: DCD and dyscalculia appeared to co-occur in a non-random pattern in this sample of children. This finding suggests a common neurobiological basis for DCD and developmental dyscalculia and is consistent with studies showing associations among dyscalculia, ADHD and RD. Understanding the relationships among developmental disorders is an essential step towards improving diagnosis and therapeutic strategies for individuals with DCD and dyscalculia.

Correspondence: *Deborah Dewey, Paediatrics, University of Calgary, Behavioural Research Unit, Alberta Children's Hospital, 2888 Shaganappi Tr NW, Calgary, AB T3B 6A8, Canada. E-mail: dmdevey@ucalgary.ca*

J.T. ELIAS, R. MARTIN, E. MAXWELL, A. LOPEZ & P.T. CIRINO. Magnitude Representation, Spatial Abilities, and Mathematical Performance in Adults.

Objective: Number line conceptualization relates to math performance in children (e.g., Siegler & Booth, 2004). While the number line has been investigated in adults (e.g., Opfer & DeVries, 2008), its relationship to math outcomes remains unclear, particularly given the higher-level math operations that adults perform (e.g., algebra). Because of the spatial nature of the number line (Hubbard et al., 2005), factors such as spatial working memory and mental rotation may underlie number line skill. We hypothesized that number line accuracy would predict math performance; that spatial working memory and mental rotation would predict number line performance; and that instructional feedback would differentially affect performance according to those cognitive skills.

Participants and Methods: Participants were undergraduates (N=98) who were administered a computerized number line task in two conditions, two algebra measures, WJ-III Calculations, a computerized spatial working memory task, and WJ-III Block Rotation. For the number line task, participants either received instructional feedback (N = 59) or did not (N=39). Regression analyses were used to explore hypotheses.

Results: Number line performance in both conditions were significant predictors of algebra and math computation performance (range $r = .27$

to $-.39$, all $p < .009$). Spatial working memory was related to number line performance ($r = -.21$, $-.25$, $p < .05$), though Block Rotation was not. There were no interactions between instructional feedback and cognitive skill, though there was a main effect for instructional feedback ($ps < .05$).

Conclusions: The number line task was predictive of math performance in adults, extending results with children. In addition, results suggest that spatial working memory may underlie aspects of number line performance (deHevia & Spelke, 2009). Performance also improved with brief instructional feedback. These results could further our understanding of characteristics that impact math performance in adults. Correspondence: *John T. Elias, B.A., University of Houston, 2121 Hepburn St Apt 902, Houston, TX 77054. E-mail: johne033@gmail.com*

V. FERNANDEZ & J. JURANEK. Developmental dyslexia: Volumetric analysis of regional variability in the cerebellum.

Objective: This study investigated the relation between cerebellar abnormalities and dyslexia by analyzing regional variability in the cerebellum among children with decoding deficits (dyslexia) and typical readers. Based on existing theory, children with dyslexia were expected to demonstrate reduced volume in the right anterior cerebellum.

Participants and Methods: All children had an IQ of at least 70 and were in grades 6-8. Children with dyslexia ($n = 25$) scored below the 26th percentile on a measure of single word decoding. Typical readers were comparable in age and gender ($n=15$). A manual tracing technique was used to create a mask for each of four regions (left and right) of the cerebellum at every slice of a T1-weighted image.

Results: Preliminary assessment of cerebellar volumes using repeated-measures ANOVA did not yield a consistent pattern of results in support of the hypothesized lateralized cerebellar anomalies.

Conclusions: Previous studies show mixed results for cerebellar deficits in children with dyslexia. These results were consistent with these mixed findings. Additional analyses will examine other cerebellar variables that might be related to dyslexia.

Correspondence: *Vindia Fernandez, B.A./Ph.D. Candidate, Department of Psychology, University of Houston, 2151 W. Holcombe, 222 TMC Annex, Houston, TX 77204-5053. E-mail: vindia_f@yahoo.com*

Y. GABAY, R. SCHIFF & E. VAKIL. Dissociation between Online and Offline Learning in Developmental Dyslexia.

Objective: Most studies investigating procedural learning in developmental dyslexia (DD) have focused on the acquisition stage, ignoring later stages involved in the process of skill learning. The current research studied sequence-learning among DD and control groups in two sessions in order to examine online and offline learning.

Participants and Methods: DD and control groups completed a Serial Reaction Time (SRT) task over a first session (online learning) and a second session 24 hours later (offline learning).

Results: While both groups showed improvements in performance during offline learning, only the control group showed improvements in performance during online learning. Moreover, the DD group differed from the control group in their ability to recover from the introduction of a different sequence.

Conclusions: The present study suggests individuals diagnosed with DD have a deficit in online learning while offline processes remain preserved. Correspondence: *Yafit Gabay, PhD student, Bar Ilan University, Rabi Simhon Halevi, Beer Sheva 13, Israel. E-mail: yafitvha@gmail.com*

B.M. GREEN, K. STOCKHEIMER, O. SANTOS & D.C. OSMON. Implicit Learning Deficits in Individuals with Dyslexia.

Objective: Recent research has suggested that individuals with dyslexia may have an implicit learning deficit. However, many studies did not evaluate whether attention problems, which occur in high comorbidity with dyslexia, are a factor in individuals with dyslexia poor performance on implicit learning tasks. This research compared implicit learn abilities in terms of reading and attention.

Participants and Methods: Subjects include 80 undergraduate students at the University of Wisconsin-Milwaukee. Average age of the sample was 21 ($SD=4$) with an average composite Shipley score of 101 ($SD=12$).

Based on the result of reading tests the participants were identified as good (Basic Reading $M=102$ $SD=5$) or poor readers (Basic Reading $M=90$ $SD=6$) and as having good or poor attention based on multiple CPT-2 scores. No significant difference in intelligence scores was observed between any groups. The group's performance on an implicit learning task, a serial reaction time task, was compared.

Results: No significant difference was observed between groups based on reading abilities; however, significant difference was observed between groups performance based on attention abilities $F(1,78) = 8.20$, $p < .05$.

Conclusions: These findings suggest that attention capacity may account for the poor performance on implicit learning task observed in individuals with dyslexia.

Correspondence: *Bonnie M. Green, B.A., Clinical Psychology, University of Wisconsin - Milwaukee, 2637 N. Frederick Ave., Apt. 306, Milwaukee, WI 53211. E-mail: green26@uwm.edu*

K.M. JANKE, B.P. KLEIN-TASMAN, S.J. HUNTER, J.H. TONSGARD & M.J. SCHUETT. Relations between Cognitive Functioning and Early Academic Skills in Preschool-Aged Children with NF1.

Objective: Neurofibromatosis type 1 (NF1) is a genetic neurocutaneous disorder, with an estimated incidence of 1 in 3,000 persons. It is a variable disorder associated with higher rates of intellectual disability and learning disabilities, attention problems, speech and language impairment, and executive functioning deficits. Research investigating the presentation of NF1 in preschool-age children is very limited. The relations between neuropsychological and pre-academic skills will be examined to identify cognitive processes that contribute to early learning difficulties.

Participants and Methods: Participants were 42 children ages 3-6 ($Mage = 54.1$ mos., $SD = 14.2$). Each was administered the Differential Ability Scales - Second Edition (DAS-II) to assess cognitive functioning as well as phonological processing ($N = 13$), rapid automatic naming (RAN; $N = 11$), and early number knowledge ($N = 41$). Select subtests of the NEPSY - Second Edition were also given to examine visuospatial and fine-motor skills.

Results: Phonological processing abilities were significantly related to verbal working memory (WM), auditory attention, and receptive and expressive language ($r = .560 - .778$). RAN abilities were moderately correlated with verbal WM ($r = .422$). Performance on a measure of early number knowledge was moderately to highly correlated with visuospatial abilities, fine-motor skills, nonverbal reasoning, verbal WM, and receptive language ($r = .305 - .504$).

Conclusions: Early neuropsychological abilities contribute to pre-academic skills. Language skills appear to support early literacy, whereas visual and motor skills support the development of math abilities. Implications for clinical work and future research with this population will be discussed.

This research was supported by funds from the UWM Research Growth Initiative, University of Chicago CTSA (UL1 RR024999), NF Inc Midwest, NF Inc MidAtlantic.

Correspondence: *Kelly M. Janke, Psychology, Univ Wisconsin- Milwaukee, 2441 E Hartford Ave, GAR 325, Milwaukee, WI 53211. E-mail: kmz@uwm.edu*

R.B. MARTIN, P.T. CIRINO & C. SHARP. Counting Procedural Skill and Conceptual Knowledge in Kindergarten as Predictors of Grade 1 Math Skills.

Objective: Though research has identified several possible factors that could be considered precursors of math difficulties in children, including cognitive, language, and number factors, there is not currently a consensus as to which are most critical. The present study focused on the role of two types of counting (procedural skill and conceptual knowledge) in kindergarten to predict math fluency, computation and applied reasoning performance in grade 1, which are direct antecedents of formal arithmetic.

Participants and Methods: Participants were kindergarten and first grade students ($N = 193$). Measures included rote counting forward and backward, counting objects, number (number identification and quantity discrimination), cognitive (working memory and phonological awareness) and behavior (behavioral inattention) factors. Hierarchical regression analyses were used to test the amount of variance the counting variables explained over and above the other variables.

Results: A step-by-step model building method showed that while both types of counting were predictive of each outcome, in the overall models the number factors accounted for variance over and above the counting predictors. Further, the number variables were the best predictors for each model, but secondary variables included verbal working memory and conceptual counting knowledge for fluency, phonological awareness and procedural counting for computation, and verbal and visuospatial working memory, phonological awareness, and procedural counting for the applied reasoning model.

Conclusions: Therefore, counting procedural skill and conceptual knowledge should be considered when screening for early math difficulties, but their contributions should be considered along with other relevant number and cognitive factors for more robust prediction.

Correspondence: *Rebecca B. Martin, Neuropsychology, University of Houston, 4505 Cullen, Houston, TX 77030. E-mail: rmartin29@gmail.com*

E.C. MAXWELL, R.B. MARTIN, J.T. ELIAS, A.M. LOPEZ & P.T. CIRINO. Symbolic and Non-symbolic Magnitude Comparison and Math Skills in Adults.

Objective: Magnitude comparison (MC) has been widely studied in children (Brankaer et al., 2011), including its relationship to math (Desoete et al., 2010). Properties of symbolic (Butterworth et al., 2001) and non-symbolic MC (Revin et al., 2011) have been studied in adults, though less often together (but see Ansari et al., 2007); still less is known about their relationship to math, especially in the context of cognitive factors. Such knowledge may expand the relevance of MC beyond children and help to understand math difficulties in adults. We hypothesized that MC would predict math in adults even in the context of broader skills.

Participants and Methods: College undergraduates ($N = 99$) completed computer tasks of symbolic and non-symbolic MC (speed and/or accuracy). Math outcomes included WJ-III Math Fluency, Calculations, and algebraic computations. Cognitive measures included WJ-III Block Rotation (spatial) and Cross-Out (processing speed), CTOPP Elision (phonological awareness), and a spatial working memory task. Regression analyses evaluated contributions.

Results: MC skills were predictive of Math Fluency ($R^2 = .19, p < .0002$). Adding cognitive variables improved models ($R^2 = .27, p < .0002$), and symbolic MC ($p < .0006$) and processing speed ($p < .02$) were unique predictors. The model for Calculations was significant ($R^2 = .26$), with contributions from spatial skills and math fluency. For algebra, the model was significant ($R^2 = .15, p < .03$) with phonological awareness and symbolic MC as unique predictors; when math fluency was added ($R^2 = .33, p < .0001$) symbolic MC was not significant.

Conclusions: Symbolic, but not non-symbolic, MC was predictive of math in adults, which is consistent with findings in children (Holloway & Ansari, 2009). Despite the relevant measures chosen, the amount of variance predicted was not large, though similar to other studies of math (Cirino et al., 2002). Further study might focus on other number-based skills and non-cognitive factors, as well as populations with math difficulty.

Correspondence: *Emily C. Maxwell, University of Houston, 4921 Crawford Street, Apt #1S, Houston, TX 77004. E-mail: ecmaxwell@gmail.com*

Y. NAKAGAWA, W. TAKEI & T. KOYAMA. Grammatical difficulties in deaf children: Assessing the comprehension of written Japanese.

Objective: The objective is to evaluate the grammatical abilities of children with a hearing loss and to reveal the comprehension difficulties of written Japanese that children with hearing loss encounter.

Participants and Methods: The participants of this study were 130 children aged between five and twelve years-old with a hearing loss.

They were assessed using a Japanese written grammatical test (J.COSS: Japanese test for comprehension of syntax and semantics). The J.COSS is multiple-choice text consisting of 20 blocks of 4 items each. Each item has four choice pictures. The participants were required to select one picture that corresponds to a grammatical construction in written Japanese. In answering the questions, no verbal communication was required.

Results: Whenever a participant correctly answered the four questions in each grammatical item, we assumed that they could understand that item (pass). As in Guttman's reproducibility of reliability scale analysis of 0.86, the development of 20 grammatical items was determined by a step-by-step order in accordance with the passing rate. Among the 20 grammatical items, the Hearing Loss children have consistently shown a lower score than the Normal Hearing children except for the noun block. Moreover, the Hearing Loss children displayed particular difficulties in understanding the reversible passive and the Japanese case particles.

Conclusions: The study investigated the development of the written Japanese grammar and showed the overall delay of grammatical competence acquisition of the children with Hearing Loss as compared to the ones with Native Hearings ability. Specifically, the Hearing Loss children revealed the difficulties comprehending reversible passive and Japanese case particles.

Correspondence: *Yoshiko Nakagawa, Ph.D, Clinical Psychology, International University of Health and Welfare, Aoyama Ichome Tower, 1-3-3, Minami-Aoyama, Minato-ku 107-0062, Japan. E-mail: SNC59S10@nijfy.com*

F. BEGUM, B. NATHAN & V. VENGATESAN. Prevalence of Learning Disability in School Children from Different Educational System in South India.

Objective: To study prevalence of LD, Classification of LD in English, Tamil and Arithmetic in different education system CBSE, Matriculation, Anglo-Indian, State Board (SB).

Participants and Methods: By Systematic Random sampling 200 normal school children class II to VI, 50 from each education system equal boys and girls. Standardized LD Assessment Test used with reliability 0.71

Results: Overall prevalence of Learning Disability (LD) in different education system 20.8% (18.93% - 22.86%) proportion with 95% CI.

Significant difference in Prevalence of LD in different education system with high prevalence in SB 16.65%*

Overall prevalence of LD in English 12.65%, Tamil 32.09%, Arithmetic 23.66%

Significant difference in LD in Oral, Writing and Reading in English*

Significant difference in LD in Writing 5.76%, Reading 5.48% and Oral 1.15%, in English in different education system*

Significant difference in LD in Writing 10.03%, Oral 9.28% and Reading 8.35% in Tamil*

Significant difference in LD in English and Tamil 11.79%* with proportion to 95% CI

Significant association between LD in Writing in Maths > Tamil > English and different education system.

* $P=0.001$

Conclusions: Overall LD 20.8%

Significant difference in prevalence of LD in different education system with high prevalence in SB school

LD more significant in Tamil

Significant association between prevalence of LD in Writing in Maths > Tamil > English and different education system.

Correspondence: *FaizjahanR Begum, M.Sc, Clinical Psychology, CARE Institute of Behavioral Sciences, 1, 5th Street, Dr. Thirumurthy Nagar., Nungambakkam., Chennai 600034, India. E-mail: faizjahan@rediffmail.com*

F. BEGUM, B. NATHAN & V.A. SATHISH. A Study on the Awareness and Perception of Learning Disability (LD) among Teachers in Tamil Nadu.

Objective: To study the level of awareness and perception of LD among school teachers, educational qualification, work experience, gender and age.

Participants and Methods: LD awareness / perception questionnaire was developed by the authors and reliability was 0.74. By random sampling method 560 teachers were selected from different schools. The questionnaire consists of 24 items on the domains of Media, Facilities, General, Medical, Attention, Academics. It is self administered.

Results: Overall awareness of LD among teachers 75% (73.8% - 76.3%) proportion with 95% CI.

Significant association between awareness of LD and Age of Teachers $P=0.001$

Significant association between awareness of LD and gender $P=0.04$

Significant association between the educational qualification and awareness on LD $P=0.05$

Significant association between teaching class and awareness on LD $P=0.001$

Conclusions: Overall awareness on LD among teachers 75%

Age of teachers influences LD awareness.

Work experience of teachers influences LD awareness.

Female teachers have better awareness on LD.

Higher Secondary class teachers have better awareness on LD.

Post-graduate teachers have better awareness on LD.

Higher the teaching class better the awareness on LD

Teachers have 78% LD awareness on the domain of Facilities for LD children.

Correspondence: *FaizjahanR Begum, M.Sc, Clinical Psychology; CARE Institute of Behavioral Sciences, 1, 5th Street, Dr. Thirumurthy Nagar., Nungambakkam., Chennai 600034, India. E-mail: faizjahan@rediffmail.com*

F. BEGUM, V.A. SATHISH & B. NATHAN. A Study on the Awareness and Perception of Learning Disability (LD) among Parents.

Objective: To study the level of awareness and perception of LD among parents, age, educational qualification, income.

Participants and Methods: LD awareness / perception questionnaire was developed by the authors and reliability was 0.74. By random sampling method 327 parents were selected from different schools. The questionnaire consists of 24 items on the domains of Media, Facilities, General, Medical, Attention, Academics. It is self administered.

Results: Overall awareness of LD among parents 68% (66.4% - 69.3%) proportion with 95% CI.

Significant association between awareness of LD and Age of fathers $P=0.03$

Significant association between awareness of LD and Age of mother $P=0.001$

Significant association between parents educational qualification and awareness of LD $P=0.001$

Significant association between parents LD awareness and class in which student studying $P=0.03$

Significant association between level on income of parents and awareness of LD $P=0.05$

Conclusions: Overall awareness of LD among parents 68%

1/3 of parents do not have adequate LD awareness.

As the age of father increases better the awareness of LD.

Middle age group mothers have better LD awareness.

Significant association between parents education qualification and awareness of LD.

Higher the class the child in, better the LD awareness among parents.

As the income increases better the LD awareness.

Sibling and mother tongue does not influence LD awareness among parents.

Parents have 78% LD awareness on the domain of Facilities for LD children.

Correspondence: *FaizjahanR Begum, M.Sc, Clinical Psychology; CARE Institute of Behavioral Sciences, 1, 5th Street, Dr. Thirumurthy Nagar., Nungambakkam., Chennai 600034, India. E-mail: faizjahan@rediffmail.com*

A. NIQUERITO & M. MERIGHI TABAQUIM. Constructive Dyspraxia in Children with Cleft Lip and Palate.

Objective: Apraxia reflects dysfunction of the motor cortical level. When planning the execution of previously learned movements, we use stored cortical representations. Any change that compromise this particular area can lead to information loss needed to perform complex movements. Constructive dyspraxia is the difficulty in reproduce or copy a visual model presented in the absence of visual disturbances, perceptual or motor.

Participants and Methods: In this study 85 individuals participated, both sexes, aged 7 to 12 years with cleft lip and palate repair. The following instruments were used: Raven's Colored Progressive Matrices Test and Graph-Percept-Motor Koppitz Bender-Santucci.

Results: The results showed that 72.9% of children had changes in motor performance, with performance below the age, showing immaturity in perceptual-motor skills, essential to the acquisition, consolidation and stability in the learning of motor sequences. The quality of the track proved to be unstable, especially in the angles construction, using rotation compensate resources and lack of integration of perceptual-motor information on the task realization.

Conclusions: : Children with cleft lip and palate showed perceptomotoras changes characteristic from the constructive dyspraxia. The results point to dysfunctions in different levels, from the cortico-subcortical, cortical-striatal and cortico-cerebellar circuits that contribute to motor behavior in the graphical construction activities, important to the development of formal ability in writing.

Correspondence: *Ana Vera Niquerito, Hospital for Rehabilitation of Craniofacial Anomalies (HRCA) and São Paulo University (USP), Rua: Pelegrino Constanzo 1-136, Bauru 17018-110, Brazil. E-mail: anavera.n@gmail.com*

W. RUENZEL, A. KOZLOWSKI, E.A. ANDRESEN, B. GREEN & D.C. OSMON. Factor Invariance between Credible and Noncredible Performers on the Word Memory Test.

Objective: This study examined factor structure of the WMT.

Participants and Methods: 270 learning disability clinic referrals and simulation analogue research participants were included.

Results: Common exploratory factor analysis on the entire sample demonstrated a unifactorial structure with all variables loading around .9 (CNS=.78, communality<.6) and having Cronbach's Alpha of at least .94. In the credible performers (N=161, Cronbach's Alpha all>.7) an initial factor had loadings from DR, MC, and PA with a second factor with loadings on IR and CNS.

Noncredible performers (N=110, Cronbach's Alpha all>.83) had an initial factor with loadings from IR and DR and a second factor with loadings from MC and PA, while CNS had loadings below .35 on both factors.

Conclusions: The following conclusions seem warranted:

- 1.The WMT's unifactorial structure may be an artifact of combining disparate groups.
- 2.The factor analyses in this study can be criticized because of non-normal distributions; however, internal consistency was good in all groups.
- 3.Present results should be replicated using Confirmatory Factor Analysis.
- 4.Factorial invariance between credible and noncredible performers suggests that effort is not a continuous variable.
- 5.Several constructs appear to compose the WMT depending upon the population being evaluated.
- 6.Credible performers showed memorial (DR, MC, PA) and reliable recognition (IR and CNS) factors.
- 7.Noncredible performers showed memorial factor (IR, DR) and underperforming on difficult tasks (MC, PA) factors.

Correspondence: *David C. Osmon, Ph.D., Psychology; Univ Wisconsin-Milwaukee, 2441 E. Hartford Ave, Milwaukee, WI 53211. E-mail: neuropsych@uwm.edu*

A. KOZŁOWSKI, W. RUENZEL, J. BLAISDELL, B. GREEN, E.A. ANDRESEN & D.C. OSMON. Comparison of Effort Tests in Learning Disability Clinic Referrals.

Objective: Few measures have been developed specifically for an LD population. We compared several such measures to assess base rate of effort problems and comparability of diverse measures.

Participants and Methods: Subjects included 38 consecutive LD referrals that included ten symptom validity measures. Average age of the sample was 26 (SD=11) with an average Woodcock-Johnson-III GIA of 96 (SD=12).

Results: Participants failed as follows: WMT 8/38 (21%), CTOMM 2/38 (5%), WRT 7/37 (22%), b Test 8/38 (21%), Dot Counting 7/38 (18%), Stroop 14/38 (37%), DASH 8/38 (21%), CAARS-Inc 4/32 (13%), CAARS-Mal 20/32 (63%), CAARS-CII 10/32 (31%).

Using failure on at least two, the b Test was the only measure to have better than low sensitivity (83%) at 88% specificity. Most sensitivities improved when using the 3 failure criterion, although the b Test dropped to 67% sensitivity.

Conclusions: Comparing various effort measures reveals unexpected aspects of detecting symptom exaggeration in a learning disability referral population:

1. While the WMT is perhaps the most sensitive measure of effort in a brain injury population where memory is a primary concern, it is not the most sensitive measure in an LD population.
2. Overall, the b Test had the best sensitivity at around 90% specificity
3. While the CAARS-mal and Stroop classified the most individuals as having suspect effort, they did not perform well at 90% specificity values.
4. Using a 2 effort-test failure rate to indicate effort problems seems warranted.

5. Using multiple effort measures in of a learning disability test battery is probably necessary to insure an adequate assessment because of the multifaceted strategies clients use to exaggerate symptoms.

Correspondence: *David C. Osmon, Ph.D., Psychology, Univ Wisconsin-Milwaukee, 2441 E. Hartford Ave, Milwaukee, WI 53211. E-mail: neuropsych@uwm.edu*

E. FERRAZ & P.A. PINHEIRO CRENITTE. Use of Phonological Remediation Program in Developmental Dyslexia.

Objective: The objective of this study was to evaluate the performance in children with developmental dyslexia in pre and post phonological remediation program, compiled from phonological skills, visual, hearing, reading and writing

Participants and Methods: Were evaluated 20 children aged 8 to 14 years, divided in GI (10 schools submitted to the program), and GII (10 schools not subject to remediation)

Tests used: phonological test; Phonological Awareness Sequential Evaluation Instrument (CONFIAS); Rapid Automatic Naming test (RAN); reading and writing of real and invented words; thematic writing; working memory test.

The program was implemented in 24 sessions twice a week lasting 30 minutes each.

Were worked out and cumulative manner through fun activities processes: rhyme, alliteration, addition and subtraction of phonemes and syllables, rapid appointment letters/digits, silent and oral reading of histories, pseudowords, phrases and texts, counting and recounting writing stories.

Results: The GI obtained improvement in tests, being statistically significant in CONFIAS, RAN and working memory when compared to the GII. In tests of reading and writing also obtained improvement in performance, even for unfamiliar words.

Even in the short term there was difference in performance post therapeutic intervention of GI, confirming the data found in previous studies claiming that the therapy focused on the difficulties related to the phonological awareness in children with developmental dyslexia have satisfactory results.

The subject of GI proved receptive to activities managing to understand them and participate actively in the process. It was also possible to observe that the subject of the group submitted to the program became more aware of their own difficulties.

Conclusions: The program proved to be an effective therapeutic method, providing improves not only quantitative but mainly qualitative in schools with developmental dyslexia as to the field of auditory skills, phonological and reading and writing.

Correspondence: *Erika Ferraz, Graduate, University of São Paulo, Al. Dr. Octávio Pinheiro Brisolla, 9-75 Vila Universitária, Depto. Fonoaudiologia, Bauru 17012-980, Brazil. E-mail: erika.ferraz@gmail.com*

L.G. ANTUNES, T.S. GONÇALVES & P.A. PINHEIRO CRENITTE. Phonological Remediation Program Contributions in Preschoolers with Risk for Learning Difficulties.

Objective: To assess the Phonological Remediation Program contribution in phonological processing skills of preschoolers with risk for learning difficulties.

Participants and Methods: This study applied a Phonological Remediation Program (PRP), developed by Silva and Capellini (2009) in preschool children (five boys and one girl), aged six years, with suggestive signs of learning difficulties. The participants were children without sensorial, cognitive, behavioral or neurological deficits and speech pathology intervention. Evidence for the Cognitive Performance Test Language (Capellini et al, 2007) were applied pre and post remediation. The intervention consisted of 22 individual sessions, using the following activities: sound and letter identification; words within a sentence; identification and manipulation of syllables; rhymes; identification, discrimination, segmentation, synthesis, subtraction, substitution and transposition of phonemes.

Results: When the performance before and after the PRP was compared, evolution to 100% was observed in reading words and pseudo-words repetition; 83.33% in the written alphabet, number recognition, words dictation, rhyme, immediate memory for digits in forward order and digit naming speed, 50% in sound discrimination, immediate memory for digits in order indirect, visual memory and speed of picture naming, about 50% in rhythm, numbers recognition and auditory memory for words. Generally, children with less progress have improved in 7 of 16 tasks and children with more progress have the skills improved in 15 tests.

Conclusions: The PRP effectiveness was verified as the preschoolers improved in phonological processing, which favored the syntactic and phonological awareness improvement. The results showed that the direct instruction of phonological awareness, combined with the grapheme-phoneme correspondence, accelerated the reading and writing acquisition of these preschoolers.

Correspondence: *Thais Gonçalves, Faculty of Dentistry of Bauru - University of Sao Paulo, Al. Dr. Octávio P. Brisolla, 14-75, Bauru 17012-191, Brazil. E-mail: thaiscarpediem@yahoo.com.br*

N.S. MARQUES SILVA, T.S. GONÇALVES & P.A. PINHEIRO CRENITTE. Auditory and Visual Memory Deficits related to Dyslexia.

Objective: To investigate the presence of deficits in auditory and visual memory in children diagnosed with Dyslexia.

Participants and Methods: Were conducted a cross-sectional study using retrospective chart analysis in the Speech Therapy Clinic of the Faculty of Dentistry of Bauru, University of São Paulo.

The medical records (between 2000 and 2010) of 23 patients diagnosed with Dyslexia were reviewed. Were investigated the clinical histories and the first interdisciplinary assessment.

Results: Through the medical records analysis it was found 82.6% male individuals. The first Speech Pathology Evaluation found 82.6% of children with deficits in phonological working memory, 39.1% with visual memory deficit and 82.6% with alterations in phonological awareness.

Conclusions: These results allow to say that the profile of the patients studied are mostly male and had deficits in phonological working memory and phonological awareness skills during the first Speech Pathology Evaluation. Nevertheless, it is still possible to conclude that phonological working memory and phonological awareness are strongly correlated with the diagnosis of Dyslexia.

Correspondence: *Thaís Gonçalves, Faculty of Dentistry of Bauru - University of Sao Paulo, Al. Dr. Octávio P. Brisolla, 14-75, Bauru 17012-191, Brazil. E-mail: thaiscarpedim@yahoo.com.br*

R.C. FERREIRA LOPES, T.S. GONÇALVES & P.A. PINHEIRO CRENITTE. Elementary School Teachers' Knowledge Before and After Speech Pathology Orientation.

Objective: To investigate teachers' concepts about learning disabilities and to analyze possible changes in their knowledge after a Speech Pathology Orientation.

Participants and Methods: Twenty-five elementary school teachers of a public school of São Paulo/SP participated in this study. A questionnaire was applied to investigate the teachers' knowledge regarding the learning disabilities. Then, lectures were held centered on learning disabilities, describing the extrinsic and intrinsic factors and the Speech Pathologists' role. The same questionnaire was reapplied to determine possible changes in the conceptual repertoire of the teachers after the orientation. The nonparametric McNemar Test were used for data-analysis, with the level of significance set at 5%.

Results: Teachers did not receive information about learning disabilities during their graduation (96%) and these problems often appear in the daily classroom, and 44% did not seek information about these difficulties.

The comparative analysis of the teachers' responses showed significant difference on their knowledge of all aspects discussed during the lectures, such as dyslexia, phonological disorder, dysgraphia, attention deficit and hyperactivity disorder and learning disabilities, contributing to their formation.

Conclusions: The quantitative and qualitative analysis of the results showed the importance of training teachers about learning disabilities and the Speech Pathologist action. It was concluded that teachers have needs in their concepts, and often attribute the learning disabilities causes to intrinsic factors and as resulted of a poor family. The teachers also not know what to do when faced these problems. After the Speech Pathology Orientation there was a significant change in teacher's knowledge, showing that the preventive action of the Speech Pathology, within the school community, can help the teachers to identify and prevent these problems.

Correspondence: *Thaís Gonçalves, Faculty of Dentistry of Bauru - University of Sao Paulo, Al. Dr. Octávio P. Brisolla, 14-75, Bauru 17012-191, Brazil. E-mail: thaiscarpedim@yahoo.com.br*

T.F. DUARTE DE MORAES, K.K. SALVADOR, P.F. GARCIA, T. GONÇALVES, M.R. FENIMAN & P.A. PINHEIRO CRENITTE. Written Language Alterations and Auditory Processing Performance in Silver-Russell Syndrome: Case Report.

Objective: Objective: To describe the written language aspects and auditory processing performance in a patient with Silver-Russell Syndrome (SRS).

Participants and Methods: For written language assessment, the following tests were used: Reading Comprehension for Texts, Auditive Discrimination Test, spontaneous writing, Educational Performance Test (EPT), Rapid Automatic Naming Test (RAN), Phonological Skills Profile and Phonological Working Memory Test.

In the auditory processing assessment the following tests were performed: sound localization test (SLT), sequential verbal memory test (SVMT) and nonverbal (SNVMT), Random Gap Detection Test (RGDT), Sustained Auditory Attention Ability Test (SAAAT), Pediatric Speech Intelligibility Test with ipsi- and contralateral competing message: synthetic sentence and word recognition (PSI / ICM or CCM), Test SSW (SSW), dichotic digits test (DDT) and Non-Verbal Dichotic Test. Psychological evaluation was performed using the Wechsler Intelligence Scale for Children (WISC – III).

Results: The patient had normal intellectual level. During the reading the patient did not respect the punctuation, he added, omitted and transposed syllables and words as well as he did repetition of words and

phrases. The child identified the central ideas of the text and managed to find his errors of understanding, but failed to establish thematic continuity between the ideas. He was not able to use his prior knowledge to infer non-explicit information. The abilities of sustained auditory attention, selective attention (on free attention subtest), sequential memory for verbal sounds and non-verbal sounds and temporal resolution were altered. The ability of figure-ground discrimination and auditory binaural integration were adequate.

Conclusions: Alterations in reading and writing were found which may be secondary to SRS, but these difficulties can also be caused by alterations in the auditory processing skills.

Correspondence: *Thaís Gonçalves, Faculty of Dentistry of Bauru - University of Sao Paulo, Al. Dr. Octávio P. Brisolla, 14-75, Bauru 17012-191, Brazil. E-mail: thaiscarpedim@yahoo.com.br*

A. PISUPATI, S. RIMRODT, N. DAVIS, J. PEKAR & L.E. CUTTING. Neurobiological Correlates of Short-Term Memory on an Orthographic Processing Task.

Objective: Maintenance of a well-defined orthographic representation of letters in short-term memory allows time to connect the grapheme to the correct phoneme, an essential step for skilled reading. Few studies have investigated the neurobiological correlates of maintaining an orthographic representation of a letter in short-term memory; the current study does this using fMRI.

Participants and Methods: Seventeen 8-16 year old typically developing children completed a short-term memory fMRI task. Participants first viewed a 3x3 matrix of blocks showing a letter formed by shading selected blocks for 1000ms. A fixation screen was viewed for 1500ms followed by an unshaded 3x3 matrix with an 'X' in one block. Participants pushed the right-hand button if the 'X' was located in a block that had been shaded to form the letter and the left-hand button if not. To isolate the activation due to short-term memory, we examined the contrast between the task and a control task that was identical except that the 3x3 matrix still showed the shading of the letter while the 'X' was displayed and the decision was made. These data were analyzed using SPM8 at $p = 0.001$ and cluster size 70.

Results: Participants showed more activation in right superior frontal gyrus, and right homologues of left hemisphere language-related regions, i.e., right IFG, right SMG.

Conclusions: These findings suggest that short-term memory for orthographic representation of letters has neurobiological correlates that may be distinct from word recognition. In our poster we will discuss implications of these findings in relation to reading.

Correspondence: *Sheryl Rimrodt, Vanderbilt University, Monroe Carell Jr. Children's Hospital, DOT 11101, 2200 Children's Way, Nashville, TN 37213, Email: sheryl.l.rimrodt@vanderbilt.edu.*

B.L. WILLIAMS & J.M. FLETCHER. Differentiating Attention Deficit Hyperactivity Disorder and Reading Disability with the Delis-Kaplan Executive Function System.

Objective: The role of executive functions (EFs) in ADHD and RD is unclear. Although the literature suggests that EFs are more strongly associated with ADHD, some studies observe associations with RD, especially if there is a comorbid association of ADHD and RD. The present study assessed the sensitivity of the Delis-Kaplan Executive Function System (D-KEFS) in evaluating EFs involved in children with ADHD, RD, and both ADHD and RD.

Participants and Methods: Participants comprised 48 children (35 ADHD, 5 RD, and 8 ADHD/RD) selected from an archival database of children evaluated for learning problems. Using ANOVAs, group performance was compared on three subtests of the D-KEFS: Trails, Verbal Fluency, and Tower. We hypothesized that ADHD would be associated with EF components of these tasks, such as Number Letter Switching, Category Switching Accuracy, and the Tower, while RD would be related to tasks with a phonological component, such as Letter Sequencing and Verbal Fluency.

Results: As predicted, ADHD was associated with poorer scores on Number Letter Switching (NLS) even when controlling for Visual Scanning, Number Sequencing, Letter Sequencing and Motor Speed. RD was associated with lower scores on Letter Sequencing and scored higher on NLS when controlling for Letter Sequencing. On Verbal Fluency, ADHD was associated with lower scores on Category Switching Accuracy, while RD was related to lower scores on Letter Fluency. On the Tower, children with ADHD and ADHD/RD exhibited a higher amount of rule violations and lower scaled scores on the move accuracy ratio, when compared to children with RD. The comorbid group generally showed deficits on tasks associated with both ADHD and RD, and was generally lower in performance.

Conclusions: The D-KEFS is differentially sensitive to EF difficulties associated with ADHD, which are generally not associated with RD. Future research should include larger groups with RD and additional D-KEFS subtests.

Correspondence: *Baruch L. Williams, Psychology, University of Houston, 126 Heyne Building, Houston, TX 77204-5502. E-mail: hspvachic03@aol.com*

V.J. WILLIAMS, J.J. JURANEK, J.M. FLETCHER, A. SIMOS, R. REZAIE, D. MOLFESE & A. PAPANICALAOU. Cortical Thickness in Good and Poor Readers.

Objective: Prior research examining brain morphology in reading impaired individuals has yielded inconsistent results, with few studies focusing on associations between cortical measures and reading ability in children. This study investigated cortical differences in children with and without reading impairments, and whether these regions correlated with reading scores.

Participants and Methods: Fifty-four children underwent 3D high-resolution MRI scans, along with an assessment of reading ability. Using FreeSurfer, cortical thickness was examined at each vertex along the cortical surface, assessing group differences between children with typical reading ability and those exhibiting reading impairments, controlling for age.

Results: After correction for multiple comparisons, children with typical reading ability showed thicker cortex in the fusiform area, inferior temporal, lateral occipital and superior parietal cortices bilaterally; areas of the superior frontal and orbitofrontal cortices in the left hemisphere; and the insular cortex, superior temporal sulcus, and rostral middle frontal regions in the right hemisphere. Cortical regions showing significant differences between groups were selected as regions of interest (ROIs) for further analysis. Using ANOVA, all ROIs within the left hemisphere were significantly correlated with reading performance, such that higher performance predicted thicker cortex. Within the reading impaired group, there were no significant differences in cortical thickness between dyslexics and comprehension/fluency impaired.

Conclusions: Several brain regions previously established as critical to reading in functional neuroimaging studies show significant differences in cortical thickness between children with and without reading impairment, demonstrating convergence across imaging modalities.

Correspondence: *Victoria J. Williams, University of Houston, 4907 Louisiana, #4, Houston, TX 77006. E-mail: tori85@gmail.com*

L.M. WILSON, N. DAVIS, S. RIMRODT & L.E. CUTTING. Word Reading Performance of Children and Adolescents with Neurofibromatosis Type 1 Following Intervention.

Objective: Neurofibromatosis type 1 (NF) is a genetic disorder which affects 1 in 3,500 people, causing tumors to grow in the nervous system. While the frequency of learning disability is about 15% in the general population (80% of these being reading disabilities), it is 30-65% within the NF population (Cutting, Koth, & Denckla, 2000). Little research has been done to determine how children with NF and reading difficulties (NF+RD) respond to reading intervention relative to children with reading difficulties of indeterminate origin (RD).

Participants and Methods: Forty-two children and adolescents with reading difficulties (NF+RD N=13, RD N= 29) were randomly assigned

to one of two 15-hour tutorial reading interventions. While both tutoring programs were structured to incorporate multisensory, research-based principles of reading instruction, one targeted fluency and the other used tactile strategies to strengthen sound-symbol correspondences. These groups' change scores on the WJ-III Letter-Word Identification and Word Attack subtests were contrasted with those of a wait list comparison group with RD (RD-WL, N=10) and a typically developing comparison group (CNT, N=22).

Results: Using CBCL-Attention scores as a covariate, analyses of variance indicated a group x tutoring program interaction ($p=.01$), with the NF+RD subgroup who received the tactile multisensory tutoring program outperforming the typically developing control group on the Letter-Word Identification subtest (mean standard score change of 4 vs. <1 for both RD-WL and CNT groups).

Conclusions: The results suggest that those with NF+RD experience gain in word-reading skills following a short-term, research-based, multisensory reading intervention that uses manipulatives and other tactile strategies to teach decoding.

Correspondence: *Lindsay M. Wilson, M.Ed., Special Education, Vanderbilt University, 2705 Natchez Trace, Nashville, TN 37212. E-mail: lindsay.m.wilson@vanderbilt.edu*

D.C. LAMÔNICA, A. NIQUERITO, M.G. GEJÃO & M.M. TABAQUIM. Interdisciplinary Neuropsychological Evaluation of children with changes development of communication and learning.

Objective: To investigate the cognitive functions of language subjects with the development of communication and learning.

Participants and Methods: 13 subjects of both sexes, with an average age of 7.1 years, children attending the school and fundamental, given on the Speech Therapy Clinic of the University of São Paulo. In neuropsychological assessment instruments were used: Colors Progressive Matrices, Bender Gestalt Visomotor Test and Wechsler Intelligence Scale for Children. In the language speech assessment were used Peabody Picture Vocabulary Test (PPVT) and School Achievement Test (SPT).

Results: In the study, 61.5% children had on average intellectual level expected for their age. In perceptual-motor tests scores as 38.5% and 61.5% on average without significant neurological signs dysfunctional. On cognitive abilities, 53.8% of subjects in the verbal scale and 61.5% in execution, had levels in the weighted average for their age. The index factor profiles showed the expected average for the perceptual organization skills, however, showed greater losses in the factors related to processing speed and resistance to distraction. In the ITPA results indicated 15.4% in average rating, 46.2 and 38.4% lower middle low. As for the SPT, 30.7% could not perform the tests in reading, writing and arithmetic, and 69.3% had total scores classified as lower level, considering their level of education. The subjects presented with developmental neuropsychological functions in areas affected verbal, perceptual-motor and analog. The assessment of communication showed significant changes regarding the difficulties in receptive vocabulary and reading skills, writing and mathematics to justify the complaints of school learning.

Conclusions: The cognitive-linguistic functions interfere in developing communicative and learning processes. Failure to perform receptive and perceptual-motor influences brought relevant to the development of scholastic skills.

Correspondence: *Dionísia C. Lamônica, Departamento de Fonoaudiologia, Universidade de São Paulo, Al. Octávio Pinheiro Brisolla 9-75, Bauru 17012-901, Brazil. E-mail: dionelam@uol.com.br*

Language and Speech Functions/Aphasia

D.C. LAMÔNICA, C.S. TAKAYA & P.M. FERRAZ. Psycholinguistics skills in diplegic cerebral palsy children.

Objective: To analyze the performance of children with Diplegic-Cerebral Palsy (D-CP), that presented suggestive signs of Periventricular Leukomalacia (PVL) in the neurological exam for image, on respect to psycholinguistic skills.

Participants and Methods: The participants were 10 children of both genders and chronological age varying from five to six years, diagnosed as D-PC and with exam for compatible image with PVL. They were evaluated by the Illinois test of psycholinguistic abilities (ITPA) and Peabody Picture Vocabulary Test (PPVT) as well as an informal evaluation, considering the cognitive performance, the weight at the time of birth, the attention skills, the degree of motor impairment and the performance on auditory and visual subtests of the ITPA.

Results: It was confirmed a statistically significant correlation between cognitive and the PPVT performance and between PPVT performance and ITPA auditory reception subtest, considering the psycholinguistic age. In the comparison among the hearing and visual abilities, the participants had better performance in the activities that involved visual skills, confirming significant correlation in the association subteste. It was found statistically significant correlation between attention and the performance on ITPA subtests in relationship to the reception, auditory and visual association and grammatical closure. It was also found a statistically significant correlation between the motor impairment degree and the psycholinguistic performance, confirming the influence of the motor impairment on such activities.

Conclusions: It is also emphasized the importance of the anatomical correlations regarding PVL, other additional factor of risk for alteration in the psycholinguistic skills.

Correspondence: *Dionísia C. Lamônica, Departamento de Fonoaudiologia, Universidade de São Paulo, Al. Octávio Pinheiro Brisolla 9-75, Bauru 17012-901, Brazil. E-mail: dionelam@uol.com.br*

D.C. LAMÔNICA, F.L. ANASTÁCIO-PESSAN & M.G. GEJÃO. Infantile development and receptive vocabulary abilities in Brazilian children with Congenital Hypothyroidism.

Objective: The aim of this study was to describe infantile development abilities and receptive vocabulary in Brazilian children with Congenital Hypothyroidism accomplished by a Brazilian Neonatal Screening Program.

Participants and Methods: Twenty children that received the diagnostic before 2 months of age were evaluated. Their age varied from 36 to 72 months and the assessment was made by the application of Communicative Behavior Observation, Peabody Picture Vocabulary Test and Gesell and Amatruda Development Behavior Scale.

Results: The language area was the most impaired ability of the infantile development (35%) and 25% children had low classification in the receptive vocabulary assessment. The early treatment for Congenital Hypothyroidism prevented intellectual deficiency but not prevented alterations in language aspects such as receptive vocabulary.

Conclusions: The oral communicative alterations observed can interfere in the social integration and in the learning of these individuals, proving the need of these abilities attendance by the speech and language pathologist.

Correspondence: *Dionísia C. Lamônica, Departamento de Fonoaudiologia, Universidade de São Paulo, Al. Octávio Pinheiro Brisolla 9-75, Bauru 17012-901, Brazil. E-mail: dionelam@uol.com.br*

A. AILION, T.Z. KING, C.C. HENRICH, R.M. MORRIS & N.S. KRAWIECKI. Longitudinal Analysis of Risk Factors Affecting Reading Trajectories in Children Diagnosed with Pediatric Brain Tumors.

Objective: Prior research suggests aggressive cancer treatments contribute to cognitive impairments in children diagnosed with pediatric brain tumors. The literature also suggests that younger age at diagnosis and treatment may result in disrupted cognitive trajectories due to an early sensitivity to diffuse injuries in the developing brain. In line with this research, we hypothesized that there is an interaction between radiation therapy (RT) and young age at diagnosis (AAD) of brain tumor, where young age when treated with RT would result in lower standard scores on the WRAT-R Reading Comprehension Subtest.

Participants and Methods: Analyses included archival data; the sample consists of 134 children diagnosed with brain tumors, and each child had between one and nine time points resulting in 487 separate cases for analyses. Participants were diagnosed with mixed tumor types in diverse tumor locations.

Results: A two level multilevel model was used to analyze individual reading trajectories while taking into account risk factors such as AAD, time since diagnosis, socioeconomic status (SES), and RT. Results detected a positive interaction between AAD and RT (interaction coefficient: $\gamma = 2.08$, $p = .02$). For participants treated with RT, younger AAD was associated with lower WRAT scores, whereas AAD had no effect for participants not treated with RT. An interaction between RT and time was also found ($\gamma = -2.29$, $p = .00$), and SES also significantly contributed to reading scores ($\gamma = -6.77$, $p = .00$).

Conclusions: These data suggest that young children with brain tumors treated with RT are at higher risk of reading impairment as reflected in their reading comprehension scores.

Correspondence: *Alyssa Ailion, Georgia State University, 934 Bridgegate Drive, Marietta, GA 30068. E-mail: aailion1@student.gsu.edu*

A.D. FALCHOOK, H. POIZNER, R.I. MAYBERRY, D. BURTIS, L. DOTY & K.M. HEILMAN. Sign Language Aphasia in Probable Alzheimers Disease.

Objective: While Alois Alzheimer, in 1907, recognized the effects of Alzheimer disease (AD) on speech and language in his original description, the effect of AD on language in deaf signers has not previously been reported.

Participants and Methods: We evaluated a 55 year old right handed congenitally deaf woman with a 2 to 3 year history of progressive memory loss and a deterioration of her ability to communicate in American Sign Language, which she learned at the age of 8.

Results: On exam she had impaired episodic memory as well as marked impairments in the production and comprehension of finger spelling and grammatically complex sentences. She also had sign anomia as well as an ideomotor apraxia, and visual spatial dysfunction.

Conclusions: This report illustrates the challenges in evaluation of a patient for the presence of degenerative dementia when the person is deaf from birth, uses sign language, and has a late age of primary language acquisition. Although our patient could neither speak nor hear, in many respects her cognitive disorders mirror those of patients with Alzheimer disease who had normally learned to speak.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

Q. FAN, N. DAVIS, S. RIMRODT, A. ANDERSON & L. CUTTING. Thalamus Connectivity: What Can Diffusion Tractography Tell Us about Reading Difficulties in Children?

Objective: Reading is a complex cognitive behavior, which relies on the corporation of a network of cortical/subcortical regions. It therefore stands to reason that the thalamus, as a white matter tract relay station, plays a crucial role in mediating reading behavior. However, very few studies have examined the thalamic-cortical connectivity in children with reading disability (RD) as compared to controls (CNT). The purpose of this study is to explore if the connectivity-based sub-thalamic pattern differs between the two groups.

Participants and Methods: DTI data were acquired on Philips 3T scanner for 46 subjects (22 CNT, mean age = 12.05 ± 3.12 ; 24 RD, mean age = 11.86 ± 2.89). Diffusion weighting was applied along 32 non-collinear directions, b value = 700 s/mm^2 . To analyze the data, the cortex was divided into nine cortical masks, and the thalamus was then seeded for the probabilistic fiber tracking. The number of streamlines projecting into each cortical mask was counted at every voxel within the thalamus, which were then used in statistical test to explore the group difference.

Results: An F-test on the thalamic connection density maps reveals that children with RD show a different connectivity-based sub-thalamic pattern from controls. In addition, within group variations in the sub-thalamic pattern were also found.

Conclusions: Structural connectivity differences in sub-thalamic nuclei were found between healthy children and children with RD, which indicates that the functional territories on the sub-thalamic scale may differ in children with RD from CNT.

Correspondence: *Qiuyun Fan, Vanderbilt University, 3322 Fairmont Dr. Apt 24, Nashville, TN 37203. E-mail: qiuyun.fan@vanderbilt.edu*

M.L. MCENTEE, T.D. VANNORS DALL, C.F. SCHRETLEN, K.M. SMITH, C.R. FORBES, B. GORDON & D.J. SCHRETLEN. Cognitive Correlates of Qualitative Aspects of Verbal Fluency Performance.

Objective: Verbal fluency (VF) tasks are frequently used for clinical neuropsychological assessment. Qualitative aspects of VF performance, such as clustering and switching, may provide additional information about the cognitive processes underlying successful VF performance. Here we assess the cognitive correlates of qualitative measures of VF performance in a relatively large sample of healthy men and women using the Hopkins qualitative verbal fluency scoring system.

Participants and Methods: 275 reasonably healthy adults from 18 to 92 years of age completed two letter-cued (S, P) and two category-cued (animals, supermarket items) VF trials from the Calibrated Ideational Fluency Assessment (CIFA; Schretlen & Vannorsdall, 2010) along with a cognitive battery assessing attention, processing speed, working memory, intelligence, and executive functioning. Pearson correlations examined relationships between cognitive variables and qualitative VF scores including total acceptable words, numbers of clusters and switches, and total and mean cluster sizes. Mann Whitney U tests were used to determine sex differences in qualitative VF scores.

Results: Measures of processing speed, working memory, intelligence, attention, and executive functioning were correlated with qualitative VF scores. Larger effect sizes were found on category than letter word fluency tasks. While VF scores did not differ by sex there were significant sex differences in cognitive correlates of VF. Men outperformed women on several cognitive tests, but women showed larger effect sizes between VF and other cognitive domains.

Conclusions: The sex differences in cognitive correlates seen with qualitative VF scores suggest that women's verbal skills might underlie many of their other cognitive abilities, while men's other cognitive abilities appear to be more independent of their semantic functioning.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

J.R. WEAVER, T.D. VANNORS DALL, K.M. SMITH, C.F. SCHRETLEN, C.R. FORBES, B. GORDON & D.J. SCHRETLEN. Neuroanatomic Correlates of Clustering on Verbal Fluency Tasks in Healthy Adults.

Objective: Letter and category word fluency tasks are used to assess language and executive functioning. Retrieving words within a semantic subcategory (i.e., clustering) is thought to entail an automatic process, while switching among subcategories (i.e., switching) is thought to entail a more top-down controlled process. Clustering and switching are often linked to left temporal and dorsolateral prefrontal brain structures, respectively, but this has not been tested with structural brain imaging in healthy adults to our knowledge.

Participants and Methods: Healthy adults (n=122, age: M=55.3; SD=17.0) completed two letter-cued (S, P) and two category-cued (animals, supermarket items) word fluency tasks. Responses were recorded and coded using the Hopkins qualitative scoring system (Ledoux et al., 2009). Participants also underwent brain magnetic resonance imaging.

Using voxel-based morphometry, word fluency measures of mean semantic cluster size were correlated with regional gray matter (GM) densities, while co-varying for age, handedness, and global GM volume. Analyses were based on an extent threshold of 20 voxels and an uncorrected $p < 0.001$.

Results: Larger mean cluster sizes correlated with greater GM densities in the left middle and superior temporal gyri (BA 21, 38), middle and inferior frontal gyri (BA 6, 45), precentral gyrus (BA 4, 6), as well as the right middle frontal gyrus (BA 10, 11), precentral gyrus (BA 4, 6) and superior, middle, and inferior temporal gyri (BA 20, 21, 38). There were no associations between GM density and mean cluster sizes on letter fluency tasks.

Conclusions: These findings support the view that category word fluency production relies most heavily on semantic activation of one lexical entry by another, in contrast to letter word fluency, which appears to require more switching among semantically unrelated words. Thus, we found that clustering activity correlated more heavily with temporal than frontal brain structures, and that this was evident only on category word fluency tasks.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

M.A. SEDO & P. MORAGA. Two-Minute "Kiddy Words": Five Little Steps in the Lexical Road.

Objective: "KIDDY WORDS" (KW) is a criterion-referenced measure that extends downwards the "BOSTON NAMING TEST", exploring developmental ages 2 to 6, and does it by using well researched "chronological markers" (Carroll, Stoddard & Vondergard, etc). (It can also be used as a check on the language dominance of bilingual students.) KW adds conceptual and a phonological cues to be used on the items failed.

Participants and Methods: This Chilean adaptation presents to each subject: a) the 5 non-scored items in the cover and b) the 9 items (scored 2-1-0) meant for the chronological age of the subject. This lowers administration time to 2 minutes. A panel of experts was used to adapt concepts and graphics to the environment of the subjects; nine drawings were replaced. The team tested 83 children aged 2 to 6 at "El Castorito" center in Santiago de Chile.

Results: Test-retest reliability was .81 to .90 in 4 of the 5 age strata; at each age, means were 13 to 17, thus suggesting the homogeneity of the levels of difficulty.

Conclusions: KW provides developmental lexical screening at the Kindergarten level; and provides "functional" and "phonological" cues to distinguish normal semantic word retrieval or the compensatory use of frontal phonological cues.

Correspondence: *Manuel A. Sedo, Ph.D., Test creation, UniLingual-Testing, 9 Ingleside Rd., Natick, MA 01760. E-mail: manuel@sedo.net*

K. SUNG, T.D. VANNORS DALL, K. LEDOUX, E.J. PICKETT, B. GORDON & D.J. SCHRETLEN. A Clustering Analysis of Semantic Associations among Letter-Cued Word Fluency Productions by Healthy Adults.

Objective: Letter-cued word retrieval requires a search of phonological word space, as when people produce consecutive words with similar initial sounds (e.g., "purse, purple"). Semantic/associative relationships among words produced on letter word fluency tasks typically are ignored by qualitative verbal fluency scoring systems. Here we aimed to use singular value decomposition (SVD) analysis to examine whether semantic/associative clustering occurs during letter word fluency task performance.

Participants and Methods: Three hundred fifteen healthy adults were instructed to name as many words as possible beginning with the letters "s" and "p" in consecutive 60-second trials. Two binary word-by-participant matrices were constructed as inputs for SVD analysis, which provided clustering of word vectors in multi-dimensional vector space.

Results: SVD analysis identified common clusters of phonemically associated words in two tasks (e.g., ‘pot, pat, pan’ and ‘simple, single, sign’). The analysis also confirmed clusters of words that were semantically or associatively related, such as “pen, pencil, paper” or “shoes, socks, shirt.”

Conclusions: The hypothesis that letter-cued fluency tasks invoke word retrieval processes based purely on phonemic associations is probably incorrect. Semantic/associative clustering on letter word fluency tasks suggests that semantic activation of one concept by another is an automatic and robust phenomenon that might even override conscious control of phonemic information search. Therefore, a scoring system that reflects semantic/associative clustering in letter fluency (e.g., Ledoux et al., 2009) might better capture the hidden cognitive processes involved on letter-cued word retrieval.

Correspondence: *Kyongje Sung, Ph.D., Neurology, Johns Hopkins University School of Medicine, 1629 Thames St., Suite 350, Baltimore, MD 21231. E-mail: ksung3@jhmi.edu*

J. URLACHER & A. BAIRD. Bilingualism, Metacognition, and the Bilingual Verbal Ability Test (BVAT).

Objective: Recent research has shown that bilingual individuals have greater cognitive flexibility and inhibitory control than monolinguals, which suggests that proficiency in more than one language results in increased metacognitive skills. These skills may include self-knowledge of language abilities. This study compared the accuracy of high and low proficiency English/French bilinguals in judging their second language skills using the BVAT as an objective measure. It was predicted that participants with high proficiency would make more accurate judgments of language abilities due to increased exposure to feedback regarding these abilities, which would result in better developed language metacognition. In addition, the psychometric properties of the BVAT were investigated by comparing data from the present study with those obtained in the standardization of the instrument.

Participants and Methods: 40 bilingual participants were recruited from an undergraduate population and completed a self-report language use/proficiency questionnaire and the BVAT. Participants were split into high and low proficiency groups based on overall BVAT scores.

Results: Fisher’s transformation revealed no difference in the correlation between self-reported and objectively measured French abilities by proficiency level. Evidence of concurrent validity for the BVAT was shown by high correlation with self-reported language proficiency, and construct validity was demonstrated by inter-subtest correlations which were significant, but not excessively high. Results were consistent with those cited in the BVAT manual.

Conclusions: In the sample used, the accuracy of language proficiency self-ratings was equivalent in participants with high and low French proficiency; this is not consistent with increased language metacognition in higher proficiency bilinguals. This was likely due at least in part to a limited range of French skills – further research is needed. The BVAT is a promising objective measure of bilingual language skills for research purposes.

Correspondence: *Jordan Urlacher, Psychology, University of Windsor, Chrysler Hall South, Room 173, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: urlache@uwindsor.ca*

M.A. WILSON, P. FERRÉ, D. ADROVER-ROIG, N. GALPARSORO-IZAGIRRE, K. MARCOTTE, Y. JOANETTE & A.I. ANSALDO. Impaired L1 Output Lexicon Access from Semantics in a Bilingual Italian-English Aphasic Patient.

Objective: The heterogeneity of bilingual profiles make single cases the most effective way to understand bilingual processing in order to develop comprehensive models of bilingual language processing. We present the case of LS, a bilingual Italian-English aphasic patient.

Participants and Methods: LS is a 65-year old male aphasic patient who, after a left fronto-parietal and caudate nucleus of the basal ganglia haemorrhagic CVA, suffered from fluent aphasia. He was assessed with a comprehensive neuropsychological and language battery in both languages.

Results: The patient’s performance in both languages and for each task was compared by means of Chi-square tests. Language and cognitive assessment showed that LS’s general cognitive state was equally impaired in both languages. His performance in picture naming, verbal fluency, verbal and written comprehension, and word reading was significantly better for L2, English. The patient’s lexical decision and word repetition were preserved for the two languages. Semantic processing impairment was comparable in both languages. Word translation was always better for L1-to-L2. This pattern suggests that the input lexicons are relatively preserved and semantics is similarly impaired in both languages. However, the pattern of significantly more impaired L1 word production is interpreted as difficulties in the semantics-output lexicon path only for L1, Italian. The activation from semantics to the output lexicon in English is preserved.

Conclusions: These results are in line with models that assume that connections between the lexicons of both languages are asymmetric and stronger from L1-to-L2 and literature showing that after basal ganglia lesions L1, i.e., the more automatized language, is normally more impaired. The need for a comprehensive model that takes into account comprehension and production processing in both normal and impaired bilingual processing to explain cases such as LS is stressed.

Correspondence: *Maximiliano A. Wilson, Centre de recherche de l’Institut Universitaire de gériatrie de Montréal, 4565 Queen Mary, Montreal, QC H3W 1W5, Canada. E-mail: maximiliano.wilson@criugm.qc.ca*

Autism Spectrum Disorders

A. CAMODECA, S. VOELKER & M. GRAGG. Automatic and Controlled Processing in the Broad Autism Phenotype.

Objective: Research on verbal fluency in the Broad Autism Phenotype (BAP) has yielded equivocal findings (Delorme, 2007; Hughes et al., 1999; Spek, 2009; Wong et al., 2006). However, weakness in controlled processing, the generation of search strategies after automated responses are exhausted, may be responsible for the more consistent weakness in letter fluency found in the BAP (Bradshaw, 2005; Hurks, 2010; Kleinhans et al., 2005; Schmidt et al., 2008; Spek, 2005). The current study hypothesized that weaknesses in controlled processing would be observed in those with the BAP.

Participants and Methods: One hundred forty seven participants completed the Delis-Kaplan Executive Function System Verbal Fluency test (D-KEFS; Delis et al., 2001) and the BAP Questionnaire (BAPQ; Hurley et al., 2007). Participants were classified into BAP (n=59) or Non-BAP (n=88) groups based on scores on the BAPQ.

Results: ANCOVAs controlling for gender (letter, category, and category switching trials) and ESL status (category switching trial only) indicated the BAP group produced significantly fewer total words on Letter Fluency, ($F(2, 144)=3.976, p=.048$), as well as fewer words during the 2nd 15” interval ($F(2, 144)=7.228, p=.008$) compared to the Non-BAP group. However, 1st, 3rd, and 4th 15” intervals, Category Total, Category Switching Total, and Total Switching did not differ between groups (all $F_s < 2.562$, all $p_s > .053$).

Conclusions: These results support findings demonstrating a specific impairment in letter fluency in those with the BAP, with intact performance in other verbal fluency areas. These results provide evidence of adequate automatic processing skills but suggest slow development of controlled processing strategies in those with the BAP. Given the research in other populations (i.e., ADHD; Hurks et al., 2004) evidencing poor automatic processing skills, it is possible that the slowed development of controlled processing is a marker for the BAP, and may partially explain the equivocal research findings regarding this population.

Correspondence: *Amy Camodeca, M.A., University of Windsor, 401 Sunset Ave, Windsor, ON N9B 1E6, Canada. E-mail: camodeca@uwindsor.ca*

V. COURCHESNE, A. S. MEILLEUR & I. SOULIÈRES. Intelligence Testing in Very Low Functioning Autistic Children: The Good Surprise.

Objective: Recent studies suggest that standard IQ tests like the Wechsler scales underestimate the intellectual potential of autistic children. Most non verbal autistic children simply cannot be evaluated with the Wechsler scales and are therefore considered as having an intellectual disability. The present study aims at evaluating the intellectual potential of these “un-evaluable” children.

Participants and Methods: Nineteen very low functioning non verbal autistic children (6 to 12 years old) recruited in a specialized school for autistic children with intellectual disability were evaluated using the WISC-IV and three tests that are believed to be more adapted to assess autistic cognition: the Raven’s Coloured Progressive Matrices (RCPM), the Children’s Embedded Figures Test (CEFT) and a visual search task (VS). A control group of 14 typically developing children aged 6 to 12 years old also performed the tasks.

Results: None of the autistic children could reliably complete the WISC-IV. However, 16 autistic children out of 19 understood and completed the CEFT and the VS, while 15 could complete the RCPM. The autistic group showed the same pattern of results as the control group across conditions on the CEFT and VS, despite generally slower response times. Moreover, 8 of the 15 autistic children who performed the RCPM scored in the normal range.

Conclusions: These results show that non verbal autistic children can be evaluated with certain tests that require none or few verbal indications. More importantly, some non verbal autistic children considered to have an intellectual disability were shown to have an intellectual potential in the normal range, which bears implications for educative interventions.

Correspondence: *Valerie Courchesne, Hôpital Rivière-des-Prairies, 7070 Boul. Perras, Montreal, QC H1E 1A4, Canada. E-mail: valerie.courchesne@gmail.com*

R. GREEN, J.S. SOUTHWICK, E.D. BIGLER, A. FROELICH, M. DUBRAY, A. CARIELLO, A.L. ALEXANDER, N. LANGE & J.E. LAINHART. Neurological Correlates of Spatial Learning and Memory in Autism.

Objective: Compared to Controls, subjects with autism tend to perform more poorly on memory measures. The current study examined the relationship of spatial learning/memory in a group of autism subjects and controls and magnetic resonance imaging measures of brain regions involved in memory.

Participants and Methods: Spatial learning was measured with the Visual Selective Reminding (VSR) subtest from the TOMAL: examined over four trials, with delayed recognition assessed 30 minutes later. Participants were male, 9-19 years old with autism (n=29, Mean Age = 13.9) and Controls (n=23, Mean Age = 13.66). No significant differences were found for age, handedness, head circumference, or verbal and non-verbal IQ. 3.0 Tesla MRI was performed with image quantification being performed by the FreeSurfer automated image analysis program.

Results: In comparison to Controls (M = 24.32, SD = 4.09), the Autism group (M = 20.83, SD = 6.0) displayed less immediate; $t(49) = 2.34$, $p = .023$ and delayed retention [TD: M = 10.41, SD = 1.62; ASD: M = 9.21, SD = 2.37; $t(49) = 2.04$, $p = .046$]. Partial correlations were calculated controlling for age. A significant correlation was observed between VSR delayed recall and the right hippocampal volume ($r = .371$, $p = .05$) in the Autism group. In the Controls, VSR immediate recall was observed to be significantly correlated with right hemisphere paracentral cortical thickness ($r = .513$, $p = .014$). Significant correlations were also found in the Control group for delayed VSR performance in total thalamic thickness ($r = .549$, $p = .006$) and right hemisphere paracentral thickness ($r = .445$, $p = .038$).

Conclusions: Learning and delayed recognition of spatial information was reduced in subjects with Autism compared to Controls. Patterns of spatial memory and associations with brain regions varied between Controls and those with Autism. Results will be discussed in terms of current theories of encoding deficits and its relationship to aberrant connectivity in autism.

Correspondence: *Ryan Green, Clinical Neuropsychology; Psychology; Brigham Young University; 776 n 645 w, Centerville, UT 84014. E-mail: ryanrgreen@yahoo.com*

A. GUNJI, M. KAGA & M. INAGAKI. Voice-specific brain responses: a NIRS study.

Objective: The voice perception plays a major role in human communication. Functional magnetic resonance imaging (fMRI) (Belin et al., 2000, 2004) and magnetoencephalography (MEG) (Gunji et al. 2003) studies reported bilateral voice-specific responses around the superior temporal sulcus (STS). A neuropsychological evaluation of voice perception would be an index to assess the developmental stage and the psychological functioning.

To develop an assessment tool for education and patient care, we measured voice-specific brain responses using a near-infrared spectroscopy (NIRS). NIRS is a noninvasive neuroimaging technique which can measure hemodynamic activity in the cortex and be made without fixing the subject’s body.

Participants and Methods: To make a direct comparison with results reported by Belin et al. (2000), the same exact stimuli have been used: human voice, environmental sounds (non-voice), scrambled voice and scrambled non-voice sounds. Each of 21 stimuli was presented once for nine normal right-handed volunteers (24.9 ± 8.9 years) in experiment 1 and then each of six stimuli was presented once for 16 normal right-handed volunteers (30.0 ± 6.2 years) in experiment 2. Hemodynamic activities were measured using ETG-4000 (Hitachi Medical Corp) with 24 channels and OMM-3000 (Shimadzu, Co. Ltd) with 44 channels.

Results: In bilateral fronto-temporal areas, changes in oxyhemoglobin (oxyHb) levels were larger in voice condition than non-voice condition. There was no significant difference between in the scrambled voice and the scrambled non-voice.

Conclusions: A neuropsychological evaluation using NIRS also provide evidence for perceptual specificity elicited by human voice.

Correspondence: *Atsuko Gunji, PhD, National Institute of Mental Health, National Center of Neurology and Psychiatry, 4-1-1 Ogawa-Higashi, Kodaira, Tokyo 187-8553, Japan. E-mail: agunji@ncnp.go.jp*

R. LAJINESS-O’NEILL, A. OLSZEWSKI, L. PAWLUK, A. CHASE, D. JACOBSON, A. MANSOUR, K. LUCE, A. RICHARD, J. MORAN & S. BOWYER. Occipitoparietal Cortical Activation During Gaze Cueing to Faces and Words in Autism Spectrum Disorder (ASD) and Relationship to Measures of Social Cognition: A Magnetoencephalography (MEG) Study.

Objective: Autism spectrum disorders (ASD) are characterized by social communication impairments such as orienting of attention. Networks critical for following social (eyes) and nonsocial (arrows) cues have been explored. Using magnetoencephalography (MEG), we extended the research and examined orienting of attention to social (faces) and nonsocial stimuli (words). This allowed for an examination of how frontoparietal regions essential for gaze following are integrated with ventral temporal regions for face and word processing. Relationships between source amplitudes and affect recognition and Theory of Mind (ToM) were examined.

Participants and Methods: Eighteen participants underwent MEG, including 9 with ASD, (Mage = 16.6 years, age range 13-26 years, MIQ = 120) and 9 neurotypical (NT) age and IQ matched controls (Mage = 17.5, age range 13-21 years, MIQ = 115). Data were analyzed using MR-FOCUSS, a current density imaging technique, and parametric measures.

Results: Higher mean amplitudes were obtained in left occipital regions during all gaze conditions in those with ASD, with additional differences in supramarginal and temporal regions during gaze shifts to targets and words, respectively (all regions $p < .05$). ASD subjects displayed an earlier onset (≈ 50 -80ms) of cortical activation in inferior frontal and middle temporal regions when gaze was cued to targets and faces while NTs demonstrated earlier activation in supramarginal cortices when cued to words. Negative relationships between activation in occipital regions and affect recognition and between left frontoparietal regions and ToM were found in ASD.

Conclusions: Results suggest that left occipitoparietal regions essential for basic visual processing and reading may be recruited for social orienting of attention and result in a piecemeal processing of social phenomena. We believe aberrant organization and “crowding” occurs in the dorsal visual pathway due to competition for neural resources necessary for both social and language (oral and written) perception.

Correspondence: *Renee Lajiness-O'Neill, Ph.D., Psychology, Eastern Michigan University, 320 King Hall, Ypsilanti, MI 48197. E-mail: rlajines@gmail.com*

K.E. LUCE, N.K. MORRIS & R. LAJINESS-O'NEILL. Differences in Social Functioning as a Function of Gender and Severity in Children with Autism Spectrum Disorder.

Objective: The number of children afflicted with Autism Spectrum Disorders (ASD) is at an alarmingly high rate around 1%, and occurs in all racial, ethnic, and socioeconomic groups. However, gender ratio is 4:1 (males:females) with limited information known about the quality of social deficits in females compared to males. Moreover, limited information is known about how severity as measured by the Social Communication Questionnaire (SCQ) is related to other domains of psychopathology or more broad-based functional abilities.

Participants and Methods: Parents completed the SCQ, Social Responsiveness Scale (SRS), and Behavioral Assessment System for Children-Second Edition (BASC-2) in a community-referred sample of children with ASD (N=86) consisting of 73 males and 13 females ranging in age from 2 to 17 years. Descriptive statistics, independent sample t-tests, and Pearson correlation coefficients were conducted to examine gender differences and relationships between indices.

Results: Significantly lower social motivation ($t(36)=2.33, p = .025$) and higher rates of atypicality ($t(46)=1.61, p = .000$) were noted in males compared to the females as measured by the BASC-2 and SRS. As ASD severity increased as measured on the SCQ, scores on Activities of Daily Living, Adaptability, Adaptive Skills, Functional Communication, and Leadership decreased on the BASC-2. Furthermore, as ASD severity increased, clinically significant increases in Attention Problems, Atypicality, and Withdraw were also noted although increases in other internalizing (e.g. anxiety) or externalizing features (e.g. aggression) were not found.

Conclusions: Results suggest that males with ASD may have less social motivation and more repetitive/rigid behaviors than females. The data further reveal that while core features of the disorder increase with severity, this does not generalize to other domains of psychopathology. Further research is needed to understand how gender impacts socialization.

Correspondence: *Kelly E. Luce, B.S., Psychology, Eastern Michigan University, 311 King Hall, Ypsilanti, MI 48197. E-mail: kluce2@emich.edu*

S.M. MCMANUS, D.L. ROBINS, E.B. TONE & D.J. MARCUS. Visual Scanning of Dynamic Affective Stimuli in Autism Spectrum Disorders (ASD).

Objective: Previous research suggests that individuals with ASD can accurately identify, at a level comparable to their typically-developing (TD) peers, simple emotions presented as static stimuli and under extended viewing conditions. This study provides information about regions of the face sampled during a relatively more complex emotion perception task, one that provides both bimodal (auditory and visual) and dynamic (biological motion) cues.

Participants and Methods: Participants in the current study (N=34) were between the ages of 15 and 25 years. Individuals diagnosed with ASD (n=17, Mage=19.36 years) and TD individuals (n=17, Mage=19.49) completed a forced-choice emotion identification task with congruent (e.g., happy face, happy voice) and incongruent movies (e.g., happy face, angry voice). Fixation duration was examined across four facial regions (eyes, nose, mouth, periphery) and movie condition (congruent, incongruent).

Results: No interactions were found, indicating that both groups displayed similar fixation patterns across regions, $F(3,96)=1.32, p=.28,$

$\eta^2=.04,$ and conditions, $F(3,96)=1.66, p=.21, \eta^2=.05.$ However, analyses indicate that fixation duration differed significantly by facial region, $F(3,96)=8.51, p<.01, \eta^2=.21.$ Fixation duration for the eyes was greater than duration for the mouth ($p<.01$) and periphery ($p<.01$). Finally, between-group differences indicate that total fixation duration was significantly greater for TD than ASD individuals, $F(1,32)=7.50, p=.01, \eta^2=.19.$

Conclusions: Despite pervasive deficits in social perception and interaction, these preliminary analyses suggest that individuals with ASD approach the visual perception of dynamic, affectively expressive faces in a pattern that resembles that of same-aged peers. These results will be discussed further in the context of within-group variability in diagnosis, accuracy, and fixation distribution.

Correspondence: *Susan M. McManus, MA, Psychology, Georgia State University, 626 N. Calvert St, Apt A, Baltimore, MD 21202. E-mail: smcmanus1@student.gsu.edu*

A. S. MEILLEUR, I. SOULIÈRES, A. BERTONE & L. MOTTRON. Magnitude of Perceptual Peaks in Autism is Partially Dependent on the Choice of the Matching Variable: The Example of Pitch Discrimination.

Objective: When comparing cognitive performance between clinical and control populations, groups are matched for intellectual functioning, assuming that the effect of the matching variable on performance is the same for both groups. The most frequent matching variable in autism studies is Wechsler Full Scale IQ (FSIQ) (Mottron, 2004). However, it has been shown that this measure underestimates autistics' cognitive level, given their difficulty with verbal material. It is therefore possible that autistics' perceptual peaks may be an artifact of the matching variable. To investigate this possibility, the current study tested the influence of the Raven's Progressive Matrices (RPM), a more representative measure of autistic intelligence, on the magnitude of perceptual peaks in autism.

Participants and Methods: 34 autistic and 34 typically developing adolescents/adults were tested on Wechsler IQ, RPM and pitch discrimination, using an adaptive psychophysical task.

Results: Regression analyses revealed a Group X IQ interaction ($p=.01$): Wechsler FSIQ predicted pitch discrimination performance in control participants ($p=.004, R^2=.176$), but not in autistic participants ($p>.20$). RPM predicted discrimination performance similarly in both groups ($p=.001, R^2=.171$; no Group X RPM interaction $p=.23$). Group comparisons entering either FSIQ or RPM as a control variable consistently revealed significantly better performance in autistics compared to controls. However, the effect size was smaller when using RPM, rather than FSIQ, thereby reducing the magnitude of the peak.

Conclusions: In sum, RPM rather than FSIQ may be a more accurate predictor of perceptual ability in autistics. Also, the fact that the peak remains, but is decreased when matching on RPM suggests that presence of peaks can partially, but not solely be explained by the choice of matching variable. This finding has implications for understanding the nature of peaks of ability in autism, and for the debate on the use of matching variables in clinical populations.

Correspondence: *Andree-Anne S. Meilleur, Rivière-des-Prairies Hospital, 7070 Perras boulevard, Montreal, QC H1E 1A4, Canada. E-mail: ameilleur009@gmail.com*

A. MEYER, S.J. STEVENS & A.V. VAN HECKE. Marquette University PEERS Pilot: EEG Coherence and Friendship Qualities in Teens with Autism.

Objective: The Program for the Enrichment and Education of Relational Skills (PEERS) is a 14-week social skills program for teens with autism spectrum disorders (ASD). This pilot aimed to investigate changes in self-reported friendship qualities and EEG coherence after participation in PEERS.

Participants and Methods: 5 adolescents with ASD participated in weekly 1.5 hour didactic sessions. Evaluations of friendship qualities

and baseline EEGs were completed pre- and post-treatment. EEG coherence was computed in the Compumedics-Neuroscan and Mathworks MATLAB programs at delta, theta, alpha, beta, and gamma frequencies. Coherences between electrodes in left and right frontal lobes (F3-F4 & F7-F8) and in frontal and parietal-temporal lobes (left: F3-P3 & F7-T5; right: F4-P4 & F8-T6) were computed, and the Friendship Qualities Scale was completed. Change scores were computed and entered into a Pearson's correlation. Paired samples t-tests were computed for measures pre- and post-treatment.

Results: Results of the correlation indicate gains in coherence in delta (F3-F4), theta (F3-F4; F8-T6), alpha (F7-F8), beta (F4-P4), and gamma (F4-P4) bands ($p < .05$) are correlated with gains in friendship qualities after receiving treatment. Paired samples t-tests revealed a trend towards an increase in gamma coherence between left frontal and parietal-temporal areas (F7-T5) after completing PEERS ($t(4) = -2.30$, $p = .08$). FQS scores revealed a significant positive increase pre- and post-treatment ($t(4) = -3.64$, $p = .02$).

Conclusions: PEERS resulted in significant increases in friendship qualities, which was correlated with significant positive increases in EEG coherence. In addition, a trend towards significant positive increases between the frontal and parietal-temporal areas in the gamma range, a frequency related to higher-order thought, was found. Given the small sample size and short time of treatment, PEERS appears to be effective in producing behavioral changes, as well as potentially impacting neural connectivity as a result of treatment.

Correspondence: *Audrey Meyer, M.S., Marquette University, 604 N 16th St, Room 307, Milwaukee, WI 53202. E-mail: audreymeyer@gmail.com*

K. MINTAH & S.E. PARLOW. Autistic Traits and Romantic Relationships Are Not Incompatible.

Objective: The popular idea that young people with autistic traits are uninterested in dating and marriage is consistent with research linking deficient social skills and difficulties forming romantic relationships. However, Jobe and White (2007) recently reported that although students with autistic traits had fewer friendships, they were as likely to form romantic relationships as their peers. The objective of this study was to replicate and extend this finding.

Participants and Methods: Two hundred and thirty-two university students completed an online survey that included the Autism Quotient (AQ) and measures of perceived ability/experience in 3 types of relationships (friendship, casual dating, committed). AQ scores ranged from 6 - 44 ($M = 18.42$). The sample included 7 participants with AQ scores above the clinical cut-off of 32.

Results: As expected, correlational analyses confirmed that autistic traits hampered friendship formation and casual dating, but these traits did not restrict the length of committed relationships. A multiple regression analysis showed that the relationship between autistic traits and romantic difficulties was mediated by 3 factors: perceived social and sexual incompetence, and dating anxiety.

Conclusions: As predicted, individuals with autistic traits reported being involved in long-term committed relationships despite romantic and social challenges. Future research should explore how long-term committed relationships are formed in this population. Social skills training for this population should include sexual cognitions and dating anxiety. Training should probably also include how to evaluate the quality of a committed relationship and how to extricate oneself from a poor relationship.

Correspondence: *Kojo Mintah, Department of Psychology, Carleton University, 60 Golder's Green Lane, Ottawa, ON K2J5G2, Canada. E-mail: kmintah@connect.carleton.ca*

K. MORIN, J. GUY, C. HABAK, H. WILSON, L.S. PAGANI, L. MOTTRON & A. BERTONE. Face perception in autism : assessing the effect of viewpoint change on identity discrimination.

Objective: Face perception is the most commonly used visual metric of social perception in autism. However, when found to be atypical, the na-

ture of its origin is often contentious. One hypothesis proposes that autism's characteristic locally-oriented visual analysis ultimately affects performance on most face tasks where global analysis is optimal. Objective: To evaluate this hypothesis by assessing face identity discrimination with synthetic faces presented with and without changes in viewpoint (access to local face attributes is minimized in the viewpoint change condition).

Participants and Methods: 60 participants (autistics and non-autistics) matched for global IQ, age and gender were asked to perform a face identity discrimination task (Habak et al, 2008). Included in this task were synthetic face stimuli (Wilson et al, 2002) extracted from traditional face photographs in both frontal and 20° side viewpoints. The face photographs were then digitized from 37 points to provide a continuous measure of facial geometry. Face identity discrimination thresholds were obtained using a two-alternative, temporal forced choice match-to-sample paradigm consisting of a target face, followed by a mask, then by 2 choice faces presented side-by-side. Participants were asked to identify which choice face matched the target.

Results: Analyses revealed a significant interaction effect between groups and conditions, with significant group differences found only for the viewpoint change condition, where autistics performance was less efficient than that of non-autistic participants.

Conclusions: The selective decrease in autistic performance for the viewpoint change condition suggests that face identity discrimination in autism is more difficult when (i) access to local cues are minimized, and/or (ii) an increased dependence on integrative analysis is introduced to the face task used. These results suggest a perceptual, rather than social origin of atypical face perception in autism.

Correspondence: *Karine Morin, Master, psychoéducation, Montreal University, 294S rue montcalm app 8, Faudreuil, QC J7V 7W8, Canada. E-mail: karine.morin.6@umontreal.ca*

A. NADER, P. JELENIC & I. SOULIERES. Comparing WISC-III and WISC-IV Profiles in Children with Autism versus Asperger Syndrome.

Objective: Previous editions of Wechsler Intelligence Scale for Children (WISC) have revealed consistent differences in the cognitive profile of autistic and Asperger children. These two subtypes of the autism spectrum differ mainly on the presence or absence of speech delay and visuospatial strengths. Our aim was to verify whether similar cognitive profiles were observed using the new WISC-IV in autistic and Asperger children.

Participants and Methods: 28 autistic and 15 Asperger children (6-15 years) completed the WISC-IV. They were individually matched on age and FSIQ to 28 autistic and 15 Asperger children who completed the WISC-III.

Results: Despite no significant FSIQ difference between Asperger (mean=98) and autistic group (91), divergent WISC-IV profiles were observed. Asperger children obtained a significantly higher score on Verbal Comprehension Index (VCI=110) than Perceptual Reasoning Index (PRI=102), while the opposite was observed in the autistic group (VCI=82 vs. PRI=105). The discrepancy between the two indexes was greater in WISC-IV than in WISC-III in the autistic group. Working memory and Processing Speed indexes were significantly lower than PRI in the autistic group and lower than PRI and VCI in the Asperger group. Significant strengths were revealed on the Block Design and the new WISC-IV motor-free visual reasoning subtest, Matrix Reasoning, in the autistic group. In the Asperger group, strengths on Similarities and Vocabulary subtests were observed. Comprehension subtest yielded the lowest score for both groups, as in WISC-III.

Conclusions: WISC-IV cognitive profiles are consistent with profiles found using WISC-III. In autistic children, the greater difference between the VCI and PRI indexes found in the WISC-IV could be linked to a diminution of motor demands, better revealing the visual reasoning strength of these children. Wechsler cognitive profile constitutes a useful tool for differential diagnosis among the autism spectrum, and with regard to other clinical conditions.

Correspondence: *Anne-Marie Nader, B.Sc., Psychology, Université du Québec à Montréal, Case postale 8888, succursale Centre-ville, Montréal, QC H3C3P8, Canada. E-mail: nader.anne-marie@courrier.uqam.ca*

A. NAIR, M. GHANE, A.J. KHAN, J.O. MAXIMO, R. SCHUSTER & R. AXEL MULLER. Neuropsychological Correlates of Thalamocortical Connectivity in Autism Spectrum Disorders (ASD).

Objective: Thalamus is an important subcortical relay structure, which plays a crucial role in visual, auditory, and somatosensory functions, as well as attention and motor control. Various lines of evidence have suggested thalamic abnormalities in ASD (e.g., Chugani et al. 1997, Freedman et al. 2003). Highly specific patterns of thalamocortical connectivity have been demonstrated in typically developing individuals (TD) using functional magnetic resonance imaging (fMRI; Zhang et al. 2008, 2010; Fair et al. 2010). The current study aims to assess the relationship between neuropsychological correlates (scores on the ADOS, ADI, WASI, and VMI) and integrity of thalamocortical connectivity in adolescents with ASD.

Participants and Methods: fMRI data from 19 ASD adolescents and 22 TD adolescents were acquired from a 3T MRI scanner using a 6-minute resting-state functional EPI. Data were analyzed using AFNI (Cox, 1996) and SPSS statistical software package.

Results: Results indicated successful replication of previously identified patterns of thalamocortical connectivity in TD adolescents. Comparatively, ASD adolescents mostly showed underconnectivity in prefrontal, parietal, motor, and somatosensory thalamocortical networks, whereas for the temporal lobe extensive thalamocortical overconnectivity was found. Additionally significant negative correlations were found for the thalamocortical motor network with scores on the VMI ($r = -.64$, $p = .03$). For the right hemisphere, negative correlations were further seen for motor network connectivity with ADOS communication scores ($r = -.39$, $p = .01$) and the ADI social interaction index ($r = -.36$, $p = .03$), and for the somatosensory network with nonverbal IQ scores ($r = -.37$, $p = .02$).

Conclusions: These findings suggest that reduced functional connectivity within the motor network may be associated with severity of autistic symptomatology.

Correspondence: *Aarti Nair, M.A., Joint Doctoral Program in Clinical Psychology, SDSU/UCSD, 9450 Gilman Drive S0419, La Jolla, CA 92092. E-mail: anair@ucsd.edu*

A. PERREAULT, C. HABAK, L. MOTTRON, F. LEPORE & A. BERTONE. Visual Shape Perception in Adolescents with Autism.

Objective: Atypical performance has been identified in autism for visual information mediated by different visual processes. However, the manner in which different visual processes interact remains unknown in autism. The objective of this study was to assess whether alterations at lower-levels of perception (local processing) affect the subsequent processing of mid-level visual representations of shapes (global processing) in adolescents with autism.

Participants and Methods: Nine autistic and twelve non-autistic adolescent participants performed a shape discrimination task. Shapes used were luminance- and texture-defined radial frequency patterns (RFPs), whose contour is deformed by varying the amplitude of their radial deformations or “bumps”. Luminance and texture manipulations probe lower-level perception, whereas shape variations of RFPs probe mid-level perception. Thresholds, representing the level of amplitude needed to detect RFPs (amplitude > 0), were measured using a method of constant stimuli and a 2-ATFC procedure for patterns containing 2, 3, 5, and 10 radial frequencies (RFs; number of bumps). Participants were asked to identify which of two successively presented patterns was the deformed RFP (target).

Results: When between-group differences were identified, shape discrimination thresholds were always higher (worse) in the autism group. Specifically, higher thresholds were evidenced for 3 and 5 RF conditions for luminance-defined RFPs, but 3 and 10 RF conditions for texture-defined RFPs.

Conclusions: Our results suggest that mid-level perception in autism, defined by global shape perception, is affected by the type of local information (luminance vs. texture) defining the shape's contour. These findings suggest that alterations in lower-level, local visual processing in autism may be associated with altered mid-level perception, and may possibly account for the atypical higher-level perception underlying objects and faces.

Correspondence: *Audrey Perreault, FAS/Psychologie, Pavillon Marie-Victorin F-414-5, Université de Montréal, 90, avenue Vincent d'Indi, Montreal, QC H3C 3J7, Canada. E-mail: audrey.perreault.2@umontreal.ca*

A.E. RICHARD, R. LAJINESS-O'NEILL & S. BOWYER. Impaired Prefrontal Gamma Band Synchrony in Autism Spectrum Disorders (ASD) During a Gaze Cueing Task.

Objective: Neural synchrony in the gamma frequency band has been found to be important in attention, memory, and cognition. Abnormalities in gamma band neural synchrony have been implicated in psychiatric disorders including ASD. Evidence suggests that individuals with ASD show abnormalities in gamma band neural synchrony arising from an imbalance in the ratio of excitatory to inhibitory neural processes. However, little research has examined gamma band activity in the context of social cognition, a significant area of impairment in ASD. This study investigated abnormalities in gamma band synchrony in ASD during a gaze cueing task.

Participants and Methods: Participants included 8 children with ASD and 8 age- and IQ-matched neurotypicals between the ages of 9 and 16, who underwent a magnetoencephalography (MEG) procedure while performing a gaze cueing task. Participants viewed a character whose eyes shifted right or left, towards or away from a target. Gamma power (42 Hz) was calculated for all frontal and posterior sensors and averaged across all sensors in each region. Peak amplitudes for frontal induced, posterior induced, and posterior evoked gamma power were compared with independent sample *t*-tests.

Results: Results indicated that ASD showed lower induced gamma power than neurotypicals in the frontal region ($p < .05$). Cohen's *d* was calculated for frontal induced gamma power, revealing a large effect size of 1.07. Contrary to hypotheses, ASD did not show higher evoked or induced gamma power in posterior regions.

Conclusions: Results indicate that prefrontal gamma response to socially relevant stimuli such as gaze cueing to an object may be impaired in ASD. The lack of group differences in posterior gamma power indicates a need for further study to clarify the nature of abnormalities in gamma band synchrony in posterior brain regions.

Correspondence: *Annette E. Richard, B.A., Psychology, Eastern Michigan University, EMU Psychology Clinic, 611 W. Cross St., Ypsilanti, MI 48197. E-mail: annette.e.richard@gmail.com*

J.S. SOUTHWICK, R.R. GREEN, E.D. BIGLER, A. FROELICH, M.B. DUBRAY, A. CARIELLO, A.L. ALEXANDER, N. LANGE & J.E. LAINHART. Verbal Learning and Neurodevelopmental Outcomes in Autism.

Objective: Neurodevelopment and cognition are evidently altered in autism, yet structure-function relationships in childhood and adolescence remain unclear. We examined relationships between verbal learning and brain structure in older children and adolescents with autism and typically developing controls.

Participants and Methods: Stepwise linear regression models were calculated for age-defined subsets (9–13, 14–19 years old) of autism ($n = 24$) and typical development ($n = 29$) participant groups. Total cortex, white matter (WM), cerebellar cortex, cerebellar WM, thalamus, and hippocampus served as prediction variables. To investigate relationships between cognition and subsequent neural development, we also regressed WSR performance on follow-up MRI scan data obtained approximately 3 years after the initial TOMAL testing (“Time 2”). Structural measurements were obtained using a 3.0 Tesla Siemens scanner, subjected to automated image processing (Freesurfer), and adjusted for total intracranial volume.

Results: Time 1 regression analyses yielded a significant model for the autism 14 to 19 year-old subgroup ($n = 12$; $R^2 = .79$; cortex $\beta = .71$, $p = .001$; white matter $\beta = -.46$, $p = .016$). Time 2 regression analyses yielded significant models for the autism 9 to 13 year-old subgroup ($n = 13$; $R^2 = .39$; hippocampus $\beta = -.62$, $p = .023$) and the typical development 9 to 13 year-old subgroup ($n = 13$; $R^2 = .79$; cerebellar cortex $\beta = .82$, $p = .001$; cerebellar white matter $\beta = -.60$, $p = .007$).

Conclusions: As expected, relationships between verbal learning and neurodevelopment were observed and will be discussed in the context of prevailing theories of developmental neuropathology in autism.

Correspondence: Jason Southwick, PhD, *Clinical Psychology, Neurology, University of Iowa Hospitals and Clinics, 1800 Calvin Court #6, Iowa City, IA 52246. E-mail: jssouthwick@yahoo.com*

J. SUH, I. EIGSTL, M. BARTON, K. TYSON, M. ROSENTHAL, E. TROYB, A. ORINSTEIN, M. HELT, R.T. SCHULTZ, M. STEVENS, E. KELLEY, L. NAIGLES & D. FEIN. Evaluation of Language and Pragmatic Abilities in Optimal Outcome Children with a History of Autism Spectrum Disorders through the Use of Narratives.

Objective: A study is following children and adolescents who have a history of autism spectrum disorder (ASD), but who no longer meet diagnostic criteria for ASD. These “optimal outcome” (OO) individuals have achieved social and language skills within the average range and receive little or no school support.

However, the use of narratives allow the examination of subtle language and pragmatic deficits not detectable through standardized testing. This study will evaluate the language skills of “optimal outcome” (OO) individuals and compare this to that of typically developing (TD) individuals and individuals with high functioning autism (HFA). It is hypothesized that OO individuals will continue to display subtle language deficits.

Participants and Methods: The “Tuesday” narrative from the Autism Diagnostic Observation Scale (ADOS) was collected from 45 participants (15 per group). To date, 21 (7 per group) have been transcribed and analyzed. Preliminary analysis was conducted on the length of narrative, mean number of utterances, fluency, and use of mentalizing terms.

Results: Descriptive statistics and ANOVA tests were conducted to determine whether there were differences in narrative characteristics among the three groups. OO individuals produced a mean length of utterance (MLU) that was indistinguishable from their TD peers, while HFA individuals produced significantly shorter narratives [$M(SD)=12.1(3.2), 11.7(2.4),$ and $8.6(1.8)$ for OO, TD, and HFA respectively; $p=.04$]. Controlling for total number of words, the OO and HFA groups produced significantly more repetitions and self-corrections [$M=.027(.017)$ and $.046(.036)$, respectively] than the TD group [$M=.007(.007)$]. Because of the preliminary sample size, potential trends on other narrative characteristics did not reach significance.

Conclusions: Preliminary results indicate that, while adolescents with OO produce narratives that are typical in some regards, they, like those with HFA, continue to produce narrations that are characterized by significant dysfluency.

Correspondence: *Joyce Suh, B.A., Clinical Psychology, University of Connecticut, 190 John Olds Drive, Apt 202, Manchester, CT 06042. E-mail: jsuh05@gmail.com*

H. TAKEICHI, A. GUNJI & M. INAGAKI. Development of an Efficient Method for Evaluation of Pervasive Developmental Disorders.

Objective: Early diagnosis of pervasive developmental disorders (PDD) is important for the well-being. Because children with PDD show a different pattern of auditory evoked response to human voice compared with typically-developing children, it may constitute a good measure for the diagnosis. We aimed at developing an efficient measurement method for this diagnosis.

Participants and Methods: We have applied the m-sequence modulation technique (Gunji et al., 2010) to detection of voice-related brain activities. Portions (256 segments) of 20 seconds-long human voice sounds and non-voice environmental sounds were spectrally scrambled, as trigger signals, at random timing according to an m-sequence. Six healthy adult volunteers listened to the stimuli. Each of eight stimuli was presented once (20s x 8 = 160s for each condition). The electroencephalograms (EEGs) were recorded from eleven scalp electrodes (Fpz, Fz, Cz, Pz, Oz, F7, T3, T5, F8, T4 and T6) referenced to nose tip. A circular cross correlation function was calculated between the m-se-

quence and the EEG, in order to detect signals specific to voice stimulus for each participant. The correlation functions were averaged across stimuli and subjected to an independent component analysis to extract the critical component. Finally, a subtraction waveform was calculated in the component score between the voice sounds and the non-voice sounds.

Results: We observed a differential signal between the voice sounds and the non-voice sounds in the interval of < 200 ms of correlation time in all participants.

Conclusions: Application of m-sequence modulation technique to efficient detection of voice-related brain activities is promising.

Correspondence: *Hiroshige Takeichi, Ph.D., RIKEN, Hirosawa 2-1, Wako 351-0198, Japan. E-mail: takeichi@riken.jp*

S.D. FAN. Location-based Negative Priming in Preschool Autism Spectrum Disorders.

Objective: Negative priming (NP) is the slow response to the stimulus that was previously ignored. It reflects an inhibitory control of attention in human information processing. Attention plays a key component to the preschool children to learn and concentrate on the learning targets. Several studies show that adult and children show normal NP response with identity based NP. However, location based NP in children is still missing. The purpose this study is to examine the location based NP effect in preschool children especially in autism spectrum disorders (ASD).

Participants and Methods: Participants are the preschool children diagnosed with or without ASD. Cognitive, social and neuropsychological tests conducted. Visuospatial priming paradigm was designed to examine the ability of facilitating the relevant information and inhibiting the irrelevant information in this study. Each trial consisted of a prime and a probe, separate by 500 ms inter-stimulus intervals. Reaction time data were examined one-way ANOVA between groups.

Results: Experiment shows that NP was intact in typical children, while the ASD participants were larger NP effect compare to other groups. On the other hand, the facilitating function of positive priming was no different between the groups.

Conclusions: Previous literature reported that adult ASD with normal location based NP. However, our study with preschool children of ASD was characterized by a pattern of greater NP to match non-ASD group. Focus on spatial localization NP functioning at the inhibitory control, suggesting the presence to suppress the mental representations of potentially distracting information might reflect restricted thought style of ASD.

Correspondence: *Shengfen D. Fan, PhD Student, Physical Medicine and Rehabilitation, Taipei Medical University Hospital, No.252, Wu-Xin street, Taipei 110, Taiwan. E-mail: dexterfan@hotmail.com*

Executive Functions/Frontal Lobes

S.D. FAN & S. TSENG. The effective of self-monitoring strategies enhances ability of cognitive and response inhibition among preschool boys.

Objective: Inhibition mediated response selection in planning and problem solving tasks. This ability of executive function control plays an important role to learn goal-directed learning. Clinical manifestations of poor inhibition control are well known might be observed in the early childhood of ADHD. However, self-monitoring strategies for inhibition control in the preschool children are rarely mentioned.

Participants and Methods: Three subjects were preschool boys with inattention and impulse control problem. Single subject design studies were examined utilizing two data-processing procedures, visual analysis and the simplified time-series analysis methods. Cognitive and neuropsychological tests conducted by clinical psychologist, including the Mullen Scales of Early Learning, Comprehensive Nonverbal Attention Test and Statue of NEPSY-II, respectively, were performed before intervention and after. Self-monitoring strategies were taught by clinical psychologist.

Results: The results of this study were summarized as follows: (1) All three boys learned self-monitoring strategies. (2) Self monitoring strategy had a significantly immediate effect on reducing inattention and impulsive behaviors of all three boys. (3) The results of the CNAT and NEPSY-II revealed that the strategies of rehearsal and pointing help to concentrate and reduce their cognitive and response impulsivity.

Conclusions: Previous literature reported that inhibition might be much better by 5 years. However, our study analyzed three 4 y/o boys learned verbal rehearsal and finger pointing of self monitoring strategies in maintain the information to process at the visual process, suggesting the presence of self monitoring processing might be key to enhance of inhibition control among young child with attention and impulsive problem. Correspondence: *Shengfen D. Fan, PhD Student, Physical Medicine and Rehabilitation, Taipei Medical University Hospital, No.252, Wu-Xin street, Taipei 110, Taiwan. E-mail: dexterfan@hotmail.com*

C. YOUNG, M. DIQUATTRO & S. HUNTER. Maternal Reports of Executive Functioning Skills in Children with ADHD, ASD, and Comorbid Presentations.

Objective: Many children with Autism Spectrum Disorders (ASD) display symptoms consistent with Attention-Deficit/Hyperactivity Disorder (ADHD). Each is associated with impaired executive functioning. Deficits have been shown in working memory and planning/organization in children with ASD. Elevated parent reports of executive functioning skills in children with ADHD and ASD have been found. Despite similarities, these groups have rarely been compared. The current study investigated maternal-reported executive functioning in children with ADHD, ASD, and comorbid ADHD and ASD.

Participants and Methods: Maternal ratings on the BRIEF for 20 children with ASD, 35 children with ADHD, and 36 children with comorbid diagnoses were evaluated. 71 percent of children were male and ages ranged from 4 to 16 years.

Results: MANOVA results indicated that groups differed significantly in attentional shifting ($p < .001$) and working memory ($p < .05$). Mothers of children with ASD and comorbid presentations reported significantly more concerns with attentional shifting than mothers of children with ADHD. Mothers of children with ADHD reported significantly more concerns with working memory than the ASD group. No differences were reported in children with comorbid presentations when compared with the ASD or ADHD groups.

Conclusions: Results suggest ASD and ADHD are associated with unique deficits in executive functioning. ASD, and ASD comorbid with ADHD, is associated with more difficulty with attentional shifting than ADHD. ADHD is linked to specific deficits with working memory, unlike ASD or comorbid diagnoses. Implications for intervention will be discussed. Correspondence: *Crystal Young, M.S., Illinois Institute of Technology, 3105 South Dearborn Suite 252, Chicago, IL 60616. E-mail: cyoung6@iit.edu*

Paper Session 3: Cognitive Control Functions

Moderator: David Kaufman

10:45 a.m.–12:15 p.m.

J.D. MEDAGLIA, A. PEECHATKA, J.M. HASSE, L. FERRANTE & F.G. HILLARY. Effective Connectivity Findings Suggest a Role of the Cerebellum in Cognitive Control.

Objective: Studies have revealed relationships between the cerebellum and the dorsolateral prefrontal cortex (DLPFC), a region involved in cognitive control, during rest. The current study seeks to extend previous findings by examining effective connectivity during distinct task loads of a continuous working memory task. It was hypothesized that the left cerebellum would be most related to activity to the right DLPFC in conditions of highest task demand.

Participants and Methods: Twenty healthy individuals ages 18-55 were recruited from Pennsylvania State University and the surrounding area. Participants completed one run each of the 1-back and 2-back during fMRI data acquisition, practiced outside the scanner, then repeated an identical fMRI session. Exploratory unified structural equation modeling (uSEM) was applied to timeseries including the cerebellum, DLPFC, parietal lobes, and motor regions to find models of best fit for the data.

Results: The uSEM revealed greater influences from the left cerebellum to the right parietal and DLPFC regions before practice during the 2-back. Additionally, influences between the left cerebellum and right parietal and DLPFC regions were greater than those between the cerebellum and motor regions during the 2-back before practice.

Conclusions: Left cerebellar connectivity to regions critical to WM and cognitive control was most pronounced during conditions of high cognitive demands and greater than connections to motor regions. These findings are the first in effective connectivity to suggest that the cerebellum may serve a role in complex cognition via communication with neocortical regions.

Correspondence: *John D. Medaglia, M.S., Psychology, Pennsylvania State University, 610 Moore Building, University Park, State College, PA 16802. E-mail: jdm454@psu.edu*

P.E. CLAYSON, J.L. HOSKIN, M.D. PRIMOSCH, S.W. BERGIN, A. CLAWSON, S.C. STEFFENSEN & M.J. LARSON. Effects of Dopamine Depletion on Cognitive Control and Performance Monitoring.

Objective: Studies using dopaminergic medications and psychiatric populations implicate dopamine in performance-monitoring processes. However, other factors or side effects associated with medication use that may be mediating the relationship between dopamine and performance-monitoring functions may confound these findings. To circumvent such possibilities, we administered an amino acid mixture deficient in the dopamine precursors tyrosine and phenylalanine to acutely deplete dopamine in order to examine the effects of dopamine on the error-related negativity (ERN), an electrophysiological index of performance monitoring.

Participants and Methods: High-density event-related potential (ERP) data were acquired while 10 males completed a Stroop color-word task three hours following mixture ingestion to target peak dopamine depletion. Using a double-blind within-subjects design, participants were administered a balanced amino acid mixture (placebo) or an amino acid mixture deficient in tyrosine and phenylalanine on two separate occasions. Order of administration was randomly assigned. 2-Condition (depletion, placebo) x 2-Accuracy (correct, error) ANOVAs were conducted on error-related negativity (ERN) amplitude.

Results: ERN amplitude was more negative for error trials than correct trials and, notably, when dopamine was depleted relative to placebo. The Condition x Accuracy ANOVA was significant. ERN amplitude was more negative in the dopamine depletion condition compared to placebo; no differences were shown for correct trials.

Conclusions: Findings are consistent with previous research that indicates decreased neural indices of performance monitoring (i.e., ERN amplitude) upon administration of dopamine agonists. Error-related performance monitoring appears to be enhanced when dopamine is acutely depleted, further supporting the role of dopamine in performance-monitoring processes.

Correspondence: *Peter E. Clayson, Psychology, University of California-Los Angeles, 3423A Franz Hall, 405 Hilgard Ave., Los Angeles, CA 90095. E-mail: pclayson@ucla.edu*

S. KOUSAIE & N.A. PHILLIPS. Bilingualism and Cognitive Control in Healthy Older Adults.

Objective: An advantage for bilingual relative to monolingual young adults on attention control tasks has been described in the literature, although not consistently. There is some evidence that this advantage is

larger in older adults, suggesting that bilingualism results in more robust and resilient cognitive control mechanisms. The “bilingual advantage” is hypothesized to result from an increased use of cognitive control mechanisms by bilinguals to manage their two languages (e.g., inhibition of a non-target language). We further examined the bilingual advantage in a non-immigrant sample using behavioural and event-related potential measures (ERPs) in three tasks that have previously demonstrated the effect in young adults.

Participants and Methods: Monolingual ($n=12$) and highly proficient English-French bilingual ($n=12$) older adults completed Stroop, Simon, and Eriksen flanker tasks during ERP recording.

Results: Behaviourally, bilinguals were faster than monolinguals overall for the Stroop ($F(1,22)=7.3, p=.01$) and Simon ($F(1,22)=7.5, p=.01$) tasks. Bilinguals also demonstrated smaller Stroop interference than monolinguals ($F(1,22)=7.7, p=.01$). On the Eriksen task there was a trend showing smaller interference in the monolinguals relative to the bilinguals ($F(1,22)=3.9, p=.06$). In terms of ERP measures, we examined conflict monitoring (i.e., the N2 component), and stimulus categorization time and resource allocation (i.e., the P3 component). The ERPs also revealed between group differences in cognitive processing during the performance of the three tasks, but the locus of the difference varied across tasks.

Conclusions: These results suggest that there may indeed be an advantage for older bilinguals relative to monolinguals on some aspects of cognitive control; however, the advantage may only be present under specific task conditions.

Correspondence: *Shanna Kousaie, Ph.D., Concordia University, 7141 Sherbrooke street west, Montreal, QC H4B 1R6, Canada. E-mail: shannakousaie@yahoo.ca*

A.N. PUENTE, C. FARACO, A. PATEL, A. WATTS & L.S. MILLER. An fMRI Investigation of Inhibition in Normal and Older Adults with Mild Cognitive Impairment.

Objective: Inhibition is a key component of executive functioning, which is vital for functional ability in older adults (OA). The current study compared the behavioral performance and neural activation of normal and OA with MCI during inhibition. We hypothesized OA with MCI would perform the task as well as normals, but would have greater activation in regions of interest: orbitofrontal cortex (OFC), dorsolateral prefrontal cortex (DLPFC), anterior cingulate cortex (ACC) and posterior parietal cortex (PPC).

Participants and Methods: This study was a cross sectional, between group design with 21 normal and 14 OA with MCI recruited from local community who were MRI compatible, between 65–85, literate, and had no current psychiatric/neurological disorder. An event related design was used to present a modified Stroop color-word task. The task was jittered and the stimuli were presented in a semi-random fashion. Behavioral results were recorded and analyzed with independent samples t -tests in PASW statistics 18, while all fMRI data were preprocessed and analyzed in SPM8. To determine the neural activation during inhibition an Incongruent–Congruent contrast was created with accurate trials only in 1st level analyses. 2nd level analyses compared the neural activity between normal and OA with MCI in ROIs with independent samples t -test.

Results: As predicted, OA with MCI activated the DLPFC, OFC and PPC to a greater degree than normal OA while performing the task with the same accuracy and reaction times. However, there was no difference in neural activation in the ACC.

Conclusions: fMRI data indicates neural activity differences even though there was no difference behaviorally. Greater activation in the DLPFC, OFC and PPC maybe indicative of OA with MCI are required to recruit more resources to preserve inhibition. Nonetheless, these differences could be also attributed to the effects of potential neuropathology. These results are consistent with other investigations, but further replications are required to ensure generalizability.

Correspondence: *Antonio N. Puente, University of Georgia, Psychology Building, Athens, GA 30601. E-mail: APuente22@gmail.com*

A. DAS, N. CHIARAVALLI, J. DELUCA & G.R. WYLIE. Evidence for Persistent Recruitment of the Executive Control Network to Maintain Cognitive Performance in Multiple Sclerosis (MS).

Objective: When individuals with MS and healthy controls (HCs) are asked to perform the same task, individuals with MS usually recruit additional brain regions. However, the mechanisms involved are unknown and little is known how such changes may help to maintain cognition despite ongoing tissue damage. Because functional connectivity (FC) analysis assesses entire networks rather than individual brain regions, we used FC to investigate this issue.

Participants and Methods: We examined brain activity in 15 clinically definite relapsing-remitting MS patients, (mean disease duration 113.5 ± 90.5 months) with minimal cognitive impairment and 12 age and education matched HCs, using 3T functional magnetic resonance imaging (fMRI) during the performance of a demanding task: the Task Switching Paradigm (TSP). We performed a seed based functional brain network analysis with seeds in the areas known to be important in task-switching (dorso-lateral prefrontal, parietal, pre-SMA).

Results: The MS subjects performed similarly to the HCs on the neuropsychological measures administered and showed similar executive function performance in the TSP. Although task-related activations were similar for MS and HC participants, the functional connectivity patterns were different. HC showed significantly greater correlations between left pre-SMA and bilateral temporal, cingulate and cerebellar regions ($P < 0.01$). The MS group showed correlations between pre-SMA and the bilateral dorsolateral prefrontal cortex with bilateral inferior parietal lobule ($P < 0.01$).

Conclusions: The differences in FC pattern between high functioning MS subjects and HCs, despite similar task performance and BOLD activation patterns, suggest that HCs are able to use the “automatic attentional” network during TSP while MS subjects must rely more on the “executive control” network to perform at a similar level. This finding has considerable significance to explain the nature of cognitive impairment in MS and has potential applications for cognitive neurorehabilitation.

Correspondence: *Abhijit Das, MD, DM, Kessler Foundation Research Center, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: adas@kesslerfoundation.org*

Symposium 3: The Cognitive Effects of Neurostimulation Therapies for the Treatment of Depression

Chair: Shawn McClintock

10:45 a.m.–12:15 p.m.

S.M. MCCLINTOCK, M. BUTTERS, M. CULLUM, S.M. MCCLINTOCK, A.I. TROSTER & S.M. MCCLINTOCK. The Cognitive Effects of Neurostimulation Therapies for the Treatment of Depression.

Symposium Description: Major depressive disorder (MDD) is a prevalent, chronic, and debilitating disorder in adult and geriatric populations that can negatively impact neurocognitive function. In addition to antidepressant treatments such as psychopharmacologic agents and psychotherapies, neurostimulation therapies selectively modulate different aspects of the central nervous system. These modalities include electroconvulsive therapy (ECT), magnetic seizure therapy (MST), and deep brain stimulation (DBS). Each of these specific neurostimulation therapies differentially affects neurocognitive function. ECT is routinely used for the treatment of MDD, with high efficacy rates, though it is associated with time-limited neurocognitive side effects of disorientation, anterograde and retrograde amnesia. Both MST and DBS are in development for the treatment of MDD, and have been found to have relatively benign neurocognitive adverse effects. Further research is required to develop neurocognitive profiles associated with each neurostimulation therapy. The purpose of this symposium is to: 1) review

the association between depression and neurocognitive function, 2) introduce and review the neurostimulation therapies, 3) discuss their associated neurocognitive effects, and 4) synthesize the information and provide recommendations for future directions. The four presentations will be followed by a question and answer session facilitated by the panel members.

Correspondence: *Shawn M. McClintock, Ph.D., Psychiatry, UT Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390-8898. E-mail: shawn.mcclintock@utsouthwestern.edu*

M. BUTTERS. Depression Associated Neurocognitive Effects.

Major depressive disorder (MDD) is a prevalent, chronic, and debilitating disorder in adult and geriatric populations that can negatively impact neurocognitive function. In addition to antidepressant treatments such as psychopharmacologic agents and psychotherapies, neurostimulation therapies selectively modulate different aspects of the central nervous system. These modalities include electroconvulsive therapy (ECT), magnetic seizure therapy (MST), and deep brain stimulation (DBS). Each of these specific neurostimulation therapies differentially affects neurocognitive function. ECT is routinely used for the treatment of MDD, with high efficacy rates, though it is associated with time-limited neurocognitive side effects of disorientation, anterograde and retrograde amnesia. Both MST and DBS are in development for the treatment of MDD, and have been found to have relatively benign neurocognitive adverse effects. Further research is required to develop neurocognitive profiles associated with each neurostimulation therapy. The purpose of this symposium is to: 1) review the association between depression and neurocognitive function, 2) introduce and review the neurostimulation therapies, 3) discuss their associated neurocognitive effects, and 4) synthesize the information and provide recommendations for future directions. The four presentations will be followed by a question and answer session facilitated by the panel members.

Correspondence: *Meryl Butters, University of Pittsburgh, 3811 O'Hara St., Pittsburgh, PA 15213. E-mail: ButtersMA@upmc.edu*

M. CULLUM. Neurocognitive Effects of Electroconvulsive Therapy.

Electroconvulsive therapy (ECT) has long been an effective intervention for treatment resistant depression, but has been associated with time-limited cognitive side effects, most notably in episodic memory, speed of processing, and consistency in recalling specific aspects of autobiographical experiences. Despite some conflicting reports, recent large-scale clinical investigations have shown that variations in electrode configuration (bitemporal, bifrontal, right unilateral) and continuation ECT versus concomitant pharmacotherapy have similar cognitive outcomes and that cognitive sequelae generally resolve completely by 12 weeks post-treatment. This presentation will: 1) discuss methodological issues in neurocognitive ECT research, 2) review data regarding different electrode placements and concomitant pharmacotherapy on cognitive outcomes, and 3) provide suggestions for future research.

Correspondence: *Munro Cullum, UT Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8846. E-mail: munro.cullum@utsouthwestern.edu*

S.M. MCCLINTOCK. Neurocognitive Effects of Magnetic Seizure Therapy.

Magnetic Seizure Therapy (MST) is a novel neurotherapeutic intervention under development to treat severe, major depressive disorder (MDD). With MST, the induced electric field and resultant seizure is more cortically focused and spreads less to deeper brain structures than with electroconvulsive therapy (ECT). The focality associated with MST is hypothesized to reduce cognitive side effects. Different aspects of MST administration, including stimulus dosing, coil orientation, and coil placement, can affect clinical and neurocognitive outcomes. Translational scientific investigations spanning computer-simulated, preclinical, and clinical methods have been used to inform the development of MST. Available evidence suggests that MST produces antidepressant

effects and a benign cognitive profile. This presentation will 1) discuss the administration of MST, 2) review the preclinical neurocognitive data, 3) review the clinical neurocognitive data, and 4) synthesize the available neurocognitive data and provide future recommendations for MST neurocognitive investigations.

Correspondence: *Shawn M. McClintock, UT Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-8898. E-mail: shawn.mcclintock@utsouthwestern.edu*

A.I. TROSTER. Neurocognitive Effects of Deep Brain Stimulation.

Depression is a primary cause of disability, yet 10% to 30% of patients are estimated not to respond to traditional pharmacological and psychotherapies. An alternative to traditional therapies, deep brain stimulation (DBS), a therapy commonly used for movement disorders, is thought to have fewer potential and reversible side effects than older lesioning techniques (e.g., cingulotomy). Other advantages include modifiability of stimulation parameters and electrode contacts and that researchers can turn the device on and off, allowing for novel control conditions to which DBS effects can be compared. The first report of DBS for depression was published in 2005, and this therapy remains experimental. Although case reports of treatment of major, refractory depression by DBS of the thalamus and globus pallidus have been published, there are currently two targets that are the subject of large, multicenter trials: the subgenual cingulate (Brodmann area 25) and the nucleus accumbens or ventral capsule/ventral striatum. These targets have been chosen based on theoretical grounds and empirical findings of functional neuroimaging studies of depression and treatment response. Early reports show that about 50% of patients may respond to DBS. In small neuropsychological studies of DBS of both primary targets beneficial effects on cognition, especially in patients with below average performance pre-operatively have been observed. Interestingly, these effects on cognition are not associated with extent of improvement in depression, suggesting they are not an epiphenomenon of depression resolution. Whether effects relate to DBS effects on motivation or specific mechanisms of cognition remains to be shown.

Correspondence: *Alexander I. Troster, University of North Carolina, 170 Manning Drive, Chapel Hill, NC 27599. E-mail: trostera@neurology.unc.edu*

Invited Address: The Neuropsychology and Cognitive Neuroscience of Episodic Memory: Past, Present, and Future

Speaker: Morris Moscovitch

11:00 a.m.–12:00 p.m.

M. MOSCOVITCH. The Neuropsychology and Cognitive Neuroscience of Episodic Memory: Past, Present, and Future.

Since the beginning of the scientific study of memory in the late 19th century, research on recent (anterograde) and remote (retrograde) memory developed in parallel, rarely converging with one another. With the discovery at the Montreal Neurological Institute of the contribution of the medial temporal lobe, and the hippocampus in particular, to recent and remote memory, the two streams converged momentarily, only to diverge again, with some exceptions, until the 21st century. In this lecture, I will track these developments and argue for a common role of the hippocampus in recent and remote memory. I will then consider the implications of this view to emerging evidence that the hippocampus is not only involved in memory per se, but may also contribute to performance in other domains such as imagination, planning, solving problems, generating items from semantic memory, naming faces, and even

to priming (implicit memory). The role of other structures, such as the peri-rhinal, parahippocampal and parietal cortex, is also starting to be appreciated. I hope to touch on some of these new developments and consider their implication for neuropsychological models of episodic memory and for clinical applications.

Correspondence: *Morris Moscovitch, PhD, Psychology, University of Toronto, 100 Saint George Street, Room 4092, The Rotman Research Institute of Baycrest Centre, Toronto, ON M6B 1N1, Canada. E-mail: momos@psych.utoronto.ca*

Poster Session 3: Assessment and Psychometrics/Drug and Toxin- related Disorders/Callosal and Laterality

11:00 a.m.–12:30 p.m.

Hemispheric Asymmetry/Laterality/Callosal Studies

E. ABBASSI & Y. JOANETTE. Affective Word Priming in the Cerebral Hemispheres as a Function of Stimulus Onset Asynchrony.

Objective: Recently based on a review on the studies that used emotional words as their stimuli, we suggested a dual-process model for the processing of emotional words in the cerebral hemispheres (Abbassi, Kahlaoui, Wilson, & Joannette, 2011). This model claims that the left hemisphere (LH) and the right hemisphere (RH) are involved in an early automatic and later controlled processing of emotional words, respectively. The present study was an attempt to provide empirical support for this model using a behavioral methodology. Therefore, in order to differentiate between the roles of the cerebral hemispheres in emotional word processing, we investigated the time course of activation of emotional words in the LH and RH using a divided visual field priming paradigm.

Participants and Methods: Twenty-eight right-handed native English speakers with normal or corrected to normal vision participated. A set of 192 prime-target pairs with the same valence (congruent: “malice-burial”) or opposite valence (incongruent: “profit-crisis”) were presented in four blocks, under short (0 and 150 ms), intermediate (300 ms), and long (750) Stimulus Onset Asynchronies (SOA), to the right visual field (RVF: LH) or left visual field (LVF: RH) and reaction times to the evaluation of the target were measured.

Results: A 2 (congruency: congruent, incongruent) X 2 (visual field: RVF-RVF, LVF-LVF) X 4 (SOA: 0, 150, 300, and 750 ms) repeated measures ANOVA revealed evidence of early priming (at short SOAs) in the RVF (LH) that shifted to the LVF (RH) later in processing (at SOA of 750). Priming was not detected at the 300-ms SOA in either hemisphere.

Conclusions: The results are consistent with the dual-process model and seem to suggest that the two hemispheres have different and possibly complementary roles in the processing of emotional words.

Correspondence: *Ensie Abbassi, PhD, Centre de recherche, Institut universitaire de gériatrie de Montréal & Faculté de médecine, Université de Montréal, Montréal, Canada, 4565, Chemin Queen-Mary, Montréal (Québec), QC H3W 1W5, Canada. E-mail: ensie.abbassi@umontreal.ca*

B. BIRATH, L.K. PAUL, A. TURK & W.S. BROWN. Discourse Coherence on the Thematic Apperception Test in Agenesis of the Corpus Callosum.

Objective: Individuals with Agenesis of the Corpus Callosum (ACC) exhibit deficits in complex cognition, including problems with social cognition, alexithymia, and complex novel problem-solving. These difficulties may stem from an underlying disruption of cognitive coherence

that might be evident in expressive linguistic output. Previous research has focused on content deficits in ACC (e.g., fewer words indicating emotions and mental states) in responses to the Thematic Apperception Test (TAT). This study analyzed the narrative coherence of TAT responses using Latent Semantic Analysis (LSA).

Participants and Methods: LSA is a computerized linguistic analysis tool that evaluates text by making either inter-textual or intra-textual comparisons in a high-dimension semantic space. Using the discourse coherence feature of LSA (i.e., average sentence-to-sentence semantic similarity), this study compared TAT responses of 25 adults and adolescents with complete (n = 18) and partial (n = 7) ACC (Age = 26.6 +/- 9.1, FSIQ = 97.3 +/- 13.6) to those of 28 matched control participants (Age = 24.3 +/- 7.3, FSIQ = 98.2 +/- 8.6).

Results: No significant differences were found in discourse coherence between the ACC and control groups, $F(5, 51) = 0.05$, $p = .823$.

Conclusions: Individuals with ACC were not deficient in constructing and expressing linguistically coherent narratives (LSA discourse coherence), despite differences in semantic content previously demonstrated. Thus, results suggest normal cognitive coherence in ACC despite complete or partial absence of the corpus callosum. Future research should focus on specific domains of social-cognitive awareness and content in responses to the TAT.

Correspondence: *Warren S. Brown, Ph.D., Fuller Graduate School of Psychology, Travis Research Institute, 180 N. Oakland Ave, Pasadena, CA 91101. E-mail: wsbrown@fuller.edu*

C.M. YOUNG, K.S. REIMER, L.K. PAUL & W.S. BROWN. Awareness of Consequences in Agenesis of the Corpus Callosum.

Objective: Anecdotal reports indicate that individuals with agenesis of the corpus callosum (ACC) have difficulty comprehending the nuances of social situations. The nature of these difficulties is uncertain. In previous studies, persons with ACC performed worse than controls on theory of mind on tasks that used real-time stimuli (video clips), but performed more normally on tests involving self-paced verbal responses to abstract scenarios. However, subjective scoring of these abstract responses makes it uncertain whether there is a difference between real-time and abstract social comprehension in ACC. The current research used Latent Semantic Analysis, an objective computerized tool, to analyze

Participants and Methods: Twenty-one adults with complete ACC (Age, M = 29.81, 18-55; FSIQ, M = 93.86, 78-129) and thirty-two age- and IQ-matched controls (Age, M = 26.38, 18-51; FSIQ, M = 101.28, 84-116) were given the AOCS. It was hypothesized that the responses of ACC participant would differ significantly from the aggregate response of controls when using a boot-strapping comparison procedure within LSA.

Results: A multivariate analysis of variance (MANOVA) of semantic similarity cosigns of AOCS response indicated a significant difference only for vignette four ($p = .047$), which was lost when FSIQ was covaried.

Conclusions: These findings support previous results indicating that, while individuals with ACC are deficient in real-time social processing, they perform as well as controls on theory of mind and social comprehension tasks when responding to abstract scenarios and with sufficient response time.

Correspondence: *Warren S. Brown, Ph.D., Fuller Graduate School of Psychology, Travis Research Institute, 180 N. Oakland Ave, Pasadena, CA 91101. E-mail: wsbrown@fuller.edu*

D.B. BURTIS, J. MO, C. WANG, M. DING, K.M. HEILMAN & J. WILLIAMSON. Constrained Monocular Viewing (CMV) and its Effects on the Autonomic Nervous System.

Objective: The relative activation of the sympathetic versus the parasympathetic system has important effects on vital organs and may influence emotional and cognitive functions. Prior studies have suggested that, whereas the right (insula) hemisphere mediates sympathetic ac-

tivity, the left mediates parasympathetic. Since each eye primarily projects to the contralateral colliculus and collicular activation influences hemispheric activation, we wanted to learn if right versus left constrained monocular viewing would influence the parasympathetic versus sympathetic systems.

Participants and Methods: The participants were 14 normal individuals (4 Woman), (mean age = 23.4 years). Pupillary sizes were recorded (Eyelink 1000) while each subject had their left, right or neither eye patched in a randomized order. The subjects were instructed to fixate on a monitor crosshair for 5 minutes.

Results: Mean pupillary area (mm²) was compared using a paired Wilcoxon test. Results indicate that CMV (with either eye) caused pupil dilation compared to no patch. But the dilation effect is significantly stronger when the right rather than left eye was patched ($p < 0.05$).

Conclusions: Patching of either eye caused a sympathetic response, but monocular viewing with the left eye increased sympathetic activity more than did viewing with the right eye. Left (versus right) eye viewing may have induced greater relative activation of its contralateral right hemisphere (versus left), thereby increasing sympathetic tone. Further studies examining hemispheric activation with monocular viewing are needed. Correspondence: *David B. Burtis, D.O., University of Florida, 7719 SW 60th Place, #1004, Gainesville, FL 32608. E-mail: dbrandon.burtis@mail.ufl.edu*

A.K. SMITH & L.J. ELIAS. Native Reading Direction and Corresponding Preferences for Left- or Right-Lit Images.

Objective: Native reading direction has been shown to influence an individual's performance on cognitive tasks, such as line-bisection and clock drawing (Fagard & Dahmen, 2003). Left to right readers tend to bisect lines left of centre and draw circles in a counter clockwise direction, whereas right to left readers typically draw circles in a clockwise direction and produce closer to centre line bisections. There is very little research on the influence of native reading direction's influence on lateral biases in lighting preference.

Participants and Methods: In the current study, native left-to-right readers and native right-to-left readers were presented with original and mirror images simultaneously, and asked to make a preference judgment. Images with a clear light source were chosen so that an obvious lighting difference was apparent between the original and mirror image. Two data sets were analyzed: participant choices for preference of right lit or left lit images and scanning patterns examining the images.

Results: Predictions were confirmed by results showing left-to-right readers exhibiting a left-lit image bias that was significantly different from right-to-left readers choices. As well, a greater mean percentage of time examining the left side of images was found with left-to-right readers, whereas right-to-left readers showed the opposite, with more fixations rightward on images.

Conclusions: These findings highlight the role that native reading direction plays in lighting preference decisions, and question conflicting results by Nicholls and Roberts (2002) who examined spatial biases in right-to-left readers.

Correspondence: *Lorin J. Elias, Ph.D., Psychology, University of Saskatchewan, 9 Campus Dr., Saskatoon, SK S7N 5A5, Canada. E-mail: Lorin.Elias@usask.ca*

M. LEANNE & L.J. ELIAS. Estradiol and Functional Cerebral Asymmetries: A Failure to Support the Interhemispheric Decoupling Hypothesis.

Objective: High levels of estradiol might cause interhemispheric decoupling via the process described by the interhemispheric decoupling hypothesis (Weis, Hausmann, Stoffers, Vohn, Kellerman & Sturm, 2008). Alternatively, it has been found that high levels of estradiol decrease right hemisphere functioning and enhance left hemisphere functioning (Mead & Hampson, 1996).

Participants and Methods: The present study tested these conflicting concepts by having 21 naturally-cycling women complete three tasks: An inter hemispheric communication task, a spatial recognition task, and a word generation task.

Results: The interhemispheric communication task revealed that: as salivary estradiol levels increase; the amount of interhemispheric communication decreases, $r(19) = 0.490$, $p < 0.05$. Additionally, both the spatial recognition task and word generation task revealed that: as salivary estradiol levels get higher, left hemisphere activity also increases, $r(19) = 0.540$, $p < 0.01$ and $r(19) = 0.397$, $p < 0.05$, respectively.

Conclusions: The findings of the current study bring into question the validity of the interhemispheric decoupling hypothesis.

Correspondence: *Lorin J. Elias, Ph.D., Psychology, University of Saskatchewan, 9 Campus Dr., Saskatoon, SK S7N 5A5, Canada. E-mail: Lorin.Elias@usask.ca*

K. SUAVANSRI, A.D. FALCHOOK, J.B. WILLIAMSON & K.M. HEILMAN. Right Up There: Hemispatial and Hand Asymmetries of Altitudinal Pseudoneglect.

Objective: Pseudoneglect is a normal left sided spatial bias associated with bisection of horizontal lines and a normal upward bias with vertical lines. Horizontal pseudoneglect has been attributed to right hemispheric dominance for the allocation of attention. The goal of this study was to test the hypothesis that the upward bias in vertical line bisection may also relate to right hemispheric dominance for the allocation of attention.

Participants and Methods: Twenty right handed healthy adults were asked to bisect vertical lines presented in the midsagittal plane (center space) and in sagittal planes left and right of the midsagittal plane (left and right hemisphere). Participants were also asked to place one outstretched arm over the other in their midsagittal plane.

Results: Vertical line bisections were biased upward but were higher in left than right hemisphere, but bisections made with the left hand were lower than those made with the right hand. However in the non-visual perceptual arm placement task, participants placed the right hand above the left.

Conclusions: These results suggest a right hemispheric upward visuospatial attentional bias and a relative left hemispheric-right hand upward action-intentional bias. Further studies are needed to understand the brain mechanisms that produce these biases.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

M.D. MODY, A. SRIVASTAVA, A.D. FALCHOOK, J.B. WILLIAMSON & K.M. HEILMAN. Focal Vertical Attention and Hemispheric-Hand Bias: Who Has the Upper Hand?

Objective: In a vertical line quadrisection task, focal attention should be directed to the quarter line on the top or bottom. If the left hemisphere mediates focal attention and the right mediates global attention, then line quadrisections performed by the right hand should be more displaced to the end of the line than those performed with the left hand.

Participants and Methods: Sixteen healthy right-handed subjects were presented with vertical lines in the midsagittal plane or in sagittal planes to the left and right of midline. They were asked to place a mark 25% of the line's distance from either the top or bottom end of the line (quadrisection) or at the midpoint of the line (bisection) with their right and left hands.

Results: Subjects performed top quadrisections higher (more toward the end) with the right hand than with the left (difference score = 0.70 mm), and with bottom quadrisections the right hand was lower than the left, again more toward the end of the line (difference score = -0.77 mm). There was no asymmetry between hands for the bisections (-0.04 mm).

Conclusions: The greater the attention paid to a line segment, the larger it is perceived. Using the right (versus left) hand may have activated the left hemisphere and when focal attention was allocated to the segment of the line that was in the upper or lower part, these segments appeared larger than their actual size and the attempted quadrisections deviated to the end of the lines.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

A. SRIVASTAVA, M.D. MODY, A.D. FALCHOOK, J.B. WILLIAMSON & K.M. HEILMAN. The Upward Bias in Vertical Line Bisection and Quadrisection.

Objective: In vertical line bisection, normal subjects demonstrate a slight upward bias (vertical pseudoneglect). Attempting to visually perceive “what” may require more focal attention than determining “where.” Since determining “what” is mediated by a ventral visual system that allocates attention upward, when normal participants perform a vertical line quadrisection task (which relies more on focal attention) they may reveal an upward bias greater in the upper than the lower quadrisection.

Participants and Methods: Sixteen subjects were asked to bisect (estimate the midpoint) and quadrisect (estimate the point 25% of the distance from the top or bottom end of the line) vertical lines placed in the mid, right and left sagittal planes.

Results: While there was an upward deviation error for vertical line bisections and for both the top and bottom quadrisections, the errors for the top quadrisections were deviated significantly higher than the errors for the bottom quadrisections. No significant difference was found between the top quadrisections and the bisections.

Conclusions: Our results suggest that when participants are required to use focal attention, there is a greater allocation of visual attention to the upper altitudinal field as compared to the lower altitudinal field. However, the finding that there were no differences in the upward bias between the top line quadrisection and the line bisection suggests that activation of the ventral stream ‘what’ system cannot entirely account for the upward biases observed in vertical line bisections and quadrisections and further research is needed.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

A. GUIMOND & C. BRAUN. Rey Complex Figure : sensitivity to right hemisphere damage of a new scoring method.

Objective: The objective of the present study was to compare the sensitivities for right hemisphere damage of three scoring methods of the Rey Complex Figure.

Participants and Methods: Participants were 51 children, teenagers and young adults

having sustained a unilateral brain lesion in childhood. The scoring methods were: 1) the standard Lezak-Osterrieth scoring method, 2) Loring’s (1988) method measuring, among others, perseveration on specific elements and 3) a new scoring system based on commissive response bias observed on all the elements of the Figure.

Results: With the three scoring procedures, the right hemisphere lesioned participants had worse scores than left hemisphere lesioned participants, this difference attaining statistical significance for the scoring method based on the global commissive response bias ($p = 0.008$) and for Loring’s method ($p = 0.020$). The standard scoring procedure was only marginally significantly related to the side of the lesion ($p = 0.070$).

Conclusions: The most sensitive and discriminative scoring system for detecting right hemisphere damage was the one based on global commissive response bias. These results are discussed in a neurodevelopmental perspective and suggestions are made for the application of this scoring system in the clinical settings.

Correspondence: *Anik Guimond, M.Ps., UQAM, 1545 De Champlain, Montreal, QC H2L 2S8, Canada. E-mail: guimond.anik@courrier.uqam.ca*

M. KIPMAN, Z.J. SCHWAB, S. DELDONNO & S.D. KILLGORE. Overvaluing the Left: Right Hemisphere Dominance for Facial Perception as Predicted by Gender and Intelligence.

Objective: Most right-handed individuals show a lateralized left visual field (LVF) bias in face processing, presumably due to right hemisphere

dominance of this aspect of cognition. The magnitude of this bias is dependent on gender, as well as several cognitive and emotional characteristics. We examined the contributions of gender, cognitive intelligence (IQ), and emotional intelligence (EI) on the right hemisphere dominance for facial perception.

Participants and Methods: 39 Healthy adults (21 males) aged 18-45 completed two Chimeric face tasks (Happy and Sad), measures of IQ (Wechsler Abbreviated Scale of Intelligence) and EI (Mayer-Salovey-Caruso Emotional Intelligence Test; MSCEIT & Bar-On Emotional Quotient Inventory; EQ-i).

Results: Neither EI nor IQ predicts right hemisphere dominance in females. For males, IQ is correlated with greater LVF bias (Happy; $r=0.320$ $p=0.047$, Sad; $r=0.402$ $p=0.011$) while MSCEIT and EQ-i are not correlated. When IQ is controlled for, MSCEIT and EQ-i as full tests are not correlated with LVF bias in males. However, when EI is broken into subsets: MSCEIT Experiential strongly predicts less LVF bias when IQ is controlled for (Happy; $r=-0.504$ $p=0.03$, Sad; $r=-0.491$ $p=0.03$). A stepwise linear regression for sad faces in males accounts for 27% of the variance $r=0.53$ with IQ alone ($b=0.569$) and 45% of the variance $r=0.67$ when MSCEIT Experiential is added ($b=-0.421$). The effect of adding MSCEIT Experiential is significant at $p=0.006$.

Conclusions: This demonstrates that male LVF bias is predicted by cognitive intelligence, which increases the bias and experiential emotional intelligence, which decreases it. Strategic EI and EQ-i don’t predict hemispheric dominance for face perception.

Correspondence: *Maia Kipman, Sc.B., Harvard, 115 Mill St., Mail Box 334, Belmont, MA MA. E-mail: Mkipman@mclean.harvard.edu*

J.T. KLUTH, K.M. HASAN, H. HANNAY & J.M. FLETCHER. Diffusion Tensor Tractography of the Hypoplastic Corpus Callosum in Spina Bifida: Relations with Neurobehavioral Function.

Objective: Although many people with spina bifida (SB) have hypogenesis of the corpus callosum (CC), there has been little focus on the hypoplastic CC in which all structures appear present, but thinned by hydrocephalus. Using diffusion tensor tractography (DTT) we evaluated the hypoplastic CC, and its relation to neurobehavioral functions.

Participants and Methods: Total and regional CC volumes and DTT metrics were correlated with Stanford-Binet composite IQ, Purdue Pegboard bimanual task, and dichotic listening task from 28 participants with SB and hypoplastic CCs. A group of 32 controls, comparable in age and gender, were used for comparison. The CC was divided into 8 subvolumes: CC1 (prefrontal), CC2-CC4 (anterior, superior, posterior frontal, respectively), CC5 (anterior parietal), CC6 (posterior parietal), CC7 (temporal), and CC8 (occipital).

Results: DTT showed variations in volume and integrity that were maximized in posterior CC segments. Composite IQ correlated with entire CC volume as well as CC1, CC7, and CC8 subvolumes ($p<0.05$). IQ also correlated with FA and radial diffusivity of CC8 ($p<0.05$). Bimanual coordination did not correlate with entire CC volume or with any integrity measures, but did correlate with CC1 and CC7 subvolumes ($p<0.05$). Dichotic listening task measures did not correlate with entire CC volume or subvolume measures. Right ear total score negatively correlated with axial diffusivity in CC8, $p<0.05$.

Conclusions: The hypoplastic CC in SB is not normal, but shows variations in volume and integrity that affect neurobehavioral function. However, most assessments of interhemispheric function appear intact and the relations that do emerge reflect more general relations with the severity of white matter injury.

Correspondence: *Jennifer T. Kluth, MA, Psychology, University of Houston, 1 Hermann Museum Circle Drive, Apt. 3055, Houston, TX 77004. E-mail: jkluth@uh.edu*

K. MCCULLOCH, M. HISCOCK & N. LACHNER. Frequency, Attention, and Phonetic Characteristics That Influence the Right-Ear Advantage for Speech Perception.

Objective: The right-ear advantage (REA) for linguistic stimuli (Kimura, 1961, 1967) is thought to represent an asymmetry of speech percep-

tion favoring the left hemisphere. Numerous factors have been reported to affect the REA and this study seeks to clarify how the REA is altered by: attention instructions, filtered or unfiltered background noise, and phonetic properties of stimuli, i.e., voice onset time (VOT) and place of articulation (PoA).

Participants and Methods: Fifty-one right-handed participants (38 females, 13 males) heard monosyllabic rhyming words from the Halwes (1990) Fused Dichotic Word Test. Participants were instructed to attend to the left- or right-ear, or divide attention equally. Noise conditions included binaural unfiltered white noise, high-pass filtered noise, and low-pass filtered noise. After combining right- and left-ear scores in a laterality ratio, we categorized the initial consonants of each dichotic pair according to PoA (bilabial, alveolar, or velar) as well as VOT (voiced or unvoiced).

Results: PoA: Repeated-measures ANOVA showed that the REA was reduced significantly by noise ($p < .025$) and attention to the left ear ($p < .005$). A Noise x Attention interaction ($p < .005$) indicated that noise impaired effective deployment of attention. A significant effect ($p < .025$) for PoA reflects an enhanced REA when bilabial consonants were presented to the right ear. An Attention x PoA interaction ($p < .025$) indicates that attention shifting is most effective with bilabials at both ears and least effective with velars at both ears. VOT: In a second ANOVA, the analysis yielded no main effect or interactions for VOT.

Conclusions: Concurrent noise attenuates the magnitude of the REA, extinguishing it in the case of unfiltered white noise, and reduces the effectiveness of volitional shifts of attention. Bilabial consonants at the right ear tend to enhance the REA and selective attention is most effective when bilabials are presented to both ears. We found no significant effects for VOT of the initial consonant.

Correspondence: *Katie McCulloch, University of Houston, 7009 Almeda Rd Apt S35, Houston, TX 77054. E-mail: katiemccull@gmail.com*

M. MNEIMNE & A. POWERS. State and Trait Effects of Emotion on Memory and Hemispheric Asymmetries.

Objective: The aims of this study were as follows: 1. To compare and contrast the valence-arousal, approach-withdrawal, and BAS-BIS theories of emotion by varying normative valence and dominance ratings, controlling normative arousal ratings, and examining their interactions with individual differences (i.e., behavioral activation/inhibition, anger, anxiety, and depression) on hemispheric asymmetries and memory; 2. To assess whether normative dominance ratings provide a valid means of quantifying motivational direction (i.e., approach/withdrawal).

Participants and Methods: Seventy-five participants viewed words varying in normative valence and dominance ratings and equated for normative arousal ratings, and were administered recall and recognition tests. Finally, they completed self-report measures of individual differences (i.e., behavioral activation/inhibition, psychopathology).

Results: Experimental data provided the most support for the valence-arousal model as fear and anger words were recalled better than neutral and joy words presented to the right hemisphere and joy and neutral words recalled and recognized better than fear and anger words when presented to the left hemisphere. Anger words were recalled and recognized equally well across both visual fields. Correlational data provided the most support for the Behavioral Activation-Behavioral Inhibition model of emotion, which links a behavioral activation system (BAS) that responds to reinforcement to left hemisphere systems and a behavioral inhibition system (BIS) that responds to punishment to right hemisphere systems, as four-way interactions were found between BAS, BIS, Visual Field, and Emotion.

Conclusions: Findings suggest that trait BAS/BIS sensitivity moderates the relation between emotional memory and hemispheric asymmetries for words. Findings also support the use of normative dominance ratings in quantifying the approach-withdrawal dimension of emotion.

Correspondence: *Malek Mneimne, Psychology, St. John's University, 5000 Utopia Parkway, Jamaica, NY 11439. E-mail: malek.mneimne@gmail.com*

Assessment/Psychometrics/Methods (Adult)

M. MNEIMNE, R. WELLINGTON, T. GREINER, V. VARBANOVA & A. POWERS. Shared and Unique Contributions of Psychopathology to Frontal Lobe Task Asymmetries.

Objective: This study examined the influence of psychopathology (i.e., anger, anxious arousal, and anhedonic depression) on frontal lobe task asymmetries by utilizing neuropsychological tests of fluency with well-established neural correlates (i.e., Controlled Oral Word Association Task, Ruff Figural Fluency Task) in an effort to understand better the neural correlates of psychopathology.

Participants and Methods: Seventy-one right-handed women were administered the COWAT, RFFT, Mood and Anxiety Symptom Questionnaire (short form) and State-Trait Anger Expression Inventory-Second Edition.

Results: Individuals reporting anhedonic depression demonstrated small deficits in left frontal lobe functioning, $r = -.22$. Individuals reporting state anger and trait anger expression-out demonstrated moderate relative frontal lobe task asymmetries above and beyond negative affect, anxious arousal, and anhedonic depression, with decreased figural, as compared with verbal fluency, R -squared change = .46-.64.

Conclusions: These findings suggest that a disposition toward anger may be associated with difficulties in nonverbal flexibility and relative right frontal lobe impairment. They are in accord with previous findings linking anger with relative right frontal hypoactivation and the approach-withdrawal model of emotion.

Correspondence: *Malek Mneimne, Psychology, St. John's University, 5000 Utopia Parkway, Jamaica, NY 11439. E-mail: malek.mneimne@gmail.com*

D. AHERN, A.R. RABINOWITZ, B. JERSKEY, S. DEONI, S. SALLOWAY & S. CORREIA. Lowering the Floor on Trail Making Test Part B: A New Scoring Metric.

Objective: To demonstrate research utility of an efficiency scoring metric for Trail Making Test Part B (TMT-Be) as opposed to standard scoring (TMT-Bs). This method captures variability among persons with dementia who do not complete the task within the standard time limit.

Participants and Methods: 56 participants (mean age 77 ± 7.7 ; 68% female) were classified into two groups using the Clinical Dementia Rating Scale (CDR): 13 normal controls (NC, CDR=0) and 43 cognitively impaired (CI) patients with diagnoses of mild cognitive impairment/Alzheimer's disease ($CDR \geq 0.5$). All participants completed a neuropsychological battery including TMT-B administered according to standard procedures and the Mini-Mental State Exam (MMSE). TMT-Be takes into account move-efficiency [ratio of correct moves (Mc) to commission errors (Ec)], time efficiency [time (T) per correct move], and omission errors (Eo).

The formula is as follows:

$$TMT-Be = [(Mc / (24 - Ec)) * (T / Mc)] + Eo \text{ (derivation)}$$

$$TMT-Be = [T / (24 - Ec)] + Eo \text{ (computation)}$$

$$\text{where: } 24 \geq Mc > 0, 24 \leq T \leq 300s, 0 \leq Eo \leq 23$$

Increased Ec or Eo or greater T/Mc all serve to increase the value of TMT-Be, indicating poorer overall efficiency.

Results: Correlation between TMT-Bs and TMT-Be were strong in both groups (NC: $r = .995$; CI: $r = .893$). In the CI group, TMT-Bs and TMT-Be correlated significantly with CDR sum-of-boxes score (CDRsb) ($r = .600$ & $.661$, respectively) and with MMSE ($r = -.697$ & $-.814$, respectively). Among the CI group who obtained a raw score of 300s ($n = 14$), TMT-Be correlated with MMSE ($r = -.741$, $p < .01$) but not CDRsb ($r = .264$, $p = .554$).

Conclusions: Considerable performance variability exists among CI individuals with TMT-Bs=300. Our metric captures variability otherwise lost by standard scoring, extending the use of TMT-B as a research tool. Correspondence: *David Ahern, Ph.D., Warren Alpert Medical School of Brown University, 333 Atwells Ave, #205, Providence, RI 02903. E-mail: david_ahern@brown.edu*

K. AN, E. JEFFAY & K. ZAKZANIS. Poor Effort and the Neuropsychological Experiment: Findings from A Healthy Undergraduate Research Pool.

Objective: The use of undergraduate participants as baseline controls in neuropsychological research studies has been an increasingly popular practice, but concerns about participant effort of this population have not been previously investigated. The purpose of the present study was to examine whether undergraduate introductory psychology students exercise variable effort in neuropsychological testing and how effort might moderate neuropsychological experimental results. To this end, we hypothesized that a substantial portion of participants that we employ in our neuropsychology studies exert suboptimal effort. Furthermore, we examined the temporal stability of effort and the variables that might mediate or predict poor effort.

Participants and Methods: Participants ($n = 36$) were administered 3 Symptom Validity Tests (SVT) (Test of Memory Malingering, Dot Counting Test, Victoria Symptom Validity Test) and various neuropsychological tests during 2 separate testing sessions at least 4 weeks apart. **Results:** The analyses revealed 55.6% of participants in Part 1 and 38.5% of participants in Part 2 exerted poor effort on at least one SVT. Poor effort on the SVTs was significantly correlated with poor performance on various neuropsychological tests. Moreover, there was support for the temporal stability of effort and age as a significant mediator of effort.

Conclusions: These preliminary results suggest that the base rate of suboptimal effort in a healthy undergraduate population is quite high, and thus question the validity of scientific findings in neuropsychology where such research samples are utilized as baseline controls. Accordingly, effort may serve as a source of variance in neuropsychological research when using undergraduate students.

Correspondence: *Elyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A5, Canada. E-mail: elyas.jeffay@utoronto.ca*

E. JEFFAY & K.K. ZAKZANIS. Cognitive Variability in High-Functioning Individuals & Its Implications for the Practice of Neuropsychology.

Objective: Literature on the neuropsychological performance of normal, healthy individuals is abundant but test performance of individuals with high educational achievement is scarce. Thus, the current study was interested if individuals with particularly high levels of educational achievement demonstrate variability in neuropsychological test performance, which cognitive domains are most variable in these persons, if the Best Performance Method proposed by Lezak is an appropriate method to estimate pre-morbid intelligence in this sample and if any of their test scores would be considered to be in the abnormal range.

Participants and Methods: Participants ($n = 25$) with a high-level of education ($M = 19.6$ yrs of education, $SD = 3.24$ yrs) were evaluated on 13 popular neuropsychological tests which spanned multiple neurocognitive domains.

Results: Based on the mean Full-Scale IQ (122.4 ± 10.4), it was seemingly reasonable to assert that the participants were a uniform and unique sample of highly educated individuals. The analyses revealed that the mean maximum discrepancy score (difference between the highest and the lowest z-score) was 4.14 ± 1.25 , the most variable cognitive domains were construction and verbal memory and that 44% of the participants had at least one score less than a z-score of -2.0 .

Conclusions: The data from this study suggest that individuals with high levels of educational achievement exhibit marked variability in test score performance, do not have cognitive abilities which are equally distributed, can be highly intelligent yet neuropsychologically impaired and that the Best Performance Method is an invalid and unreliable method of estimating pre-morbid levels of intelligence.

Correspondence: *Elyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A5, Canada. E-mail: elyas.jeffay@utoronto.ca*

A.D. BAIRD, R. GALE, L. KRASEAN, S. ISKANDAR & J. URLACHER. The Independent Living Scales In Canadian Older Adults Without Cognitive Complaints.

Objective: The Independent Living Scales (ILS; Loeb, 1996) is an invaluable direct assessment of older adults' ability to respond to hypothetical scenarios and execute tasks pertinent to advanced ADLs. The chief normative sample, representative of the US population, included persons 65 and up who were living independently and had no diagnosis of dementia, psychiatric disorder, or unstable medical or neurological conditions. Here we describe ILS performance of a mostly Canadian older adult sample without cognitive complaints.

Participants and Methods: The sample includes 81 volunteers (age $M = 72 \pm 7$; education $M = 15 \pm 3$) who completed the first 4 ILS subscales. We computed T scores according to Loeb's norms. All had normal scores on temporal orientation and semantic fluency tasks. Participants were drawn from 3 studies, including one focused on always-single adults.

Results: We computed associations between the average T score for the first four scales (ILS4AVG) and age, temporal orientation, cardiovascular risk, animal naming, and education. Only the last correlation was significant ($r = .35$). MANOVAs showed no differences between women ($n = 55$) and men.

Consistent with Loeb's analysis, subscale T score distributions were negatively skewed. The lowest ILS4AVG was 41.00. From 2 to 4 participants received scores below 40 T on each subscale. Two participants received low scores on 2/4 subscales. No one received low scores on more. Isolated low scores occurred across educational brackets.

Conclusions: While scores should not determine placement/clinical capacity opinions, information about level of performance in this Canadian well-educated sample should enhance confidence in use of the ILS. Correspondence: *Anne D. Baird, Ph.D., Psychology, University of Windsor, 401 Sunset Drive, Windsor, ON N9B 3P4, Canada. E-mail: abaird@uwindsor.ca*

S. BENOIT, I. ROULEAU, R. LANGLOIS, V. DOSTIE, M. VENDETTE & S. JOUBERT. Assessment of Semantic Memory through Famous Person Knowledge among an Aging French-Quebecer Population.

Objective: As in Alzheimer's disease, mild cognitive impairment (MCI) patients have semantic memory deficits, especially when famous person knowledge is assessed. However, mechanisms of this semantic breakdown still need to be documented. Is recall about recent names more impaired than recall about remote ones? Is it influenced by repetition over time, i.e. are enduring famous names better recalled than transient ones? As a first step to answer these questions, the aim of this study was to create a culturally-adapted famous person knowledge test for an aging French-Quebecer population.

Participants and Methods: 320 young and 46 healthy elderly subjects ($M=24.15$ and 72.27 y.o.; $SD=2.89$ and 6.97) answered multiple-choice questions about 102 international and Quebecois famous persons who became famous during one of the following time periods: 1960-75, 1975-90, 1990-2005, 2005-2010. Their fame was either transient (were briefly famous and then were forgotten) or enduring (remained famous throughout the decades). 40 names were selected for the final version of the test.

Results: A 3 factors ANOVA revealed a significant interaction between fame persistence, fame onset and subjects' age ($F(3,92)=40.22$; $p<.001$; $R^2=.57$). Concerning enduring names, no significant difference for any period of time was found between young and elderly subjects, confirming that these stimuli were truly enduring. Regarding transient names, differences were only significant for the 1960-75 and 1975-90 periods ($t(194)=28.98$; $p<.001$ and $t(181)=15.54$; $p<.001$). The younger subjects' lack of knowledge about these names confirms their transient nature. Exploratory analyses in 8 MCI patients ($M=74.38$ y.o.; $SD=6.28$) also showed impairment for recent names, which is compatible with the recent memory loss observed in this population.

Conclusions: This new famous person knowledge test adapted to French-Quebecer culture and language will eventually allow assessing early semantic memory loss in MCI and in dementia. Special thanks to the Alzheimer Society, FRSQ and NSERC.

Correspondence: *Sophie Benoit, Département de psychologie, Université du Québec à Montréal, C.P. 8888 succursale Centre-ville, Laboratoire d'Isabelle Rouleau, Montréal, QC H3C 3P5, Canada. E-mail: so.benoit@hotmail.com*

O. BEZDICEK, M. PREISS, L. MOTAK, B.N. AXELROD, T. NIKOLAI & E. RUZICKA. Czech Version of the Trail Making Test Normative Data is not Equivalent to the American Version.

Objective: The aim of our study is to test the hypothesis that the norms of the Trail Making Test (TMT) may not be equivalent across cultures (Fernández & Marcopulos, 2008).

Participants and Methods: The Czech version TMT normative data (N = 422 healthy adults) and the largest available American normative data (N = 911 individuals; Tombaugh, 2004), both stratified for age and education level, were compared by series of independent two-sample t-tests. In both studies, Parts A and B were administered according to the guidelines presented by Spreen and Strauss (1998).

Results: The normative data differed in 18–24 and 55–64 age groups for the TMT Part A, with the Czech sample slower than the American normative data. For TMT Part B, the completion times in Czech normative data (vs. American normative data) were significantly longer in all but the 65–74 years age group (all ps < .004 after Bonferroni's correction). The only differences in education were in 18–24 age group, and thus cannot explain much of the observed differences in scores across the cultures.

Conclusions: These findings indicate that the Czech normative data are similar to those available for American population in respect to the TMT Part A whereas completion time for Part B is significantly slower for almost every age group. This conclusion further supports the need for adjustment of available TMT-norms regarding different countries and cultures (Mitrushina et al., 2005).

Correspondence: *Ondrej Bezdicek, M.S., Dept. of Neurology and Centre of Clinical Neuroscience, Charles University in Prague, 1st Faculty of Medicine and General University Hospital, Katerinska 30, Praha 128 21, Czech Republic. E-mail: ondrejb@yahoo.com*

H. BUCHTEL, H. TREE, D. KELLY & C. ZEPELIN. Does the instruction "Do not lift your pencil" affect times for the Trail Making Test?

Objective: The original instructions for the Trail Making Test (TMT) did not include any reference to whether or not the pencil could be lifted from the paper during the task. Recently, examiners have started telling patients that they should complete the task without lifting the pencil. We investigated whether this new instruction affects the time taken to complete the task.

Participants and Methods: We analyzed the TMT data of 376 patients referred for neuropsychological testing. One hundred thirty-five were told not to lift the pencil and 241 were not. Participants were divided into two age groups (20–64 [M=39±15] and 65–92 [M=76±8]). The mean ages of the two instruction groups were the same (Young Mean = 38±15 vs 42±15; Older Mean = 76±8 vs 76±6)

Results: The instruction to keep the pencil on the paper had little or no effect on time in seconds to complete Trails A (Young Participants: 37"±24 vs 38"±22; Older Participants: 72"±42 vs 79"±49) and Trails B (Young: 86"±54 vs 95"±47; Older: 175"±58 vs 154"±67). There were more participants who did not complete Trails B within 300" when they were told not to lift the pencil (Young: 8.4% vs 3.2% and Older: 31% vs 29%), but the differences were not significant. For participants with both Trails A and Trails B scores below 300", there was a marginally significant 3-way interaction (Instruction x Task x Age) (p<0.0498): On Trails B, the older participants were slower than the younger participants when given the instruction to not lift the pencil.

Conclusions: Based on this analysis of 376 patients receiving the TMT under clinical conditions, we conclude that differences between the times obtained with or without the instruction to not lift the pencil are small and not clinically significant. This leads us to believe that normative data gathered with the new instructions will be very similar to the normative data gathered without this instruction.

Correspondence: *Henry Buchtel, Ph.D., Psychiatry, University of Michigan, 2101 Commonwealth Blvd, Suite C, Ann Arbor, MI 48105. E-mail: gusb@umich.edu*

B. BUTLER, G. ESKEES, R. KLEIN & M. LAWRENCE. The Vertical Flanker Task: A Reasonable Alternative.

Objective: In flanker tasks participants respond to a central item surrounded or flanked on two sides by congruent or incongruent symbols. This task has been used experimentally for decades to assess interference effects (incongruent RT slower than congruent RT) and conflict adaptation (reduced interference effects following incompatible trials). In most reports, however, the target and flankers are presented horizontally, which may limit conclusions in patients with visuo-spatial deficits (e.g., neglect/extinction or blindsight). Thus, we have undertaken an initial investigation in healthy young adults of the effects of vertical versus horizontal stimulus presentation on a flanker task using three proportions of congruent trials (25%, 50%, and 75%).

Participants and Methods: Twenty-four participants (age = 20 years; 7 males) completed three blocks of trials, one at each congruency proportion, in which they identified centrally-presented red heart or diamond shapes randomly flanked either horizontally or vertically by four congruent or incongruent distractors (50% vertical).

Results: Generalized Linear Mixed Models comparison showed that incongruent flanker trials were less accurate (2.7% incorrect) than congruent trials (1.6% incorrect) over all conditions. In reaction time analyses, interference effects were present in both the vertical and horizontal orientations, but varied in the horizontal orientation depending on response finger. Furthermore, regardless of orientation, there was evidence of conflict adaptation (derived from analysis of sequence effects) only when the proportion of congruent trials was greater than incongruent trials.

Conclusions: Thus, given the presence of interference effects and conflict adaptation in healthy young adults, a vertical flanker presentation with 75% congruent trials may be an adequate alternative that avoids the potentially confounding effect of laterality. Supported by the Dalhousie Psychiatry Research Fund and the Atlantic Innovation Fund, ACOA.

Correspondence: *Beverly Butler, Ph.D., Psychiatry - Research, Dalhousie University, 5th floor, Abbie J Lane Bldg, 5909 Veterans Memorial Lane, Halifax, NS B3H 2E2, Canada. E-mail: DrBevButler@gmail.com*

N. CARLOZZI, D. TULSKY, S. GARCIA, D. GRAY, E. HAHN, J. HAMMEL, H. HOLLINGSWORTH, S. JEROUSEK, P. KISALA, J. LAI, S. MAGASI & A. HEINEMANN. Developing patient reported outcome measures of environmental factors affecting participation in medical rehabilitation.

Objective: Environmental barriers and facilitators are key factors in social participation that have a large impact on rehabilitation outcomes; yet limited tools are available to measure these important factors. This study was designed to develop new patient reported outcomes (PROs) measures to evaluate environmental factors that affect participation and quality of life in individuals with severe disabilities (i.e., traumatic brain injury [TBI], spinal cord injury [SCI] and stroke).

Participants and Methods: 2212 items were identified or developed to evaluate 6 environmental factors domains: social environment; economic quality of life; built and natural environment; assistive technology; access to information and technology; and systems, services and policies. Expert reviewers winnowed this pool to 280 items. Cognitive interviews with individuals with TBI (n=4), SCI (n=6) and stroke (n=5) resulted in a revised set of 273 items. These 273 items were tested in individuals with TBI (n=100), SCI (n=105), and stroke (n=100).

Results: Confirmatory factor and Rasch analyses supported the unidimensionality of items within each domain. Item banks that can be administered as computerized adaptive tests (CATs) were developed for economic quality of life and for negative aspects of the social environment. Short forms were developed for: access to information and technology; assistive technology; built and natural environment; and systems, services and policies.

Conclusions: We are field testing all items with a larger sample (200 TBI, 200 SCI, 200 stroke) to develop additional CATs. The utilization of these PROs will allow for efficient and sensitive testing of environmental factors in medical rehabilitation populations.

Correspondence: *Noelle Carlozzi, Ph.D., Department of Physical Medicine and Rehabilitation, University of Michigan, 4944 Miller Road, Ann Arbor, MI 48103. E-mail: ncarlozzi@umich.edu*

A. WIECHMANN, K. CARTER, K. NOLL, L. LACRITZ & C.M. CULLUM. An Alternate Form of the Texas Card Sorting Test: A Pilot Study.

Objective: The Texas Card Sorting Test (TCST) is a brief (5 min.) nonverbal measure of mental flexibility that requires sorting six stimulus cards that vary in multiple dimensions. As with many other executive function tasks, the lack of an alternate form has been a limitation in longitudinal studies. A second version of the TCST was developed and examined in relation to the initial version.

Participants and Methods: Both TCST forms were administered in counterbalanced fashion to 14 healthy controls (M age= 34.1, SD= 10.3; M Education= 16.4, SD= 1.7; Caucasian= 64%, Female= 50%). TCST forms were investigated using a Paired samples t-test and Pearson product-moment correlation.

Results: There was a significant difference between the mean number of logical sorts for the original TCST (M logical sorts= 6.9, SD= 1.1) and the alternate form (M logical sorts=6.0, SD=1.6; $t(14) = -2.4$, $p = .034$, two tailed). However, the mean difference (M= .86, 95% confidence interval: -1.64 to -.77) was small ($\eta^2 = .27$) and the majority of subjects scored the same or within one sort. The forms were significantly correlated ($r = .54$, $p = .05$).

Conclusions: Similar scores were obtained by controls on both versions of the TCST in a small control sample, with good agreement between forms. Results provide initial support for this alternative version of the TCST, though further validation in larger healthy and clinical samples is warranted.

Correspondence: *April Wiechmann, Ph.D., Neuropsychology, UT Southwestern Medical Center, 2206 Red Bluff Dr., Carrollton, TX 75007. E-mail: aprilwiechmann@my.unt.edu*

M.J. CELINSKI & L.M. ALLEN. Is Malingering the Same as Poor Effort?

Objective: Psychoassistant requires minimal effort to recognize largely universal over-learned stimuli, wherein poor results may be interpreted as deliberate under-performance. The test involves two trials of 25 well-known and 25 nondescript stimuli utilizing immediate feedback in which a baseline assessment is followed by corrective learning and retesting to overcome potential knowledge gaps. A final purportedly “difficult” block involves retesting with distorted stimuli and random feedback. Psychoassistant is arguably less demanding than typical recognition memory paradigms used to assess motivation during assessment, since learning is either entirely absent or is minimal and involves discerning meaningless images from ubiquitous cultural icons.

Participants and Methods: The present study presents multiple cross-validation analyses of Psychoassistant utilizing a sample of 30 normal volunteers and various subsamples drawn from a population of 442 patients referred for compensation-related neuropsychological assessment. Various quasi-experimental groups were defined in the clinical sample based on performance on CARB, TOMM, and well-accepted embedded effort measures derived from common neuropsychological tests. A series of binary logistic regressions (BLRs) was undertaken to assess the relative sensitivity, specificity and overall classification concordance between subgroups identified as genuine, exaggerating and normal.

Results: Overall rates of correct classification ranged between 76% to 92% across the variously-defined comparison groups. Optimizing specificity at either 90% or 95% resulted in reduced sensitivity, which was expected given the minimally demanding nature of Psychoassistant and the fact that a diagnosis of “malingering” is most often made when a patient fails multiple measures of symptom validity.

Conclusions: Whereas Psychoassistant may arguably provide evidence of intended under-performance, we conclude that it should be used adjunctively with more sensitive tests of effort.

Correspondence: *Marek J. Celinski, Ph.D., C.Psych, Private Practice, 27 Roncesvalles Avenue, Suite 508, Toronto, ON M6R3B2, Canada. E-mail: marekcelinski1@rogers.com*

H. CHERTKOW, Z. NASREDDINE, N. PHILLIPS & V. WHITEHEAD. In Mild Cognitive Impairment, Does the Severity of Impairment on the MoCA (Montreal Cognitive Assessment) Predict Progression to Dementia?

Objective: MCI (Mild Cognitive Impairment) is common, and it would be ideal to be able to use simple screening tools like the Montreal Cognitive Assessment (MoCA) in order to predict progression to AD and dementia. We retrospectively assessed MoCA scores in the Jewish General Hospital Memory Clinic at McGill, to test the predictive ability of MoCA in MCI.

Participants and Methods: 106 subjects with MCI were assessed – mean age 75.1 years. All had demographic and neuropsychological testing, and clinical diagnosis by skilled specialists, and were followed annually for 2.5 +/- 1.3 years in clinic. Clinical classification after lengthy clinical and neuropsychological assessment in a tertiary Memory Clinic, was considered the gold standard. All were administered the MoCA

Results: At presentation, mean MMSE was 27.8 and mean MoCA was 23.3 +/-3.0. Over follow-up, 45 subjects progressed to dementia (mean initial MoCA 22.6) and 61 did not (mean MoCA 23.9). Initial Trails A and Delayed Verbal recall were significantly worse in Progressors. The evaluation of progressors in the highest vs. lowest tertile of the MoCA scores produced a borderline significant different distribution on Chi Square ($p = 0.06$). When age was cofactored by ANCOVA, this was no longer significant. At the same time, MoCA scores under 20 (found in 11% of the cohort), and age >75, were predictive of progression: 88% of subjects meeting both of these criteria progressed, vs 15% of those meeting neither criteria.

Conclusions: Analysis MoCA scores does not produce evidence that lower MoCA scores in MCI predict progression to dementia. Only the subset with very low MoCA scores, particularly if they were age 75 or greater, had a very high risk of progression to dementia.

Correspondence: *Howard Chertkow, MD, FRCP, Neurology, Lady Davis Institute, Rm 408, 3777 Cote Ste. Catherine Road, Montreal, QC H3T1E2, Canada. E-mail: howard.chertkow@mcgill.ca*

P.M. DEAN & J.H. CERHAN. Reconsidering the “what am I wearing and holding?” item on the Mattis Dementia Rating Scale-2.

Objective: The Mattis Dementia Rating Scale (MDRS) is a widely used measure to evaluate global cognitive functioning. Of the five subscales, Initiation/Perseveration (I/P) has the weakest internal consistency and poor reliability, likely due to the diversity of items. Items E (supermarket fluency) and F (naming examiner’s attire) comprise the majority of the points possible. However, item F can create discomfort for the examiner and patient, especially across cultures and generations. The aim of this study was to determine whether item F contributes meaningfully to the I/P subscale score, total MDRS score, and dementia classification.

Participants and Methods: We looked at MDRS results of 102 patients who were administered item F because of failure to reach the acceptable minimal points on the supermarket fluency item. Full points (8) for item F were assigned to all patients to yield an adjusted score.

Results: Spearman rho indicated a weak relationship between items E and F. After adjusting scores, 97% remained unchanged in dementia classification. Of the twelve percent whose total scaled scores changed at all, most were from a 2 to a 3.

Conclusions: While item F is intended as a proxy for the more challenging item E, the weak correlation suggests that the two tasks represent different cognitive constructs. We found that giving full credit for item F, regardless of item E score, had little to no impact on the resulting scores and interpretation of MDRS results. The findings support the option of avoiding discomfort by giving patients full credit for item F without administering the task.

Correspondence: *Pamela M. Dean, Ph.D., Psychiatry and Psychology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905. E-mail: dean.pamela@mayo.edu*

A. DELGADO. Using the Rasch Model to Test the Psychometric Quality of Emotion Recognition Items.

Objective: Recent meta-analyses have shown (1) that the neuropsychological task that best discriminates between Alzheimer's disease and vascular dementia is an emotion recognition test, and (2) a robust link between Parkinson disease and specific deficits in recognizing emotions, particularly acute with respect to negative ones. Emotion recognition items are part of many procedures in Neuropsychology, but they are either analyzed by means of Classical Test Theory or, most often, left unanalyzed. An additional problem is that experimental items are usually an easy subset taken from the basic emotions list: happiness and sadness are very often found, given that many researchers assume dimensional theories and consider these two expressions as exemplars of positive and negative emotions. The objective of this study was to test the psychometric quality of an emotion recognition task by means of the Rasch Model, an Item Response Theory one-parameter model.

Participants and Methods: Some 130 participants (63 females and 67 males across diverse age groups and educational levels) answered 28 items representing emotions from the universal emotions list.

Results: Results clearly show that happiness and surprise items were too easy and did not fruitfully contribute to the measure. Expressions of contempt—one of the moral emotions—gave rise to the most difficult items, thus helping to avoid the ceiling effect usually found.

Conclusions: From the measurement perspective, the Rasch Model has permitted the construction of an interval scale on which items and participants can be jointly located, advantageous scientifically as well as from the perspective of the divulgation of results [MICINN grant PSI2009-09490].

Correspondence: *Ana R. Delgado, PhD, Universidad de Salamanca, Facultad de Psicología, Arda. de la Merced 109-131, Salamanca 37005, Spain. E-mail: adelgado@usal.es*

B.M. DOANE, M.L. OIEN, G.J. LAMBERTY, A.H. SIM & K.A. MCGUIRE. Relationship between MMPI-2-RF Somatic/Cognitive Scales and Neuropsychological Functioning.

Objective: Patients referred for neuropsychological evaluation often report symptoms that are not explained by their history or medical diagnosis (Lamberty, 2007). Few studies have examined the influence of somatoform presentations on neuropsychological measures, despite concerns about such effects. Using the MMPI-2-Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008), the current study examined the relationship between the Somatic Complaints Restructured Clinical Scale (RC1), select validity scales, and the RF Somatic/Cognitive scales with neuropsychological performances in a polytraumatic veteran sample.

Participants and Methods: MMPI-2-RF profiles were obtained from 156 veterans referred for neuropsychological evaluation. Using general linear modeling and Bonferroni-corrected post hoc analyses, the relationship between elevations on RF variables and performance on ability measures was examined. Follow up analyses ($n = 140$) were performed after excluding for insufficient effort performances ($n = 16$). Poor effort was defined as performance below established cut offs on the Test of Memory Malingering or the Victoria Symptom Validity Test.

Results: Participants with COG (Cognitive Complaints) elevations demonstrated significantly poorer performances on executive and cognitive efficiency measures ($p < .05$). RC1, Fs (Somatic Infrequency), NUC (Neurological Complaints), and GIC (Gastrointestinal Complaints) elevations were also associated with significantly lower scores on select delayed memory and executive tasks ($p < .05$). After controlling for effort, the majority of effects for the COG and Fs scales persisted.

Conclusions: In contrast to Gervais (2009), COG elevations were associated with poorer ability test performances regardless of measured effort on stand alone symptom validity tests. Preliminary results suggest that those with greater cognitive/memory complaints may demonstrate poorer performances on executive/cognitive efficiency tasks. Suggestions for clinical use and future research directions are discussed.

Correspondence: *Bridget M. Doane, Ph.D., Psychology, Minneapolis VA Health Care System, 2300 Lexington Ave. S, Apt. 305, St. Paul, MN MN. E-mail: bmdoane@gmail.com*

J. HARRISON, S. DONAGHY & K. OINONEN. Relative Utility of the Wechsler Test of Adult Reading (WTAR) and OPIE-3 in Predicting Premorbid Intelligence Using the WAIS III.

Objective: Estimation of premorbid intellectual functioning is important to help determine cognitive decline. The WTAR and OPIE-3 approaches are the only method specifically designed for the prediction of WAIS-III performance. The objective of the current study was to compare the relative utility of these methods in a clinical sample.

Participants and Methods: Participants included 101 individuals with known neurological damage (mean age 46.41, mean education 12.23). The most common diagnoses were CVA ($n = 28$) and TBI ($n = 27$). Six OPIE-3 FSIQ estimates were calculated according to the published prediction algorithms by Schoenberg et al. (2002). WTAR estimates were derived from the tables provided in the WTAR manual (2001). Clinical utility was evaluated in terms of the ability of methods to produce estimates that: (a) Were higher than obtained FSIQ scores (b) Approximate the mean and standard deviation of FSIQ found in the general population; and (c) Have sufficient range and variance to account for the normal variation of intellectual ability found in healthy populations.

Results: The obtained FSIQ mean ($M = 87.60$, $SD = 13.03$) was significantly lower than all computed mean FSIQ estimates ($p < .001$). The highest mean estimated scores were calculated from the WTAR-demographics ($M = 101.72$, $SD = 6.89$), WTAR-combined ($M = 101.09$, $SD = 12.80$), and OPIE-3(Best) ($M = 100.37$, $SD = 10.90$) methods. In comparing difference scores, the OPIE-3(Best) and WTAR-combined methods demonstrated the largest proportions of estimated scores higher than obtained FSIQ scores and exceeding obtained scores by more than 5 and 10 IQ points.

Conclusions: Results support the use of the WTAR-combined and OPIE-3(Best) methods of premorbid intellectual estimation in clinical practice. The WTAR-demographics, OPIE-3(4ST), and OPIE-3P methods did not perform as well. The remaining methods demonstrated inconsistent results, and while they may be appropriate in specific clinical situations, they are not recommended for general clinical use at this time. Correspondence: *Steve Donaghy, Ph.D., St. Joseph's Hospital, 35 N. Algoma St., Thunder Bay, ON P7B 5G7, Canada. E-mail: donaghys@tbh.net*

S. DONAGHY & L. BRENNAN. Comparison of Three Models Generated by the Test of Premorbid Functioning (TOPF) to Predict Premorbid Intellectual Abilities.

Objective: The TOPF was developed to estimate premorbid intellectual abilities on the WAIS IV. The manual provides guidelines to help clinicians choose among several prediction models, with a theme being that demographic models are best if TOPF obtained and predicted scores differ. The objective of the current study was to compare the Equated (EQ), TOPF-demographics (TOPF), and Simple Demographics (SD) models in a clinical sample.

Participants and Methods: Participants included 72 adults who were administered the TOPF and WAIS IV (mean age=41, mean ed=12). Referral questions were related to neurological damage ($n=21$) or to query cognitive decline ($n=21$), PCS ($n=11$), or FASD/ADHD/ and/or LD ($n=19$). Analyses examined statistical significance versus base rate (BR) in decision making and agreement between the 3 models.

Results: Only 13 subjects (18%) obtained TOPF scores in the range predicted from demographics, while 12 had scores higher and 47

lower than predicted. A BR in which the difference between obtained scores and predicted scores would be seen 15% or less of the time placed 46 subjects (64%) in the predicted range, while 2 were higher and 24 lower than predicted. A BR of ≤ 15 makes the TOPF more available and was used in forming groups. For the BR >15 group, the 3 models reached the same conclusion (significant/not significant) 74–87% of the time in WAIS IV indices. For the BR ≤ 15 group, the 3 models agreed at most 54% of the time. The greatest agreement was between EQ and TOPF models, particularly in the BR >15 group. T-tests showed that the BR groups did not differ in age, education or (as expected) SD predicted scores. The BR ≤ 15 group had significantly lower scores than the BR >15 group on the VCI, the WMI ($p < .04$) and on all but one of the EQ and TOPF predicted scores ($P < .007$).

Conclusions: Base rates, not statistical significance, should be used in decision making with the TOPF. If the BR between obtained and predicted TOPF scores is ≤ 15 , the SD model is recommended. The models reach similar conclusions if BR >16 .

Correspondence: *Steve Donaghy, Ph.D., St. Joseph's Hospital, 35 N. Algoma St., Thunder Bay; ON P7B 5G7, Canada. E-mail: donaghys@tbh.net*

C. SANGINITI, E. TORNATORE & P.J. DONOVICK. Raven Standard Progressive Matrices: Faster is not Better.

Objective: The Raven Progressive Matrices is commonly used as a measure of visual-spatial intelligence. The objective of this study was to investigate undergraduate performance on this test as a function of time invested in completing the test and when in the semester they were tested. The undergraduates received research credits for participation. We hypothesized that performance would be related to when students completed this requirement and how long they took to complete this test.

Participants and Methods: In the course of a larger project, 72 undergraduates (40 females) were administered the Standard Progressive Matrices. In addition to the total correct answers, we unobtrusively measured how long it took the participant to complete the test. In addition, we recorded when in the semester the student was tested.

Results: The mean number of correct answers in this sample was 44 (with most scores falling between the 25th and 50th percentile). However, we found that there was an inverse relationship between time to complete the test and the number of correct responses ($r = .36$). That is, the faster they were, the less accurate, regardless of when they were tested in the semester. There was no significant relationship between when in the semester and performance on this test.

Conclusions: At least in undergraduates, there is reason to believe that rapid performance on the Standard Progressive Matrices is indicative of less than optimal effort. We suggest that in addition to number of correct responses, noting how long it takes clients to complete this test may be a useful measure of on tests of complex abilities.

Correspondence: *Peter J. Donovan, Ph.D., Psychology, Binghamton University, Binghamton University, Binghamton, NY 13902. E-mail: donovick@binghamton.edu*

A. DOUGLAS, L. LETTS, K. EVA & J. RICHARDSON. Measuring incidents of harm in people with dementia after hospital discharge.

Objective: Persons with dementia often consider safety when deciding to stay at home. However, standardized measures lack validation for safety outcomes. Defining and validating a method for measurement of safety contributes to further validation of clinical measures. The objectives of the study were to determine the test-retest reliability and validity of measuring the outcome "incidents of harm" by caregiver interviews.

Participants and Methods: The Incident of Harm Caregiver Questionnaire was designed based on the definition of "incidents of harm" from previous work. Caregivers of geriatric inpatients ($n = 47$) were administered the interview once per month for six months. For test-retest reliability, caregivers were re-administered the questionnaire 3–4 days after one monthly interview. For validity, caregivers completed daily logs for one month and medical charts were examined.

Results: Test-retest reliability measured over a one-week period ($n = 38$), was high for the occurrence of an incident of harm (yes/no; kappa = 1.0) and the type of incident (percent agreement = 100%). Validation against daily logs found no disagreement regarding occurrence or types of incidents. Validation with medical charts found no disagreement regarding the occurrence of an incident of harm and disagreement in half of the six incidents for incident type.

Conclusions: The data support the validity of caregiver interview for determination of number and types of incidents of harm in this sample and are important to researchers as a method to measure safety when validating clinical measures. This outcome has ecological validity with importance for independent living and allocation of scarce resources. The Canadian Institutes of Health Research supported this study.

Correspondence: *Alison Douglas, PhD, Baycrest Centre, 67 Lake Ave Dr., Stoney Creek, ON LSG1X7, Canada. E-mail: a3indigo@gmail.com*

A. FREDLAND, L. GLASS-UMFLEET, N. SCHWAB, J. WARD, L. SHELLEY, C. NICOLE, J. TANNER, P. NGUYEN, M.S. OKUN, D. BOWERS & C.C. PRICE. Test-Retest Reliability on the Rey-Osterrieth Complex Figure Test in a Sample of Parkinson's Disease Patients Compared to Normal Controls.

Objective: It is common practice to administer the same tests on more than one occasion to document the progression of a patient's cognitive status. When interpreting changes, one should consider the stability of the measure and practice effects. The Rey-Osterrieth Complex Figure Test (ROCFT) is a frequently administered test that assesses cognitive functions such as visuospatial organization and memory. Previous test-retest studies on the ROCFT have been mixed, with reliability coefficients ranging from poor to adequate. To enhance the generalizability of prior investigations, we examined the test-retest reliability of the ROCFT in a sample of participants with Parkinson's disease (PD) and normal controls.

Participants and Methods: The ROCFT was administered to 70 participants matched by age and education (PD = 42, Controls = 28) over two testing periods with a time interval of approximately one year. Test-retest reliability (stability) coefficients were determined for the Copy, Immediate Recall, and Delayed Recall tasks scored using Denman criteria.

Results: Test-retest reliability was relatively larger for PD's copy score ($r = .68$) compared to controls ($r = .11$). Stability coefficients for PDs and controls ranged from small to medium on immediate (PD $r = .631$, Control $r = .735$) and delayed trials (PD $r = .734$, Control $r = .708$).

Conclusions: Neuropsychologists are encouraged to consider not only the nature of the test, but also the nature of the patient sample when assessing test-retest reliability. Findings indicate that compared to controls, individuals with PD are less susceptible to practice effects. The control group results are comparable with previous studies showing testing intervals at > 1 year. NINDS K23NS060660(CP)

Correspondence: *Alana Freedland, University of Florida, 2330 SW Williston Rd., Apt. 1332, Gainesville, FL 32608. E-mail: afreed87@gmail.com*

J.J. RYAN, J.S. SEELEY, L. GLASS UMFLEET, D.S. KREINER, K.I. BROWN & S.D. OTT. Thirty-second Transcription Rates on WAIS-IV Coding.

Objective: WAIS-IV Coding differs from its counterpart in the WAIS-III. The number-symbol pairings were changed and the numbers on the response form now appear with equal frequencies in each row. This study was designed to determine if, compared to the WAIS-III subtest, these changes resulted in different 30-second transcription patterns.

Participants and Methods: Thirty-three male and 44 female (mean age = 20.12 years) college students completed the WAIS-III subtest and 35 males and 79 females (mean age = 19.10 years) completed the WAIS-IV revision. The numbers of symbols copied were recorded during each 30-s interval (i.e., 30-, 60-, 90-, and 120-s).

Results: The average number of completed WAIS-III symbols per interval was: 23.61 (SD = 3.10) for 0-30 s, 21.49 (SD = 3.56) for 30-60 s, 22.31 (SD = 3.46) for 60-90 s, and 22.78 (SD = 3.09) for 90-120 s. The WAIS-IV symbol means were: 20.28 (SD = 3.47) for 0-30 s, 19.54 (SD = 3.82) for 30-60 s, 19.50 (SD = 2.95) for 60-90 s, and 20.06 (SD = 4.13) for 90-120 s.

A two-way mixed ANOVA revealed a significant difference for scales, $F(1, 188) = 41.35, p < .001$. The ANOVA also revealed a significant difference among intervals, $F(2.73, 564) = 17.29, p < .001$, but the interaction between scales and intervals was not significant ($p = .06$).

Conclusions: Total scores on the WAIS-III were higher than those on the WAIS-IV, but the 30-second transcription patterns were similar across versions.

Correspondence: *Joseph J. Ryan, PhD, Psychological Science, University of Central Missouri, 1111 Lovinger, Warrensburg, MO 64093. E-mail: ryan@ucmo.edu*

M.C. GROSCH, M.R. PARIKH, L.L. GRAHAM, L.S. HYNAN, M.F. WEINER & C. CULLUM. A New, Quick and Cost Effective Coding Test: The Texas Assessment of Processing Speed (TAPS).

Objective: Neuropsychological coding tasks are some of the most sensitive measures of cognitive functioning. Some of the more popular tests require 90-120 seconds and entail a cost to users. We developed a coding test (the Texas Assessment of Processing Speed-TAPS) that uses numbers and common symbols, is free and quick to administer (60 seconds). Here we examine the relationship between the TAPS and the Coding subtest of the WAIS-IV in a mixed adult population.

Participants and Methods: The TAPS and Coding were administered as part of a larger investigation to three groups ($N=63$): Alzheimer disease (AD, $n=11$), MCI ($n=12$), and healthy controls ($n=40$). Mean age of the sample was 70.8 years (range: 52-87), and mean education was 15.7 years (range: 10-20).

Results: TAPS scores were strongly correlated with Coding ($r[61]=0.87, p < 0.001$). TAPS distinguished between AD and controls ($p < 0.001$) similar to Coding ($p=0.002$). Mean TAPS score (max=75) for the AD group was 19.36 (range: 4-38); for the MCI group, 28.67 (range: 20-35); and for the Control group, 30.65 (range: 19-49). ROC analysis comparing healthy controls and ADs produced an area under the curve of 0.85 and an optimal cut-point of 25, which yielded 91% sensitivity and 78% specificity. Both measures were equally associated with age ($r[61]=-0.37, p=0.003$), and neither showed a significant correlation with education in this sample.

Conclusions: The TAPS is a brief, easily administered, cost-effective measure. Preliminary analyses support the validity of the TAPS, although further investigation is needed in other populations and against other well-validated tests.

Correspondence: *Maria C. Grosch, B.S., University of Texas Southwestern Medical Center, 3230 Maple Ave, #126, Dallas, TX 75201. E-mail: maria.grosch@utsouthwestern.edu*

L. HANE, H. HANNAY, T. TIAN & J. WAGUSPACK. Patterns of Performance Across Trials of the PASAT as a Predictor of Brain Injury Severity.

Objective: The relationship between patterns of performance across trials of the Paced Auditory Serial Addition Test (PASAT) and severity of injury at 3 months post-injury was assessed. It was hypothesized that severity of TBI would be related to patterns of performance when demographic variables were accounted for.

Participants and Methods: A multicultural sample of 81 patients with complicated mild, moderate and severe TBIs from Ben Taub General Hospital in Houston, TX (Hispanic=23, Caucasian=41, African American=15, Asian=2) was studied. Mean age was 27 years (SD=10) and mean education was 11.8 years (SD=2.4), with 63 males and 18 females. The PASAT was completed as part of a neuropsychological battery at 3 months post injury. Patterns of performance were determined individually for correct responses (CR), omissions (OM) and incorrect responses (ICR), summed for each trial. Injury severity measures were the Best Day 1 Glasgow Coma Scale (GCS) and worst Marshall CT Classification. Performance patterns were

classified by using a cluster analysis for functional data conducted in the statistical program "R", a program that can conduct cluster analyses on data involving several trials. Once patterns of performance were determined for each dependent measure, multinomial logistic regression was used to model the relationship between injury severity variables and PASAT performance.

Results: Two patterns of performance were found for CR, 3 for OM, and 2 for ICR. The patients' Best Day 1 GCS scores correctly predicted patterns of performance with 62% accuracy ($p < .05$) for CR, and 44% accuracy ($p < .01$) using OM. Patterns of performance using ICR were not significantly related to either injury severity variable.

Conclusions: Pattern analysis may have potential for predicting how patients will perform on the PASAT at various time points, dependent upon the initial severity of injury. Future analyses will consider other time points following injury and other dependent measures.

Correspondence: *Leslie Hane, M.A., University of Houston, 126 Henye, Houston, TX 77204-5022. E-mail: lkinnahane@gmail.com*

R.K. HEATON, D.S. TULSKY, S. WEINTRAUB, S.S. DIKMEN, P.D. ZELAZO, J.L. BEAUMONT, J. SLOTKIN, E. EDWARDS, J.W. KING, K. CONWAY, C. MOY, E. WITT, L. FREUND, M.V. WAGSTER & R. GERSHON. The NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox): Validity of Composite Scores for the Cognitive Function Battery in Adults.

Objective: The Cognitive Function Battery (CFB) of the NIH Toolbox is a brief, psychometrically sound set of instruments for use in epidemiologic studies and clinical trials for individuals 3 to 85 years of age. This presentation describes the psychometric properties of CFB Composite Scores computed for adults.

Participants and Methods: A total of 268 community-residing individuals from the general population, ages 20-85 years participated. The CFB contains seven computer-based instruments assessing six distinctive cognitive sub-domains [Executive Function, Episodic Memory, Language (Vocabulary and Reading), Processing Speed, Working Memory, and Attention]. Participants were administered the battery, corresponding gold standard validation measures, and sociodemographic questionnaires. Three Composite Scores were derived: an overall CFB score, a "crystallized" abilities score (more dependent upon past learning experiences) and a "fluid" abilities score (capacity for new learning and information processing in novel situations).

Results: CFB Composite Scores showed excellent test-retest reliability ($r: 0.88 - 0.92$), strong convergent ($r: 0.75 - 0.89$) and divergent ($r: 0.19 - 0.33$) validity compared to those of gold standard measures of similar and different abilities, respectively, and the expected age effects ($r = 0.19$ crystallized, $r = -0.67$ fluid, $r = -0.26$ overall). Finally, scores showed significant relationships with health status, employment, past school performance, and presence of a disability, reflecting their external validity.

Conclusions: These data show that NIH Toolbox Cognitive Function Battery Composite Scores have excellent reliability and validity, suggesting that they can be effectively used in epidemiologic or clinical studies. Furthermore, they may offer statistical advantage particularly for smaller scale studies.

Correspondence: *Sandra Weintraub, PhD, Cognitive Neurology and Alzheimer's Disease Center, Northwestern University Feinberg School of Medicine, 320 E. Superior, Searle 11-467, Chicago, IL 60611. E-mail: sweintraub@northwestern.edu*

S. WEINTRAUB, S.S. DIKMEN, R.K. HEATON, D.S. TULSKY, P.D. ZELAZO, P.J. BAUER, N.E. CARLOZZI, J. SLOTKIN, D. BLITZ, K. WALLNER-ALLEN, N.A. FOX, J.L. BEAUMONT, D. MUNGAS, J. RICHLER, J.E. ANDERSON, J.J. MANLY, R. HAVLIK, E. EDWARDS, J.W. KING, K. CONWAY, C. MOY, E. WITT, L. FREUND, M.V. WAGSTER & R. GERSHON. The NIH Toolbox for the Assessment of Neurological and Behavioral Function (NIH Toolbox): Validity of the Cognitive Function Battery in Adults.

Objective: The NIH Toolbox provides brief measures of cognitive, emotional, motor and sensory function for use in large-scale epidemiologic and clinical trials, constituting a "common currency" among studies. Here we report the results of a validation study of the Cognitive Function Battery (CFB) in an adult sample.

Participants and Methods: A total of 268 community-residing individuals from the general population, ages 20–85 years participated. The Cognitive Function Battery, consisting of seven computer-based instruments assessing six distinctive cognitive sub-domains [Executive Function, Episodic Memory, Language (Vocabulary and Reading), Processing Speed, Working Memory, and Attention], was administered to all participants along with a series of corresponding “gold standard” validation measures for each test instrument, and sociodemographic questionnaires. One third of the sample was retested within 1 to 3 weeks of initial testing.

Results: Each of the seven instruments showed good test-retest reliability (correlations from 0.74 to 0.90) and acceptable levels of convergent validity with its respective gold standard (correlations from 0.50 to 0.86). Divergent validity values indicated very low correlation between each NIH Toolbox CFB instrument and gold standard tests measuring non-parallel constructs (all correlations < 0.26). Scores on each instrument showed the expected age-related effects. Finally, most of the derived test scores were significantly correlated with subject-reported health status.

Conclusions: These and similar findings in a young sample (3–15 years of age, reported separately) support the use of the NIH Toolbox Cognitive Function Battery as a reliable and valid set of brief instruments of cognitive functioning across the lifespan.

Correspondence: *Sandra Weintraub, PhD, Cognitive Neurology and Alzheimer's Disease Center, Northwestern University Feinberg School of Medicine, 320 E. Superior, Searle 11-467, Chicago, IL 60611. E-mail: sweintraub@northwestern.edu*

A.M. HUBLEY & S. MYERS. Hubley Depression Scale for Older Adults (HDS-OA): Reliability, Validity, and a Comparison to the Geriatric Depression Scale.

Objective: Screening for depression in older adults is common practice in neuropsychology but a brief, efficient, current, and cost-effective screen of depression for this group is still needed for general practice and research settings. The Hubley Depression Scale for Older Adults (HDS-OA) is a 16-item measure designed for older adults and based on current diagnostic criteria. It uses a dichotomous response format, large font size, reminders of the reference period, and is freely available. We examined the psychometric properties of the HDS-OA and hypothesized that the HDS-OA would show (a) satisfactory reliability, (b) stronger correlations with convergent than discriminant measures, (c) a significant difference between depressed and non-depressed groups, (d) high sensitivity and specificity, and (e) equal or better performance than the 30-item Geriatric Depression Scale (GDS) and GDS-15.

Participants and Methods: The sample consisted of 50 men and women ages 63 to 93 forming two groups: 25 currently depressed older adults from hospital- and clinic-based geriatric units, and 25 age- and gender-matched community-based older adults whose non-depressed status was confirmed diagnostically. Participants completed the HDS-OA and both convergent (GDS, GDS-15) and discriminant (anxiety, mental status, self-rated health) measures.

Results: The HDS-OA showed satisfactory internal consistency ($\alpha = .88$) and evidence of convergent (GDS: $r = .89$; GDS-15: $r = .86$) and discriminant validity (anxiety: $r = .67$; mental status: $r = -.39$, self-rated health: $r = -.43$). Depressed and non-depressed groups differed significantly on the HDS-OA. The HDS-OA showed 92% sensitivity and 100% specificity.

Conclusions: This study provides strong support for the reliability of scores and validity of inferences made from the HDS-OA. In addition, the HDS-OA performed equivalently to the GDS and better than the GDS-15 in identifying older adults with depression, and performed better than both measures in correctly classifying older adults without depression.

Correspondence: *Anita M. Hubley, Ph.D., Dept. of ECPS, University of British Columbia, 2125 Main Mall, Vancouver, BC V6T 1Z4, Canada. E-mail: anita.hubley@ubc.ca*

C.P. JOHNSON, K. TRAN, J. DEBLANC, K. NELSON, N. NWOSU, L. SIUM, M. NAIL, S. HODGE & M. HISCOCK. Variations on a Paradigm: Relationships Between Common Verbal List Learning Tests.

Objective: The verbal list learning paradigm is a commonly employed class of neuropsychological tests. Nonetheless, few studies have compared popular tests of verbal learning despite several distinctive test characteristics. Three common verbal list learning measures are: California Verbal Learning Test-II (CVLT-II), Hopkins Verbal Learning Test-Revised (HVLT-R), and Rey Auditory Verbal Learning Test (RAVLT). The purpose of the current study was to investigate the unique characteristics of each test that might contribute to intra-individual variation in performance.

Participants and Methods: Thirty students between the ages of 18 and 43 from a large public university completed the CVLT-II, HVLT-R, and RAVLT in a quasi-randomized (Latin Squares) design. Poorly motivated participants were identified using the University of Victoria Symptom Validity Test and their data were excluded. Non-verbal problem-solving tasks of 20 minutes duration were inserted into short and long delays on all three tasks. All measures were administered and scored in accordance with standard instructions.

Results: Spearman's rank-order correlation coefficient was used to assess the position of each participant across the three tasks when compared to the rest of the sample. There was no relationship among the three tests on individual trials, learning slope, final learning trial, or retention. There was a strong correlation between the long delay free recall trial on both the RAVLT and CVLT-II ($p < 0.001$), but not the HVLT-R.

Conclusions: Variations in characteristics of popular verbal list learning tasks may result in dissimilar performance profiles within individuals. Dissimilar profiles among these tasks may provide valuable information for the researcher or clinician who needs to choose the most appropriate test for a particular application.

Correspondence: *Chad P. Johnson, M.A., Psychology, University of Houston, 3304 Trail Hollow Drive, Pearland, TX 77584. E-mail: c.parker.johnson@gmail.com*

B. YOCHIM, K.D. KANE & A.E. MUELLER. Naming Test of the Neuropsychological Assessment Battery: Validity and Receiver Operating Characteristic Curves.

Objective: The assessment of naming, or word-finding, represents an important component of neuropsychological assessment. This study explored the convergent and divergent validity of the Naming subtest of the Neuropsychological Assessment Battery (NAB) and its clinical utility in the detection of cognitive impairment.

Participants and Methods: The sample included adults age 60–94 years recruited from the community ($N = 122$), from a senior living community ($N = 60$), and from a mental health clinic ($N = 23$). Cognitive impairment was present in 33 (18%) participants, and 156 participants (82%) were cognitively intact. Measures of naming, memory, abstraction, visuoperception, and processing speed were administered to assess convergent and divergent validity, and Receiver Operating Characteristic (ROC) curve analyses were conducted to determine the sensitivity and specificity of the NAB Naming test.

Results: The NAB Naming Tests correlated most highly with the Boston Naming Test (BNT), followed by measures of memory, followed by measures of visual perception, processing speed, and abstraction. Visual perception correlated more highly with the BNT than with the NAB Naming tests. ROC curve analyses found Form 1 of the NAB Naming test to have sensitivity of 64% and specificity of 72% with a cut score of 29 or below. The Area under the Curve (AUC) was 0.75, indicating that 75% of randomly chosen impaired participants performed more poorly than randomly chosen intact participants.

Conclusions: Findings support the use of the NAB Naming test as part of the neuropsychological assessment of older adults. Results are simi-

lar to what has been found regarding the clinical utility of the BNT. It is possible that intact visuospatial abilities are more necessary for completion of the BNT than they are for completion of the NAB Naming tests. Future research should examine the clinical utility of this measure with a sample of patients with diagnoses of dementia due to Alzheimer's disease and other causes.

Correspondence: *Brian Yochim, Ph.D., Psychiatry, VA Palo Alto Health Care System, MIRECC (151 Y), 3801 Miranda Ave., Palo Alto, CA 94304. E-mail: byochim@stanford.edu*

K. KANE, B. YOCHIM & A. MUELLER. Validity and ROC Curve Analyses of the Brief Visuospatial Memory Test, Revised (BVMT-R).

Objective: This study explored the convergent and divergent validity of the Brief Visuospatial Memory Test, Revised (BVMT-R), as well as its sensitivity and specificity in the detection of cognitive impairment in older adults. Validity and Receiver Operating Characteristic (ROC) curve analyses were assessed by comparing the BVMT-R to an established verbal memory measure, the California Verbal Learning Test, 2nd edition (CVLT-2) and other lesser-related measures of executive functioning and naming abilities.

Participants and Methods: Participants included 169 older adults from community, independent/assisted-living facility, and clinical settings; Mean age = 76.95 years, range = 60-94 years; 64% Female; 98% European American) who were administered the BVMT-R, CVLT-2, Verbal Fluency and Trail Making subtests of the Delis-Kaplan Executive Function System (D-KEFS), and Naming subtest from the Neuropsychological Assessment Battery (NAB).

Results: An overall pattern of correlations was found such that BVMT-R scores correlated most strongly with measures of memory (CVLT-2), followed by measures of executive functioning (D-KEFS Trails 4), and then by a measure of naming abilities (NAB). The BVMT-R correlated least with the D-KEFS Verbal Fluency subtest. ROC curve analyses found that sensitivity and specificity were best for BVMT-R Total Recall (optimal cut-off score = 10.5; sensitivity = 82% and specificity = 78%; Area Under Curve = .860) and Delayed Recall (optimal cut-off score = 3.5; sensitivity = 83% and specificity = 85%; Area Under Curve = .883) scores.

Conclusions: This study provides evidence that the BVMT-R possesses both convergent and divergent validity, as well as strong sensitivity and specificity rates for Total and Delayed Recall scores in the detection of cognitive impairment in older adults.

Correspondence: *Katherine Kane, M.A., Psychology, UCCS, 136 Summer Lane, Rocky Hill, CT 06067. E-mail: kdkane@gmail.com*

R.P. KESSELS & R.S. BUCKS. The Location Learning Test – Revised Edition: Normative Data and Validation in Patient Groups.

Objective: To assess nonverbal episodic memory, most existing neuropsychological tests use either picture recognition paradigms or examine pictorial free recall using reproduction by drawing. However, recognition tasks are relatively insensitive to cognitive decline, and visuospatial construction may be impaired independent of memory function. Here, we present a nonverbal memory task that overcomes these limitations.

Participants and Methods: The revised LLT assesses visuospatial recall using a 5x5 grid in which 10 common objects are presented, the location of which must be recalled immediately after each of 5 learning trials (15 sec presentation duration) and after a delay of 20-30 minutes. The LLT was administered in 382 healthy participants (176 males, ages 18-90, mean NART-IQ 102.1+14.0) to collect a normative group and in patients with MCI/VCI (n=109), diabetes (n=149), dementia (n=66) and stroke (n=105)

Results: LLT performance correlated significantly with age and education level ($p < .0005$). Regression-based normative data were computed for use in clinical practice, taking age and NART-IQ into account. With respect to validation of the test in patient groups, the LLT discriminated MCI from AD better than a verbal learning test (RAVLT). Within the stroke group, right-hemisphere patients showed less learning on the LLT than the left-hemisphere group ($p < .05$).

Conclusions: The LLT is a valid addition to existing neuropsychological tests for the nonverbal assessment of episodic memory function. It has been shown to be applicable in patients with stroke, diabetes, MCI/VCI and dementia, and the age- and IQ-adjusted regression-based norms can be used in clinical practice.

Correspondence: *Roy P. Kessels, PhD, Radboud University Nijmegen, PO Box 9104, Nijmegen 6500 HE, Netherlands. E-mail: r.kessels@donders.ru.nl*

T. KIMPTON & S. HALL. Does Preparation Outside of the Lab Facilitate the Simulation of Mild Traumatic Brain Injury?

Objective: This study investigated the effects of allowing brain injury simulators unrestricted access to information about mild traumatic brain injury (MTBI). The test performance of brain injury simulators who chose their own preparation strategy was compared to brain injury simulators who did not prepare and a control group. It was hypothesized that brain injury simulators who prepared would be more difficult to detect than those who did not prepare.

Participants and Methods: Forty psychology students were randomized to a brain injury simulator preparation group (BIS-P), brain injury simulator no preparation group (BIS-NP), or a control group. All participants were given their instructions and returned the next day to complete a brief neuropsychological test battery. During the interim, the BIS-P group was told to prepare anyway they chose, using any available sources, to facilitate simulating an MTBI. The BIS-NP group was instructed not to prepare. The control group was instructed to perform to the best of their ability.

Results: Group means for each test were compared. On all tests, both BIS groups obtained scores that were significantly lower than the control group, and the means for both groups were well below the cut-offs for the effort measures. There were no significant differences between the BIS-P and BIS-NP groups.

Conclusions: The results suggest that free preparation does not facilitate simulation of an MTBI. The majority of the BIS-P participants prepared by seeking information about brain injury symptoms. This suggests that basic information about brain injury symptoms does not appear to threaten the validity of neuropsychological testing.

Correspondence: *Tory Kimpton, Psychology, University of Montana, Skaggs Building 143, Missoula, MT 59812. E-mail: tory.kimpton@umontana.edu*

V. KLEMAN, B.J. SCOTT & S. DAVIS. The Influence of Verbal Mediation on WAIS-IV Matrix Reasoning.

Objective: Verbal mediation predicts successful performance on a variety of tasks (Chi et al., 1994; Cole & Pheng, 1998; Silverberg & Buchanan, 2005). Accordingly, the influence of verbal mediation must be accounted for in order to interpret test results accurately. The Wechsler Adult Intelligence Scale – Fourth Edition (WAIS-IV; The Psychological Corporation, 2008) includes subtests of visuospatial intelligence, but the influence of verbal mediation on these subtests has not yet been explored. The current study compared Matrix Reasoning (MR) item scores to total Similarities scores as well as to total Verbal Fluency scores on the Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001). It was hypothesized that verbal skills would be more strongly associated with more difficult MR items.

Participants and Methods: Using archival clinical data for 43 patients seen primarily for academic assessment, point biserial correlations were used to compare WAIS-IV MR item scores with total Similarities scores. In order to further evaluate the relationship between variables, scores on MR also were correlated with phonemic and category Verbal Fluency total scores. Bonferroni corrections were used to reduce experimentwise error.

Results: The most significant correlations were found between MR items and total Similarities scores, while the fewest were found between MR items and category fluency scores.

Conclusions: The hypothesis that verbal skills would be significantly correlated with more difficult MR items was not confirmed. Further analysis suggested that items involving tracking changes in stimulus orientation may be especially subject to verbal mediation.

Correspondence: *Virginia Kleman, M.S., Pacific University School of Professional Psychology, 222 Chester Ave, Danville, IL 61832. E-mail: ginny.kleman@pacificu.edu*

R. LANGLOIS, S. JOUBERT, S. BENOIT, M. VENDETTE, V. DOSTIE & I. ROULEAU. Assessing Memory for Transient and Enduring Public Events: A New Promising Tool.

Objective: Decline in retrograde memory has been reported in Alzheimer's disease and mild cognitive impairment (MCI) using tests of past public events. However, the deterioration mechanisms are yet to be documented. Is there a temporal gradient? Are enduring events better recalled than transient ones? In an attempt to answer these questions, the aim of this study was to create a test of past events culturally-adapted to an elderly French-Quebecer population.

Participants and Methods: 53 young ($M=23.32$ yrs) and 25 elderly ($M=71.50$ yrs) participants answered 40 multiple-choice questions on public events pertaining to four epochs: 1960-75, 1976-90, 1991-2005, 2006-11. Two types of events were included: transient (reported briefly by the media) and enduring (reported repeatedly since their occurrence).

Results: A mixed between-within subjects ANOVA was conducted to investigate the effects of an event's durability (transient or enduring) on young and elderly subjects across four epochs. An epochs and durability interaction revealed different patterns of response between groups (Wilks' Lambda = .56, $F(3, 74) = 19.50$, $p < .001$). For transient events, younger subjects' lower scores on past events (1960 to 1991) compared to recent ones was expected since they did not witness the events (Wilks' Lambda = .13, $F(3, 50) = 108.07$, $p < .001$). For enduring events, no group difference was apparent, thus confirming that younger subjects benefited from the enduring nature of public events. Elderly subjects' performance regarding the enduring and transient events remained equivalent throughout all epochs. Finally, exploratory analysis with 8 MCI patients ($M=74.38$ yrs) revealed the high sensitivity of this tool.

Conclusions: The results demonstrate that this novel instrument is well-adapted to the aimed population and is a promising clinical method in the early detection of MCI. This study was supported by a grant from the Alzheimer Society of Canada to Sven Joubert and Isabelle Rouleau. Correspondence: *Roxane Langlois, Neuropsychology, Université du Québec à Montréal, CP 8888, succursale Centre-ville, Montréal, QC H3C 3P8, Canada. E-mail: langlois.roxane@courrier.ugam.ca*

M. LAUNEANU & A.M. HUBLEY. Does the Total Score Make Sense? Factor Structure of the Geriatric Depression Scale-15 (GDS-15).

Objective: The 15-item Geriatric Depression Scale (GDS-15) is commonly used to screen for depression across a wide age range in clinical and research settings. The scale yields a total score and generally is assumed to have a unidimensional structure. However, previous exploratory factor analyses (EFA) have suggested the presence of two or even three factors, which raises questions about the use of the total score. The purpose of this study was to examine the factor structure of the GDS-15 using both categorical EFA and confirmatory factor analyses (CFA). To date, no factor analytic studies appear to have employed a statistical model appropriate to the categorical structure of the GDS-15 items and no CFA have yet been used with this measure.

Participants and Methods: The sample consisted of 896 community dwelling adults (418 men and 478 women) ages 16 to 94 years, who completed the GDS-15 as part of a battery of measures administered in several neuropsychology and memory studies. Initially, a categorical EFA was conducted to examine the GDS-15 factor structure. Next, the one factor model suggested by the EFA was tested with a CFA using tetrahoric matrices with Robust Maximum Likelihood estimation.

Results: The EFA extracted three factors with eigenvalues larger than 1; however, the Parallel Analysis and other criteria only justified the retention of a single factor. The stricter CFA indicated that a one factor model achieved very good fit with the current data and, hence, provided further support for the unidimensionality of the GDS-15.

Conclusions: Using data analysis models to fit the categorical structure of the GDS-15 data correctly, the scale was found to have a unidimensional structure. Thus, a total GDS-15 score can be computed and meaningfully interpreted as a unitary construct. This study raises awareness about choosing appropriate methods of data analysis and suggests that previous research using continuous EFA to identify the GDS-15 factor structure may have rendered distorted results.

Correspondence: *Mihaela Launeanu, MA, Educational and Counselling Psychology, The University of British Columbia, 2125 Main Mall, Vancouver, BC V6T 1Z4, Canada. E-mail: codruta@interchange.ubc.ca*

L. MACE, E.K. WHIPPLE, L. BRENNAN, K.J. MANNING, V.T. WEISSER, J.G. ANG & M.T. SCHULTHEIS PHD. Measuring Simulation Sickness During Virtual Reality Driving in Neurological Populations.

Objective: The use of virtual reality (VR) simulation for assessment and rehabilitation in neurological populations continues to grow. A significant side effect of VR is simulator sickness (SS). The most commonly used tool to assess for SS is the Simulator Sickness Questionnaire (SSQ), originally developed for healthy military personnel. Although used with clinical populations, questions remain about the interpretation of SSQ scores for individuals with neurological compromise [i.e., brain injury (BI), multiple sclerosis (MS)]. The current study compared the SSQ measures between individuals with BI, MS, and healthy controls (HC) during exposure to a virtual reality driving simulator (VRDS).

Participants and Methods: Individuals with BI ($n = 27$), MS ($n = 33$) and HC ($n = 46$) were administered the SSQ in conjunction with VRDS exposure. The SSQ consists of a symptom checklist administered both pre and post VR exposure. For each participant, a pre-exposure SSQ score was calculated to quantify the presence of symptoms prior to and after VR exposure, using Kennedy's pre-documented procedures.

Results: Between group comparisons using ANOVA indicated that individuals with MS ($M = 17.57$, $SD = 23.08$) and ABI ($M = 18.42$, $SD = 23.97$) reported a significantly higher level of symptoms prior to the VR exposure than HC ($M = 8.37$, $SD = 11.91$), [$F(2, 103) = 3.22$, $p = .044$, $p < .05$]. Similarly, the neurological populations endorsed a higher level of symptoms post-exposure: MS ($M = 33.89$, $SD = 28.68$), ABI ($M = 35.18$, $SD = 34.28$) than HCs ($M = 21.22$, $SD = 27.71$), but this difference was relative to the pre-exposure score and did not reach significance.

Conclusions: The findings suggest that individuals with neurological compromise may present with SS related symptoms prior to VR exposure; however, the presence of these symptoms does not appear to increase susceptibility to SS. Further research examining the utility of the SSQ with populations experiencing neuropsychological impairments can further delineate the contribution of these factors to SS symptoms.

Correspondence: *Lauren Mace, Psychology, Drexel University, 405 Fairmount ave, Philadelphia, PA 19123. E-mail: laurenmace@gmail.com*

L.H. MASON, A.L. SHANDERA-OCHSNER, J.P. HARP, K. WILLIAMSON, W.M. HIGH & D.T. BERRY. Differential Sensitivity of the MMPI-2-RF Validity Scales to Random Responding and Overreporting of PTSD Symptoms.

Objective: The MMPI-2-RF validity scales were evaluated to determine appropriateness when used to differentiate between random responding, genuine PTSD, and feigned PTSD.

Participants and Methods: A sample of 109 undergraduate students, screened for PTSD using the PCL-C, were randomly assigned to one of

four groups: honest, feigned PTSD, half random, and full random. Twenty-eight veterans diagnosed with PTSD were selected from an archival database to develop a clinical MMPI-2-RF profile. These veterans were diagnosed with PTSD using the CAPS, took the MMPI-2 or MMPI-2-RF, and passed a test of malingering (M-FAST).

Results: Initial group differences were analyzed using ANOVAs ($p < .01$) with significant main effects followed by Tukey's HSD post hoc analyses ($p < .05$). Results demonstrated that the MMPI-2-RF was able to detect and differentiate random responders with elevated VRIN-r, F-r, and Fp-r scores; effect sizes were much larger for full random responders. Full random responders elevated VRIN-r, F-r, and Fp-r with scores that were significantly higher than other groups. Malingered PTSD was detected and differentiated with extremely elevated F-r scores and elevated Fp-r scores. Sensitivity and specificity analyses supported the aforementioned results, with the VRIN-r sensitive and specific to random responding and F-r and Fp-r both sensitive to malingered PTSD and random responding. F-r and Fp-r were more sensitive to full random responding than to half random responding. Additionally, use of a classification algorithm resulted in the following correct classifications in each group: honest 100.00%, feigned PTSD 53.85%, half random 44.44%, full random 88.89%, and genuine PTSD 100.00%.

Conclusions: The MMPI-2-RF appears useful in differentiating between full and half random responding, genuine PTSD, and feigned PTSD with promising classification accuracy using a diagnostic algorithm for honest, full random, and genuine PTSD responders.

Correspondence: *Lisa H. Mason, Psychology, University of Kentucky, 3524 Creekwood Dr., Apartment 3, Lexington, KY KY. E-mail: lisa.mason13@gmail.com*

D. MILLER, P. DAVIDSON, D. SCHINDLER & C. MESSIER. WAIS-IV and WMS-IV in Older Adults.

Objective: New editions of the Wechsler scales of Intelligence and Memory are now available. Yet, given the significant changes in these new releases and the skepticism that has met them, independent evidence on their psychometric properties is much needed but currently lacking.

Participants and Methods: We administered the WAIS-IV and the Older Adult version of the WMS-IV to 185 older adults. We examined how closely our data matched the normative sample by comparing our scaled scores with those of the publisher and evaluated inter-relations among subtests using confirmatory factor analysis.

Results: Not surprisingly, scaled scores from our sample were generally somewhat higher than those from the normative sample. Factor analysis on our sample provided support for a five-factor model of the WAIS-IV and WMS-IV Older Adult batteries combined. We found no significant differences between the hierarchical (i.e., including a general g factor) and non-hierarchical version of each model. Allowing some subtests to load on more than one factor significantly improved model fit. The best fitting models for our sample were also the best for the normative sample.

Conclusions: By and large the data from our community-dwelling older adults fit well with the normative sample. Overall, the data suggest that the WAIS-IV and WMS-IV are reliable.

Correspondence: *Patrick Davidson, University of Ottawa, 136 Jean-Jacques Lussier Priv., Ottawa, ON K1N6N5, Canada. E-mail: patrick.davidson@uottawa.ca*

P.S. MOORE, C. CULLUM, M. CHANSARD, S.H. LISANBY, I. BERNSTEIN, H. TERRACE, M.M. HUSAIN & S.M. MCCLINTOCK. From Basic to Clinical Science: Translating Neurocognitive Measures to Understand the Cognitive Effects of Electroconvulsive Therapy.

Objective: Research has found that electroconvulsive therapy (ECT) predominantly impacts global memory functions. However, those findings were limited by the use of standard neurocognitive measures that confound reaction time and accuracy variables, and are sensitive to depression. We developed a touch-screen, computerized, neurocognitive battery in a nonhuman primate model that assesses short-term, long-

term, and working memory, and is specific and sensitive to ECT. We adapted this battery for human use and previously found that performance was associated with age, education, and estimated IQ. The purpose of this study was to evaluate the psychometric properties of the translated neurocognitive battery.

Participants and Methods: 40 healthy participants (age: $M=38.7$, $SD=14.5$; education: $M=16.4$, $SD=2.1$; estimated IQ: $M=112.7$, $SD=6.0$) completed the five adapted neurocognitive measures that comprise the battery (Target Identification, Target Tracking, Target Sequencing, Spatial Configuration, and Serial Target Recognition). Pearson correlation coefficients were computed to examine associations between the measures.

Results: With one exception, correlations among the translated neurocognitive battery measures were small ($r=0.09$) ranging from -0.17 to 0.33 . The exception was a large correlation between the Target Tracking and Spatial Configuration ($r=.809$, $p < .0001$) measures.

Conclusions: Overall, most of the translated neurocognitive measures within the battery were found to be unrelated, suggesting that each assesses different aspects of cognition. Further exploration with a larger cohort is necessary to confirm their psychometric properties, assess convergent and discriminant validity with standardized neurocognitive measures, and then to assess performance in patient populations.

Correspondence: *Patricia S. Moore, B.A., Psychiatry, University of Texas Southwestern Medical Center, 4106 Newton, #112, Dallas, TX 75219. E-mail: patricia.moore@utsouthwestern.edu*

J. NOVITSKI, S. KARANTZOULIS & C. RANDOLPH. Sensitivity and Specificity of the RBANS in Mild Cognitive Impairment.

Objective: Mild Cognitive Impairment (MCI) is considered a transitional stage between normal cognitive aging and dementia. Early detection of MCI may allow for early intervention strategies and potentially slow cognitive decline. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) is a measure of global neurocognitive functioning that is sensitive to detecting cognitive impairment associated with various types of dementia. The utility of the RBANS in discriminating MCI from normal cognition, however, has not yet been fully established. We examined the sensitivity and specificity of the RBANS Delayed Memory Index (DMI) and Total Score (TS) in detecting MCI.

Participants and Methods: Participants included 81 individuals with amnesic MCI (aMCI; mean age=77, $SD=6.8$; mean education=15 years) and 81 healthy controls (HC; mean age=77, $SD=6.4$; mean education=15 years). Criteria for aMCI included presence of a memory complaint, objective evidence of memory test scores below expected premorbid levels, and relatively preserved activities of daily living. Sensitivity and specificity of the RBANS DMI and TS was calculated using receiver operating characteristic (ROC) and area under curve (AUC) analyses.

Results: The amnesic MCI participants performed significantly worse than the HC participants on the RBANS DMI and TS (both p 's $< .001$). The AUC was 0.90 for DMI and 0.88 for TS.

Conclusions: The RBANS DMI and TS demonstrated good sensitivity and specificity to detecting MCI, suggesting that it may be a useful tool in detecting MCI and tracking transition to dementia.

Correspondence: *Julia Novitski, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 415 Howard St., Apt. 140S, Evanston, IL 60202. E-mail: julia.novitski@my.rfums.org*

N.J. PASTOREK, N. SESTITO, K.L. MAESTAS, M. TROYANSKAYA & R.S. SCHEIBEL. Validation of Embedded Measures of Symptom Validity in the Neurobehavioral Symptom Inventory.

Objective: The Neurobehavioral Symptom Inventory (NSI), a commonly utilized postconcussive symptom checklist, currently provides no means to detect symptom exaggeration. This is especially problematic given the elevated rates of symptom exaggeration in mild traumatic brain injury (mTBI) clinic samples. The aim of the current study was to establish predictive values on the NSI for detecting possible response bias on the Word Memory Test (WMT).

Participants and Methods: Data collected from 80 Operation Enduring Freedom/Operation Iraqi Freedom veterans with histories of combat-related mTBI were examined with receiver operating curve (ROC) analysis using dichotomized performance on the WMT as the standard of symptom validity. Predictive values were also established for the sum of 12 rationally developed validity items that were integrated into the original NSI. The validity items represented atypical symptoms following mTBI. Original and experimental items were all rated on 0 to 4 point Likert scales, with anchors reflecting a combination of symptom severity and impact of the symptom on daily functioning.

Results: Results indicated that a cutoff score of >56 for the total score of the original 22-item NSI yielded sensitivity of 37% with a specificity of 95%. A cutoff score of >11 for the total score on the experimental 12-item validity scale yielded sensitivity of 37% with a specificity of 94%. A selection of 6 of the most optimal validity items resulted in sensitivity of 44% with a specificity of 95% using a cutoff score of >8.

Conclusions: In conclusion, a straightforward cutoff score on the original 22-item NSI may provide a reasonable embedded measure of symptom exaggeration. Rationally developed validity items that reflected atypical symptoms following mTBI did not result in clearly superior predictive values. Identification and application of symptom exaggeration indicators within commonly used postconcussive symptom report measures are essential for the development of informed treatment planning. Correspondence: *Nicholas J. Pastorek, Ph.D., Michael E. DeBakey VA Medical Center, 2002 Holcombe Blvd, RCL 117, Houston, TX 77030. E-mail: nicholas.pastorek@gmail.com*

S. PYUN, Y. HWANG & K. NAM. A Study Of Development And Standardization Of Korea University Naming Test (KUNT).

Objective: Naming disability is one of the most common features in aphasia. Although picture naming test is widely used in clinical setting, standardized naming test is rare in Korea. Furthermore those current naming tests are not sufficient to assess the ability to decide semantic categories, abstractness, and so on. This study was designed to develop and standardize Korea University Naming Test (KUNT) in normal adult population, on the basis of psycholinguistic principles.

Participants and Methods: The initial test item of KUNT was made from 346 words retrieved from Sejong Corpus based on their imaginability. 80 items were selected based on frequency, semantic category, and picture response consistency across participants. KUNT consists of two main semantic categories (natural object or artifact, concreteness or abstractness) as well as various subcategories (animal, plants, inanimate object, body, job and action). Two sets of 40 items were generated by controlling by psycholinguistic factors such as word length and frequency. KUNT was standardized in 221 healthy adults (male 55, female 166, mean age 67.8) by four age groups and five education levels.

Results: Inverse results were founded between age group and education level. Mean KUNT scores decreased significantly as age increased ($r = -0.4315$, $p = 0.00$) and as education years decreased ($r = 0.304$, $p = 0.00$). Post-hoc analysis of KUNT scores showed that significant mean differences ($p = 0.00$) between no education group and others and between 75 years and older group and others.

Conclusions: Our findings from this study showed that KUNT can be useful for evaluation of naming ability in brain-damaged patients.

Correspondence: *Yu Mi Hwang, Ph. D., Rehabilitation, Korea University Anam Hospital, Anam-dong 5-ga, Seongbuk-gu, Seoul 136-705, Republic of Korea. E-mail: beleco@empal.com*

L.A. RABIN, W.B. BARR, A.T. SPADACCINI, M.M. CHARCAPE & K.S. GRANT. Assessment Practices of Clinical Neuropsychologists in the U.S. and Canada: A 10-Year Follow-Up Survey.

Objective: As a 10-year follow up to our original study (Rabin, Barr, Burton, 2005), the current research surveyed the assessment practices and test usage patterns of clinical neuropsychologists in the U.S and Canada.

Participants and Methods: Potential participants were randomly selected members of the National Academy of Neuropsychology and/or the International Neuropsychological Society. Participants had the option of completing a paper-and-pencil questionnaire or equivalent online version.

Results: Respondents were 500 doctorate-level psychologists (25% usable response rate; 54% women) who had been practicing neuropsychology for an average of 14.7 years. Respondents provided basic demographic and practice-related information and reported their most frequently utilized instruments in the domains of: intelligence and achievement; memory; attention, concentration, and working memory; language; executive functioning; visuospatial/visuoconstructive skills; mental status; sensory/motor functioning; response bias/incomplete effort; activities of daily living; and mood and personality. Additional questions related to usage rates of tests with alternate forms and ecological validity. Participants also reported the perceived challenges associated with neuropsychological assessment procedures. Overall, the Wechsler Adult Intelligence Scale-Fourth Edition, followed by the Trail Making Test, California Verbal Learning Test-Second Edition, and Wechsler Intelligence Scale for Children-Fourth Edition, were the most commonly used tests. Participants identified lack of ecological validity and difficulty comparing the meaning of standardized scores across tests as the greatest challenges associated with the selection and interpretation of neuropsychological instruments and data, respectively.

Conclusions: Following a review of findings, results are compared to those obtained in prior surveys and implications for the field of neuropsychology discussed.

Correspondence: *Laura A. Rabin, Ph.D., Psychology, Brooklyn College/CUNY, 2900 Bedford Ave, Brooklyn, NY 11210. E-mail: lrabin@brooklyn.cuny.edu*

S. RAHAYEL, V. PÉPIN, S. VILLENEUVE, J. BERTRAND, M. DELORIMIER, A. RIZK, C. DESJARDINS & J. GAGNON. Validity of the Montreal Cognitive Assessment to Detect Mild Cognitive Impairment in Chronic Obstructive Pulmonary Disease.

Objective: Chronic obstructive pulmonary disease (COPD) is characterized by progressive and partially irreversible chronic airflow limitation. Mild cognitive impairment (MCI) is one of the important extrapulmonary manifestations in COPD. The Mini-Mental State Examination (MMSE) and the Montreal Cognitive Assessment (MoCA) are two brief instruments for detecting cognitive impairment. Our aim was to evaluate the validity of the MMSE and the MoCA to detect MCI in COPD.

Participants and Methods: Forty-five moderate to severe COPD patients without dementia underwent a comprehensive neuropsychological evaluation. MCI was defined as 1) a subjective cognitive complaint; 2) objective evidence of cognitive decline; 3) preserved daily living activities. Receiver operating characteristic curves were created for the MoCA and MMSE to assess their ability to identify MCI in COPD patients. The optimal cut-off value was defined as the highest score when combining sensitivity, specificity, and percentage of correctly classified patients.

Results: Scores obtained were 25.64 ± 2.89 (range 20–30) for the MoCA and 28.31 ± 1.58 (range 22–30) for the MMSE. MCI was found in 36% (16/45) of COPD patients on neuropsychological evaluation. For the MoCA, a cut-off of 25 (≤ 24 indicating impairment) yielded the best balance between sensitivity (75%) and specificity (79%), with 78% correct classifications and an area under the curve of 0.82. No value for the MMSE was found to have acceptable sensitivity or specificity.

Conclusions: The MoCA is superior to the MMSE in detecting MCI in COPD patients. This study was supported by the FRSQ, CLA, and REPAR.

Correspondence: *Shady Rahayel, Université du Québec à Montréal, 2840, rue Louis-Veuillot, Montreal, QC H1N 2P6, Canada. E-mail: shady.rahayel@gmail.com*

P. RIORDAN, R. SAWYER & T. LOMBARDO. Comparison of Computer Graphics Tablet and Paper-and-Pencil Administrations of the Rey-Osterrieth Complex Figure Test.

Objective: Computer graphics tablet-based administration of visual design copy measures presents significant data collection advantages. We examined the equivalence of a graphics tablet-based computer administration of the Rey-Osterrieth Complex Figure (ROCF) test with a traditional paper-and-pencil administration.

Participants and Methods: Sixty-two undergraduate volunteers were administered the ROCF using a computer graphics tablet and an alternate form of the test (Taylor Complex Figure) using pencil and paper. ROCF and TCF copies were independently scored by two pairs of scorers, each using different scoring systems for the measure. Participants were also assessed for computer anxiety, attitudes, and familiarity, as well as comfort with the computer equipment used in the study.

Results: No significant performance differences were observed in the first scoring pair; however, in the second pair participants scored significantly higher on their paper-and-pencil reproduction than their tablet reproduction. No significant relationships between computer-based ROCF performance and pre-existing computer attitudes, anxiety, or familiarity were observed. Participant ratings regarding the graphics tablet suggested that it was perceived as interesting but more difficult to use than paper-and-pencil.

Conclusions: Overall, results of the current study did not support the use of a computer graphics tablet as an alternate administration method for the ROCF.

Correspondence: *Patrick Riordan, Ph.D., Hines VA Hospital, 2015 W Potomac, #1, Chicago, IL 60622. E-mail: patrick.f.riordan@gmail.com*

Z.J. SCHWAB & W.D. KILLGORE. Disentangling Emotional and Cognitive Intelligence.

Objective: Emotional intelligence (EI) has been described as the ability to perceive, understand, and use emotional information to facilitate thinking. While the construct of EI has garnered considerable lay attention over the past decade, there has been only modest scientific validation of the basis of this construct and whether it is indeed unique from traditional cognitive intelligence, as measured by the Wechsler scales (IQ). This issue has been clouded by contrary conceptualizations of EI as an "Ability" versus a "Trait" more akin to personality. To disentangle these constructs, we examined the inter-correlations among measures of EI, IQ, and personality.

Participants and Methods: Forty-one healthy adults (22 men) ranging from 18 to 45 completed the Bar-On EQ-i ("Trait" EI), Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT-"Ability" EI), Revised NEO Personality Inventory (NEO-PI-R), and the Verbal (VIQ), Performance (PIQ), and Full (FSIQ) scales of the Wechsler Abbreviated Scale of Intelligence (WASI). Data were analyzed with bivariate correlation and stepwise linear regression ($\alpha=.01$).

Results: MSCEIT and EQ-i were not significantly correlated ($r=0.15$). MSCEIT correlated with FSIQ ($r=0.53$), VIQ ($r=0.53$), and PIQ ($r=0.43$), but not personality. EQ-i was uncorrelated with IQ, but significantly correlated with Neuroticism ($r=-0.65$), Extraversion ($r=0.49$), Conscientiousness and ($r=0.44$). In regression analyses, EQ-i was predicted by a combination of Neuroticism, Conscientiousness, and Extraversion ($R=0.83$). MSCEIT was predicted by VIQ ($R=0.53$).

Conclusions: Ability and Trait measures of EI appear to be measuring different psychological constructs. Ability EI shares considerable variance with cognitive IQ (up to 28%), while Trait EI appears to be primarily a measure of personality.

Correspondence: *Zachary J. Schwab, BS, McLean Hospital, Harvard Medical School, 115 Mill St., Belmont, MA 02478. E-mail: zschwab@mclean.harvard.edu*

C.H. SONG, J. KIZIELEWICZ, Z. SCHWAB, M. WEINER, S. RAUCH & W.D. KILLGORE. Time is of the Essence: The Design Organization Test as a Valid, Reliable, & Brief Measure of Visuospatial Ability.

Objective: The Wechsler Scales are some of the most frequently used measures of intelligence. However, these scales are time consuming to

administer, and there is a need for more time efficient measures that provide the same information. The Design Organization Test (DOT; Killgore et al., 2005) was developed as brief 2-minute alternative to the Wechsler Block Design (BD) subtest. The initial development study showed the DOT to be reliable and valid for assessing college students and clinical populations. The present study further examined the validity and reliability of the DOT in normal healthy adults.

Participants and Methods: 36 healthy right-handed adults (13 male, 23 female) ranging in age from 18 to 45 completed the Wechsler Abbreviated Scale of Intelligence (WASI) and 2 alternative versions of the DOT. Test-retest reliability, alternate forms reliability, and concurrent validity were evaluated.

Results: DOT scores correlated significantly with the WASI ($r=.73$, $p<.001$). Notably, Block Design (BD) scores were strongly correlated with the DOT, $r=.80$, $p<.001$. Alternate versions of the DOT were highly correlated with each other ($r=.82$, $p<.001$). Scores increased approximately 5 points between first ($M=36.03$, $SD=9.96$) and second ($M=41.00$, $SD=10.40$) administrations, $t(33) = -7.13$, $p<.05$, suggesting a small but reliable practice effect.

Conclusions: The DOT was found to be a valid measure of visuospatial ability that correlated highly with BD and total WASI scores. The DOT is recommended as an efficient alternative measure when the lengthy block design procedure is not practical.

Correspondence: *William D. Killgore, Ph.D., Psychiatry, Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

J.W. TAM, S.A. CREAMER & M. SCHMITTER-EDGEcombe. The Role of Processing Speed in the Brief Visuospatial Memory Test (BVMT).

Objective: The Brief Visuospatial Memory Test (BVMT) is commonly used to assess visual learning and memory. While research suggests that speed of processing can affect verbal list learning performance, the impact of processing speed on BVMT visuospatial learning and delayed memory performance has not been investigated. We hypothesized that speeded processing abilities would more significantly influence the BVMT visuospatial learning scores compared to the delayed memory scores.

Participants and Methods: 159 healthy older adults were recruited (age 50 – 94 years). Participants completed a standardized neuropsychological test battery which included the BVMT, Trails A, Symbol Digit Modalities Test (SDMT), and Clox 2 to assess visual memory, speed of processing, and visuospatial abilities, respectively.

Results: After controlling for age and education [$\Delta R^2 = .28$; $\Delta F(1,157) = 62.37$; $p > .001$], hierarchical regression analysis showed that speed of processing as measured by Trails A was a unique predictor [$\beta = -.09$, $t(155) = -2.14$, $p = .03$] for the BVMT visual learning performance among healthy older adults while visuospatial abilities measured by Clox2 was not. A parallel but separate regression analysis conducted using the oral subtest of the SDMT as a predictor also revealed similar findings [$\beta = .12$, $t(155) = 3.13$, $p = .002$]. In both cases, the speeded processing task did not account for additional variance in the BVMT delayed recall.

Conclusions: These findings demonstrate the important role of speeded processing in visuospatial learning as assessed by the BVMT. This may be related to the 10 second time limit allotted for studying the 6 designs and their locations. Deficits in speeded processing abilities should be considered when interpreting BVMT visuospatial learning performance.

Correspondence: *Joyce W. Tam, M.A., Washington State University, PO BOX 644820, Pullman, WA 99164. E-mail: jw140@gmail.com*

D. UKUEBERUWA & P. ARNETT. Identifying Coping Style Factors in Multiple Sclerosis.

Objective: The description and classification of coping strategies may distinguish adaptive and maladaptive types of coping, that is, explain which strategies best allow the individual to overcome stress and return to a healthy or desired state. Carver and Scheier designed the COPE as

a valid assessment of strategies that impede or contribute to adaptive coping, for which they distinguish 6 subscales forming Active (mostly adaptive) and Avoidant (mostly maladaptive) Coping factors. This study sought to identify coping factors in a sample of individuals with multiple sclerosis (MS).

Participants and Methods: 50 participants (38 female) with a confirmed diagnosis of MS completed 6 subscales of the COPE. Items were subjected to a principal components analysis with varimax rotation. The study retained items loading onto a factor at 0.4 or greater.

Results: The factor composition, one adaptive coping and one maladaptive coping factor, was consistent with a priori predictions. The exceptions were one Avoidant Coping item that loaded positively on one factor and negatively on the other and two Active Coping items that loaded negatively on the maladaptive factor but did not load on the adaptive factor. The raw data for those two Active Coping items were re-coded so that the items would load positively on the maladaptive factor.

Conclusions: Adaptive and maladaptive coping style factors were created with data from an MS sample. The method used a psychometrically valid reconstruction of the Active and Avoidant Coping factors identified by Carver and Scheier, which can now be used to investigate the role of coping style in these patients.

Correspondence: *Dede Ukueberuwa, Penn State University, 115C Moore Building, University Park, PA 16802. E-mail: dedemu@psu.edu*

L.G. UMFLEET, D. BOWERS, C. PRICE, R.M. BAUER, M. KEISKI, D. DEDE, D. KAY, J. JONES, C. JACOBSON, K. FOOTE & M.S. OKUN. Parkinson's Disease Normative Study: Normative Data for Commonly Used Clinical Neuropsychological Measures in 379 PD Patients.

Objective: Although Parkinson's disease (PD) is associated with neurocognitive changes, there is a paucity of data available for determining what might be considered "normal" cognitive status or decline for this disorder. The purpose of this investigation is to provide normative data from a large cohort of "nondemented" individuals with idiopathic PD. **Participants and Methods:** Participants included a convenience sample of 379 PD patients (93% Caucasian) who underwent neuropsychological evaluation as part of standard referral from the UF Movement Disorders Center (MDC) and met stringent inclusion/exclusion criteria (e.g., DRS >5th%ile, no DBS or brain surgery). Neuropsychological measures included indices of executive function (Stroop, Trailmaking, COWA, Wisconsin), attention/memory (WMS-III, Hopkins), visuoperceptual-spatial (JOLO, FRT), language (BNT) and processing speed. Raw data were converted to: a) normative scores based on respective test manuals and b) to PD-specific norms based on this cohort. Data were divided into four age ranges (40-59, 60-69, 70-79, 80+) and further separated by education (<12, 12-16, >16). Reliable change results were calculated for 70 individuals who underwent a second evaluation

Results: Presented in an MDC Norms booklet are tables with a.) patient data that were converted to normative scores using appropriate test manuals, b.) reliable change data, and c.) PD-specific norms across age and education groups. Each subgroup is further characterized by disease specific information (duration, UPDRS Motor, Hoehn Yahr staging).

Conclusions: This is the first study that stratifies commonly administered neuropsychological test scores by age and education in a PD patient population. PD-specific normative tables serve as a useful clinical tool for Neuropsychologists.

Correspondence: *Laura G. Umfleet, M.S., Roosevelt University, 3500 SW 34th Street, Apt Q-146, Gainesville, FL 32608. E-mail: lglass@mail.roosevelt.edu*

L.G. UMFLEET, J.J. RYAN, J. MORRIS, N. PLISKIN & E. ROSSINI. Comparison of Nondominant and Dominant Hand Performances on the WMS-IV Visual Reproduction Subtest.

Objective: Dominant side hemiparesis, hemiplegia, and upper extremity injuries are frequently encountered in neuropsychological practice. Individuals with these limitations are often forced to use the nondominant hand for everyday manual tasks, and they may be

instructed to complete paper and pencil with the nondominant hand during a neuropsychological evaluation. It is important to provide data on nondominant hand completion of commonly administered neuropsychological tests to demonstrate the extent to which this impacts memory. Results of previous studies demonstrate minimal intermanual differences on copy components of the ROCFT and WMS-IV Visual Reproduction (VR) tasks, with dominant hand use yielding better scores. However, there is a paucity of literature addressing the impact of nondominant hand use on tasks of visual memory. Using a diagnostically diverse clinical sample, the present study investigated the effects of nondominant hand completion on the WMS-IV VRI and VRII tasks.

Participants and Methods: As part of a comprehensive neuropsychological evaluation, 35 right-handed participants were administered the WMS-IV VR. Hand used to complete the VR was counter-balanced.

Means for age and education were 42.46 and 15.51 years, respectively. Presented in Table 1 are patient demographics and diagnostic categories.

Results: Displayed in Table 2 are means and standard deviations for age, education, estimated FSIQ, and VR subtest. Participants in the nondominant hand group did not differ from the dominant hand group in terms of age and education. Memory scores were similar between the group who used their nondominant hand and the group who used their dominant hand, $p > .05$ on both the VRI and VRII.

Conclusions: Overall, the present findings suggest that when a standard administration is precluded, it is reasonable to use the nondominant hand to complete the VR subtest and to make use of the WMS-IV norms for interpretation. Limitations will be discussed.

Correspondence: *Laura G. Umfleet, M.S., Roosevelt University, 3500 SW 34th Street, Apt Q-146, Gainesville, FL 32608. E-mail: lglass@mail.roosevelt.edu*

T.D. VANNORS DALL, C.R. FORBES, C.F. SCHRETLEN, K.M. SMITH, T. HO, B. GORDON & D.J. SCHRETLEN. Normative Data for an Expanded Qualitative Verbal Fluency Scoring System.

Objective: Clustering on verbal fluency tasks (VF) is thought to reflect the organization of lexical entries in an underlying network. Switching among subcategories is thought to invoke a more deliberate, controlled word search process. We developed a VF scoring system that extends previous methods to capture additional phonological, semantic and associative relationships between successively-reported words. This system yields scores that reliably capture a broader range of word retrieval strategies than other systems. Here we provide preliminary normative data for these qualitative VF measures.

Participants and Methods: 327 neurologically normal adults ranging from 18 to 92 years old completed two letter-cued (S, P) and category-cued (animals, supermarket items) VF tasks from the Calibrated Ideational Fluency Assessment (CIFA; Schretlen & Vannorsdall, 2010). To date, 276 of these have been scored using the Hopkins system. Scores include total acceptable words, numbers of word clusters and switches, and total and mean cluster sizes. We used multiple regression to model the contributions of age, sex, race, and years of education to these qualitative scores of CIFA word fluency productions.

Results: Qualitative aspects of VF performance were most consistently associated with age and education. They showed little to no relationship with sex and race. Based on these results, we derived demographically-calibrated normative data for these qualitative features of VF productions for both letter and category word fluency.

Conclusions: These normative data may help further delineate the nature and severity of semantic system dysfunction in neurological and neuropsychiatric diseases and conditions that are characterized by impaired lexical retrieval.

Correspondence: *Tracy D. Vannorsdall, PhD, Psychiatry & Behavioral Sciences, Johns Hopkins School of Medicine, 600 N. Wolfe St. / Meyer 218, Johns Hopkins Hospital, Baltimore, MD 21287. E-mail: TVannor1@jhmi.edu*

E.J. WALDRON, R.D. JONES, K. MANZEL & D.T. TRANEL. Is reliable change different for individuals with brain damage? A comparison of neurologically stable brain damaged patients with normal controls.

Objective: Serial assessments are common in neuropsychological practice, and reliable change indices based on neurologically normal control participants are often used to determine if the scores obtained on these assessments are meaningfully different. However, little work has explored whether patients who are stable from a medical/neurological perspective show test-retest reliability that is comparable to normal comparison groups. This study examined the stability of neuropsychological performances in brain damaged but neurologically stable patients. Our prediction was that patients would demonstrate overall lower test-retest reliability compared to normal controls.

Participants and Methods: Forty participants with stable brain lesions were administered several standard neuropsychological measures at two time points greater than one year apart (average interval = 9.76 years, $SD=5.88$). Tests included the BVRT, AVLT, RCFT, BNT, COWA, Facial Discrimination, & TMT A&B. Test-retest reliability coefficients were calculated and compared to published values from normal control participants.

Results: Test-retest reliability coefficients ranged from $r = .25$ (Facial Discrimination) to $r = .97$ (BNT). Several of these coefficients were markedly different from published values of test-retest reliability.

Conclusions: These results suggest that at least some reliability coefficients that have been published for neurologically normal participants are not necessarily directly applicable when testing individuals with brain damage. In a stable neurological population, some measures were more reliable than published test-retest correlations, whereas others were less reliable. The findings suggest that current cut-offs and accepted values for reliable psychometric change may be more clinically meaningful if test-retest data are available for brain-damaged populations.

Correspondence: *Eric J. Waldron, Ph.D., Neurology, University of Iowa, 200 Hawkins Dr., 2007 RCP, Iowa City, IA 52242. E-mail: eric-waldron@uiowa.edu*

G. WEISSBERGER, T.H. GOLLAN, M.W. BONDI & D.P. SALMON. Which Neuropsychological Tests Are Sensitive to Future Alzheimer's Disease Progression Across Cultural Groups?

Objective: Given prior work demonstrating cultural effects on neuropsychological testing, we aimed to identify measures sensitive to eventual progression to probable Alzheimer's disease (AD) in non-Hispanic and Hispanic older adults who were originally cognitively normal.

Participants and Methods: Eight non-Hispanics and eight Hispanics who eventually developed AD, and 74 matched cognitively normal controls (42 non-Hispanic) were collected from a pool of normal controls tested annually at UCSD's Alzheimer's Disease Research Center. Data were collected on Year 1 testing, before participants were diagnosed with AD. Normal controls were classified as healthy for two subsequent years after their Year 1 testing and converters were tested on average 4.5 years before AD diagnosis.

Results: Normal control non-Hispanics performed better than Hispanics on the Trail Making Test (Parts A and B), WAIS Vocabulary and Digit Symbol, the Boston Naming Test, Semantic and Phonemic Fluency, and the Dementia Rating Scale (p 's < .05). Of interest, TMT A and B, Digit Symbol, and the BNT were still sensitive to AD progression for both groups (p 's $\leq .05$), despite lower scores for Hispanics. The Mini Mental State Examination, Heaton Visual Reproduction, and Wisconsin Card Sorting Task were insensitive to decline in both groups (p 's $\geq .15$). Finally, the DRS ($p = .10$), WAIS Vocabulary, and Semantic Fluency (p 's $\leq .01$) were sensitive to progression in non-Hispanics, but not Hispanic participants.

Conclusions: This study was a first step in determining those neuropsychological measures sensitive to the detection of AD in both Hispanics and non-Hispanics regardless of cultural biases.

Correspondence: *Gali Weissberger, Clinical Psychology, San Diego State University/University of California, San Diego Joint Doctoral Program, 811 West Nutmeg St. Apt 401, San Diego, CA 92103. E-mail: gweissbe@gmail.com*

P.A. WOICIK, K. WHEARTY, J.J. WEIL, T. MALONEY, A. KONOVA, N. ALIA-KLEIN & R.Z. GOLDSTEIN. Emotional Response to Verbal Drug Cues: Toward the Development of a Drug Word Bank for Neuropsychological Testing.

Objective: The impact of a drug related context on behavior, cognition and emotion in susceptible individuals distinguishes drug addiction from other psychopathologies. Here we aimed to develop and validate a repository of drug-related and matched non-drug words for the construction of a drug-related context to tailor neuropsychological tests for drug addiction.

Participants and Methods: Using a computerized administration, two university samples (Study 1 (N = 79), Study 2 (N = 335)), of undergraduate students provided emotional ratings of valence and arousal for preselected and frequently used drug-related words. Participants also answered selected drug and alcohol use questions.

Results: Study 1 revealed that emotional ratings for 120 drug words were low relative to scale [$t(78) = 13.6$ and 6.7 , $p < 0.0001$ for valence and arousal, respectively]. Additionally, we observed a trend suggesting a positive relationship between valence ratings for the words and self-reported frequency of alcohol and drug use ($r = 0.52$, $p < 0.01$). In Study 2 emotional ratings were collected for 70 drug words and 70 matched non-drug words. Drug words were rated more negatively (lower valence) than non-drug words [$t(334) = 27.3$, $p < 0.0001$] but arousal ratings did not differ for the type of word. Valence ratings for drug words were positively correlated with frequency of alcohol and drug use ($r = 0.40$, $p < 0.01$) and consumption of alcohol ($r = 0.23$, $p < 0.01$).

Conclusions: This pattern of correlations, that was unique to drug words, suggests that the current drug word bank may be sensitive to the severity of alcohol and drug use in young, high-achieving drinkers/drug users. The current results provide preliminary support for the validity of a large drug word bank that can be used for the design of neuropsychological tests tailored for assessment in drug addiction. This study was supported by grants from the National Institute on Drug Abuse (to RZC: 1R01DA023579) and General Clinical Research Center (5-MO1-RR-10710).

Correspondence: *Kayla Whearty, B.A., Brookhaven National Lab, Building 490, P.O. Box 5000, Upton, NY 11973. E-mail: kayla.whearty@gmail.com*

**Assessment/Psychometrics/Methods
(Child)**

L.M. CHARETTE, A. FOSTER, J.P. RYAN & T. ATKINSON. Predicting Attention-Deficit/Hyperactivity Disorder Using Computerized Performance Tests.

Objective: This retrospective study investigates how two computerized continuous performance tests, the Conners' Continuous Performance Test Second Edition (C-CPTII) and the Integrated Visual and Auditory Continuous Performance Test (IVA-CPT) compare as predictors of Attention-Deficit/Hyperactivity Disorder in children ages 6 to 18. Both computerized tests were compared to results from parent and teacher rating scales: Conners' Parent Rating Scales-Revised Long Form (CPRS-R:L); Conners' Teacher Rating Scales-Revised (CTRS-R:L); Behavior Assessment System for Children, Second Edition Parent Rating Scale (BASC-2 PRS); and Behavior Assessment System for Children, Second Edition Teacher Rating Scale (BASC-2 TRS).

Participants and Methods: Convenience data from archival records of children with and without ADHD between the years of 2004 and 2010 were used. The diagnosis of ADHD was made by a psychologist using classroom observation, parent and teacher interview, results of the BASC-2 PRS and TRS, CPRS-R:L, CTRS-R:L and test results from a neuropsychological battery. The ADHD group ($n=44$) included both males ($n=30$) and females ($n=14$); a control group included 15 participants (12 males; 3 females).

Results: Using logistic regression, the results indicate that the IVA-CPT Sustained Auditory Attention subscale was a statistically significant predictor of ADHD. Further, the CPRS-R:L ADHD subscale and CTRS-R:L Inattentive subscales, as well as the BASC-2 Teacher Hyperactive subscale were statistically significant predictors of an ADHD diagnosis.

Conclusions: Our results provide evidence that the IVA-CPT can be used as an effective predictor of ADHD. Specific subscales of the CPRS-R:L, CTRS-R:L and BASC-2 were also effective in distinguishing children with and without ADHD.

Correspondence: *Thomas Atkinson, Ph.D., Psychiatry and Behavioral Sciences, Memorial Sloan-Kettering Cancer Center, 641 Lexington Ave, 7th Floor, New York, NY 10022. E-mail: atkinsot@mskcc.org*

K.T. BAUM, P.K. SHEAR, S. HOWE & S. BISHOP. Measurement of Intelligence in Children and Adolescents with Autism Spectrum Disorder: Factors Affecting Performance.

Objective: In autism spectrum disorders (ASD), results of cognitive testing inform clinical care, theories of neurodevelopment, research design, and public policy. The Wechsler Intelligence Scale for Children (WISC) and the Stanford-Binet (SB) are commonly used and are shown to be highly correlated in pediatric and typically-developing populations, but have not been compared in ASD. The present study evaluated differences in IQ scores between the WISC-IV and SB-5 in ASD and examined whether the symptomatic, neuropsychological, or behavioral factors that are prominent in this population differentially affected scores.

Participants and Methods: Forty participants with ASD (10 to 16 yrs) completed testing that included the WISC-IV, SB-5, and measures of language, visual-motor integration, and theory of mind. Parents rated the children's adaptive functioning and behavior.

Results: Paired samples t tests showed that FSIQ and verbal IQ scores differed significantly between the two tests. The majority of participants obtained higher FSIQ scores on the SB-5, with 14% obtaining scores on the two tests that were more than one SD apart. WISC-IV verbal scores were higher. Classification of significant verbal-nonverbal discrepancies across measures was only consistent for two-thirds of the sample. Neuropsychological functioning scores (language, visual-motor, and theory of mind) were not correlated with IQ. However, age predicted differences in FSIQ and nonverbal IQ across the two tests, with older participants scoring higher on the SB-5 than younger ones.

Conclusions: Despite excellent convergent validity between tests at the group level, significant differences exist between tests for individuals in IQ scores, classification, and verbal-nonverbal discrepancy, which could have a significant impact on the individual's clinical care, as well as research practices. Neuropsychological, behavioral, and symptom variables do not account for score differences across tests, although a more comprehensive evaluation is needed.

Correspondence: *Katherine T. Baum, M.A., Psychology; Children's Hospital of Philadelphia / Univ. of Cincinnati, 4641 Spruce St, Apt. 1, Philadelphia, PA 19139. E-mail: katherinetbaum@gmail.com*

L.A. DAY, J. REESMAN & J. TORRES. Feasibility and Initial Validation of a Modified Signed Paired Associates Test for Deaf Children.

Objective: There are no published measures available that assess language related memory for children who communicate using American Sign Language (ASL). Most memory measures are created using spoken language, which creates methodological difficulties when translating those measures into ASL. The goal of the present study was to examine use of a signed-based language learning and memory test for deaf children who use (ASL).

Participants and Methods: The Signed Paired Associates Test (SPAT, Pollard et al., 2005) was modified and administered to 10 clinically-referred deaf children seen for neuropsychological assessment, who were all fluent users of ASL. Average participant age was 12.3 years (range 7.3- 17.1 years), 4 of whom were females. Children were administered the task by an examiner fluent in ASL. Children under age 13 were administered a prerequisite task to ensure that they understood the concept of "pair."

Results: Outcomes were comparable to those obtained in previous samples of deaf adults. Participants gained an average of 2.03 word pairs over 4 learning trials. Average total immediate recall was 40.2 (6.51) of 56 possible pairs over 4 learning trials and average combined free

and cued delayed recall was 12.5(1.72) of 14 word pairs. Participants retained an average of 54% of the word pairs during the delayed free-recall as compared to the 4th learning trial, and they retained an average of 100% of the word pairs during the combined delayed- and free-recall trials.

Conclusions: Preliminary results suggest that a modified version of the SPAT is feasible for use in a sample of clinically referred deaf children who are fluent in ASL. Findings suggest that further modification of the task for children may be indicated, including lengthening the list to avoid a ceiling effect. Addition of a multiple choice or a forced choice section of this task is also recommended as a possible embedded effort measure.

Correspondence: *Lori A. Day, PhD, Neuropsychology; Kennedy Krieger Institute, 1750 E. Fairmount Ave, 3rd Floor, Baltimore, MD 21231. E-mail: DayLo@kennedykrieger.org*

M.M. TABAQUIM, C.G. NARDI & J.C. DUTKA. Neuropsychologic Evaluation of Children with Cleft Lip and Palate.

Objective: To investigate the neuropsychologic functions of individuals with repaired cleft lip and palate (CLP).

Participants and Methods: Participated 72 children with repaired CLP (trans, pre and post-incisive foramen), both genders, mean age of 10.7y, during fundamental and middle school all under treatment at a specialized center for rehabilitation of craniofacial anomalies. For the investigation the Colored Progressive Matrices, Bender Teste Visomotor and BANI-TS – Neuropsychological Assessment Battery Simplified were used. Kruskal Wallis test was used to compare the children grouped according the different types of cleft palate (significance level defined at 0.05).

Results: Findings revealed that 78% of the children performed at intellectual level expected for their ages and 22% performed at borderline normalcy level. General score for neuropsychologic function was found at a mean performance of 70% during tasks, with operational memory found at the lowest performance level (45%), followed by cognitive-linguistic at 53%. Graphic perceptual-motor abilities related to visual-spacial function were found at 58% of performance level expected for the age, with the children in the trans-incisive foramen group performing at the lowest level (32%) when compared with children in the pre- and post-incisive foramen groups. Most efficient performance was found for synesthetic sensations skin and receptive language suggesting preserved input of information. There was no statistical significance for the difference found among types of CLP. The individuals in the pre-incisive foramen CLP group had best neuropsychologic performance with scores at 73.2% compared to individuals in the trans-incisive foramen CLP (69,7%) and pos-incisive group (67,1%).

Conclusions: Individuals with repaired CLP present with alterations in neuropsychologic functions in the associative cortical areas, specially operational memory for numbers and words, and in the cognitive-linguistic area, compromising semantic and pragmatic abilities.

Correspondence: *Maria de Lourdes M. Tabaquim, Department of Speech, Language, Pathology and Audiology; Universit of São Paulo - USP, Alameda Octávio Pinheiro Brizolla, 9-75, Rua Bandeirantes, 9-60 Apto 61, Bauru 17015-012, Brazil. E-mail: malu.tabaquim@usp.br*

N.D. DOTY, A.E. DOYLE, E.N. HILL, L.A. KILLEEN, E.H. O'DONNELL, M.C. PUTNAM, D. TONER, B.L. WILLOUGHBY, H.K. WILSON & E. BRAATEN. An Ecological Model of Child Neuropsychological Assessment: Integrating Cognitive, Psychiatric, Academic, and Family Factors.

Objective: Empirical findings indicate youth with psychiatric or neurodevelopmental disorders may present with a range of cognitive impairments and may benefit from neuropsychological testing. Traditional models of neuropsychological assessment, initially developed for evaluation of acquired brain injury in adulthood, cannot adequately capture the range of cognitive, developmental, academic, emotional, and

psychosocial factors relevant to this population. On the basis of ecological theory, we have developed an integrative model of child assessment, which includes standardized assessment across key dimensions of child functioning (i.e., cognitive, academic, psychiatric, social, adaptive, and family functioning). Here, we present the implementation of this model within a hospital-based outpatient assessment clinic.

Participants and Methods: Demographic and assessment data from a sample of 200 patients ages 3 to 20 ($M = 10.4$, $SD = 3.8$) were used to characterize the clinic's referral population.

Results: While a substantial portion of patients presented with intellectual, language, or learning disorders (40%), other referral issues included anxiety disorders (25%), mood disorders (22%), disruptive behavior disorders (48%), and autism spectrum disorders (22%). Rates of comorbidity were high, with many patients meeting criteria for two (27%), three (15%), or four (8%) diagnoses. Patients who presented with cognitive or learning disorders often met criteria for comorbid emotional (42%) or behavioral (47%) disorders. Fifteen percent had prior inpatient psychiatric hospitalizations, while 58% had received special education services. Parent questionnaire data (CBCL) also highlight the broad range of presenting concerns.

Conclusions: Findings underscore the need for a multi-dimensional, ecological model of child assessment. Such a model crosses disciplinary boundaries between psychiatry, clinical psychology and neuropsychology, with important implications for training the next generation of practitioners for evidence-based practice.

Correspondence: *Nathan D. Doty, PhD, Learning and Emotional Assessment Program, Massachusetts General Hospital & Harvard Medical School, 151 Merrimac Street, 5th floor, LEAP, Boston, MA 02118. E-mail: ndoty@partners.org*

A. DROUIN-GERMAIN, M. HENRY, G. LALONDE, M. BEAUCHAMP & P. NOLIN. Sense of Presence and Performance in ClinicaVR: Classroom-Stroop.

Objective: To examine the impact of sense of presence on performance on a task measuring attentional and executive functions presented in a virtual classroom. It is hypothesized that a higher sense of presence, i.e. being in the virtual environment, will be associated with better performance on the virtual task.

Participants and Methods: The sample was made up of 27 adolescents aged between 13 and 17 years old recruited in a high school. For each of them, two virtual tasks inspired by conditions 1 and 3 of the D-KEFS Color-Word Interference Test were administered. At the end, participants were asked about their sense of presence during the completion of the virtual tasks. An abbreviated version of the Questionnaire on the Sense of Presence (QSP) from the Cyberpsychology Laboratory of the University of Quebec in Outaouais (2002) was used.

Results: Globally, the results showed no significant correlation between the score of sense of presence and the scores of the ClinicaVR: Classroom-Stroop, as observed for commissions errors ($r = .29$, $p = .09$; $r = .20$, $p = .24$), omissions ($r = .15$, $p = .38$; $r = .14$, $p = .42$) and reaction time ($r = .26$, $p = .13$; $r = -.22$, $p = .19$), respectively for the first and second condition.

Conclusions: These results do not support the main hypothesis that participants who experience a high sense of presence in the virtual classroom would perform better than those who feel less present. Therefore, according to our study, the sense of presence did not appear to be an essential factor in considering validity of performance on this virtual test.

Correspondence: *Anne Drouin-Germain, Psychology, Université du Québec à Trois-Rivières, 3351 Boul. des Forges, C.P. 500, Trois-Rivières, QC G9A 5H7, Canada. E-mail: Anne.Drouin-Germain@uqtr.ca*

B. ELZINGA & E. HELDER. Neuropsychological and Behavioral Correlates of the Inattentive/Overactive Profile in Internationally-Adopted Children.

Objective: Previous research has documented the incidence of inattention/overactivity (I/O) in internationally adopted children (Lindblad, 2009). However, I/O classification in these studies was derived prima-

rily from parent report (Stevens, 2007); likewise, these studies often sample children from a single country. This study, consisting of a multi-national group of international adoptees, categorizes inattentive/overactive participants according to cognitive measures and longitudinally examines their neuropsychological profile and behavioral adjustment.

Participants and Methods: Forty-four children (15 male, 29 female; mean age year 1 = 77.2 months) from ten countries were studied (mean time post-adoption at year 1 = 21.8 months). Participants were assessed yearly for two years via a neuropsychological battery and parent report. Nineteen participants were classified as I/O based on "clinically elevated" commissions, omissions, and/or perseverations scores on a sustained attention task ($t \geq 60$).

Results: At year one, I/O participants were found to have lower full-scale IQs, and reading and spelling scores ($p < .05$) compared to non-I/O peers, and also had poorer verbal memory and receptive language ($p < .05$). Although some catch-up in cognitive performance was observed at year two, the I/O group was parent-rated as more anxious ($p < .01$) and as having more difficulties with communication ($p < .05$) at follow-up. Parents of I/O children rated themselves as less confident in their parenting skills than non-I/O parents ($p < .05$). Changes in I/O group composition between years one and two were also compared.

Conclusions: The present study presents a novel perspective on challenges inattentive-overactive adoptees face over time. Findings have implications for education and parenting expectations of international adoptees and their families.

Correspondence: *Brie Elzinga, Calvin College, 20 Anne Briar Drive, Maryville, IL 62062. E-mail: bae4@students.calvin.edu*

T.W. ERTELT, T.V. PETROS & C. YEAGER. Neuropsychological, Academic Achievement, and Behavioral Differences Between the Child Behavior Checklist Pediatric Bipolar Disorder Profile, Attention-Deficit/Hyperactivity Disorder, and Emotionally Normal Controls.

Objective: The goal of the present study was to identify differences in neuropsychological functioning, as well academic achievement and emotional/behavior functioning, in children identified as having a bipolar disorder or attention-deficit/hyperactivity disorder (ADHD) and emotionally normal children. The present study hypothesized that children with bipolar disorders would experience impaired performance on executive functioning tasks compared to the other groups and have higher reports of problematic behaviors.

Participants and Methods: A profile on the Child Behavior Checklist (CBCL), called the CBCL Pediatric Bipolar Disorder (CBCL-PBD) profile, has been identified as an efficient proxy method of screening children for bipolar disorders, and strong diagnostic accuracy has been reported when using the CBCL-PBD profile. The present study examined children between six and twelve years old who were positive for the CBCL-PBD and positive for a diagnosis of ADHD (CBCL-PBD + ADHD group, $n = 17$), negative for the CBCL-PBD and positive for a diagnosis of ADHD (ADHD group, $n = 44$), and negative for both the CBCL-PBD and an ADHD diagnosis (control group, $n = 10$) on measures of problem solving, set shifting, sustained attention, alternating attention, verbal memory, visuospatial memory, academic achievement, and emotional/behavioral functioning. All participants were recruited from an outpatient psychology clinic.

Results: No significant differences were observed between groups on measures of neuropsychological functioning; however, notable differences in academic achievement and emotional/behavioral functioning were observed.

Conclusions: The lack of significant neuropsychological differences in the CBCL-PBD group from other groups suggests the profile may not identify full-threshold cases of bipolar disorders or a distinct syndrome at all. The importance of considering neuropsychological functioning in diagnosis is addressed.

Correspondence: *Troy W. Ertelt, Ph.D., Assessment and Therapy Associates of Grand Forks, 725 Hamline Street, Grand Forks, ND 58203. E-mail: tertelt@atagf.com*

P. GONZÁLEZ-PÉREZ, S. HERNÁNDEZ, E. VERCHE, R. MARTÍN, I. QUINTERO, J. BRAVO, C. HERNÁNDEZ-SANTANA, A. GARCÍA-QUINTÁS & E. GARCÍA-MARCO. Adaptation of the Neuropsychological Test of Learning and Visual Memory (DCS) in a Child Spanish Population.

Objective: The development of neuropsychological instruments that assess learning and figural memory have been scarce. In addition, there are even less studies when we are dealing with Spanish neuropsychological tests and batteries in child population. The Visual Learning and Memory Test for Neuropsychological Assessment (DCS) can help to solve this situation. The main objective of this paper is to adapt into a Spanish child population this test, in a new way of administration.

Participants and Methods: This test was administered to 119 children aged between 6 and 12, falling the final sample into 79 children (37 boys, 42 girls), according to a normal IQ, and not suffering neurological or psychiatric alterations, motor and visual perception deficit, or learning disabilities. We used two computerized parallel forms with a fixed time of presentation in the learning task. There was no time limit for recalling and recognition. Three new tasks were added: long-term recall, recognition task and visual discrimination. New errors measures were included: confabulation errors, incorrect reproductions and false positives.

Results: The results showed that the parallel versions of administration are suitable; there are no sex differences and a coherent intern consistency into two factors, one related to learning and free retrieval strategies and the other related to recognition memory. Moreover, there was a significant increase in the test performance according to age.

Conclusions: This work contributes quantitatively and qualitatively an important extension in the assessment of memory systems and strategies of recovery, enriching the clinical and experimental usefulness of the original instrument.

Correspondence: *Pedro González-Pérez, Psychobiology and methodology, university of La Laguna, Campus de Guajara, La Laguna 38205, Spain. E-mail: pedagon@ull.es*

R. GREEN, B. COLEMAN, A. RIZZO & S.D. MARION. Measuring Classroom-related Inattention in a Virtual Environment.

Objective: Traditionally, neuropsychological assessment has utilized continuous performance tasks (CPT) for the measurement of basic sustained attention and the identification and diagnosis of attention disorders. Although CPT's generally differentiate ADHD from controls in experimental settings, research has indicated room for improvement in diagnostic utility. The current study examines the most recent version of the Virtual Classroom (VC), a continuous performance task that approximates a real-life classroom setting within a virtual-environment. It was hypothesized that performance on the VC would be correlated with performance on the Conner's CPT.

Participants and Methods: 37 children were assessed for attention by both the Conner's CPT and the VC. Errors of commission and omission and clinical confidence of ADHD (via Conner's CPT) were compared across measures.

Results: Consistent with the hypothesis, results showed significant correlations between omission scores on the Conner's CPT and the VC CPT, $r = 0.697$, $p < .001$, in addition to correlations between clinical confidence scores on the Conner's CPT and the total correct scores on the VC CPT, $r = -0.544$, $p < .001$.

Conclusions: Results indicate convergent validity between the Conner's CPT and the VC. These findings add to existing literature validating VC approaches to the assessment of attention. Additionally, the fact that these correlations are not perfect indicates unique contributions from VE-based attention measures. VC's provide distracting stimuli that more closely resemble a real-life performance scenario. Future studies need to examine more closely actual classroom expressions of inattention to determine whether VC's in fact capture unique, classroom-related inattention.

Correspondence: *Benjamin Coleman, Fuller Theological Seminary, 955 Lehigh St., Altadena, CA 91001. E-mail: bencoleman@gmail.com*

D.D. HARGRAVE, J.W. KIRK, A.K. CONNERY & M.W. KIRKWOOD. CVLT-C Recognition Discriminability as an Embedded Validity Indicator After Pediatric Mild Traumatic Brain Injury.

Objective: In adult populations, many well validated symptom validity tests (SVTs) are available to evaluate examinee effort. Far less research has examined methodologies appropriate for use with children, though recent research supports the use of several stand-alone instruments. Very few studies have investigated the utility of "embedded" validity indicators in pediatric populations. The present study examined the value of California Verbal Learning Test-Children's Version (CVLT-C) variables in detecting suspect effort.

Participants and Methods: The sample consisted of 225 outpatients aged 8 to 16 years referred for clinical assessment after mild traumatic brain injury. The suspect effort group consisted of 39 patients (17%) who failed the Medical Symptom Validity Test (MSVT). The comparison group consisted of 186 patients who passed the MSVT. Groups did not differ in age, gender, grade, ethnic/racial status, maternal education, history of premorbid learning disability or ADHD, WJ-III single word reading grade level, litigation status, time since injury, or injury severity.

Results: Logistic regression demonstrated CVLT-C Recognition Discriminability to be significantly predictive of MSVT failure (OR = 2.88, $p < .001$). Receiver Operator Characteristic (ROC) curve analysis yielded an Area Under the Curve (AUC) of .756, indicating acceptable model fit. The optimal Recognition Discriminability cutoff was $z = -1.0$, which yielded sensitivity of 51% and specificity of 91%.

Conclusions: Results suggest that CVLT-C Recognition Discriminability is useful as an embedded validity indicator, at least in relatively high functioning pediatric outpatients.

Correspondence: *David D. Hargrave, M.A., Psychiatry and Behavioral Sciences, University of Kansas School of Medicine, 7829 E. Rockhill, Ste. 105, Wichita, KS 67206. E-mail: dhargrave@kumc.edu*

P.K. ISQUITH, G.A. GIOIA, C. VAUGHAN, M. SADY & E. GERST. Improving Concussion Assessment in Children with Symptom Reports and Test Performance.

Objective: Classification statistics based on outcome data informs users about the properties of a measure and its utility for making clinical decisions. We examined these qualities in a new assessment tool for evaluating concussion effects in children.

Participants and Methods: Symptom reports and neurocognitive performance scores from Pediatric ImPACT for 22 children 5-7 years and 50 children 8-12 years with recent concussions and matched non-injured children were cast separately into 2 x 2 classification tables. Classification statistics were calculated based on recommendations by Chelune (2010).

Results: The Response Time Composite (RT) resulted in the best classification accuracy (77%) for younger children given high specificity (.95) but limited sensitivity (.57) and likelihood ratios of 12.57 (positive) and .45 (negative). Thus, with a 50% base rate, Pediatric ImPACT improved the posttest odds of detecting a child with concussion effects from 1 to 12. For older children, symptom reports combined with RT resulted in modest sensitivity (.68) and strong specificity (.88) with 78% of children correctly identified. Likelihood Ratios were 5.67 and .36, increasing the odds of detecting a child with concussion effects from 1 at pretest to nearly 6 at posttest, while decreasing the odds of misidentifying an injured child as non-injured from 1 to .36.

Conclusions: Symptom reports and neurocognitive test performance, particularly response time, can substantially increase diagnostic accuracy for both detecting and ruling out post-concussion effects in referred children. While diagnosis is based on clinical interview, the child's history and injury characteristics, elevated symptom ratings and/or poor test performance raise concerns about the presence of concussion effects.

Correspondence: *Peter K. Isquith, Ph.D., Department of Psychiatry, Dartmouth Medical School, 221 US Route 5 S Unit 15, Norwich, VT 05055. E-mail: Peter@QPsych.com*

M.D. MCCURDY, A. KHATCHADOURIAN, A.E. PRITCHARD, T. ZABEL & L.A. JACOBSON. Classification of ID Using the WISC-IV: FSIQ or GAI?

Objective: When considering the diagnosis of Intellectual Disability (ID), use of the WISC-IV General Ability Index (GAI; Raiford et al., 2005) is believed to improve the measurement of intellectual ability by reducing the impact of working memory (WM) and processing speed (PS) deficits. Using a mixed clinical sample, we examined the diagnostic implications of using GAI versus FSIQ for determination of ID (≥ 2 areas of adaptive impairment on the Adaptive Behavior Assessment System-II [ABAS-II]).

Participants and Methods: Children referred for outpatient neuropsychology evaluation ($N=409$, $M\ age=10.0$, $SD=2.76$) were administered the WISC-IV and ABAS-II.

Results: WISC-IV GAI and FSIQ were very highly correlated ($r=.958$, $p<.001$). Fewer children, however, were identified as ID using GAI ($n=68$) compared to FSIQ ($n=81$). The 13 children classified as ID based upon FSIQ but not GAI (i.e., $FSIQ\leq 70$ and $GAI>70$) showed similar levels of adaptive impairment as those meeting ID criteria based upon both FSIQ and GAI ($p=.61$). When using low IQ scores ($SS\leq 70$) to predict children with low adaptive functioning (General Adaptive Composite [GAC] ≤ 70), FSIQ and GAI were comparable ($p\geq .10$ for all) in terms of sensitivity (GAI=.31, FSIQ=.36) and specificity (GAI=.90, FSIQ=.86). The same was true for the positive (GAI=.74, FSIQ=.70) and negative (GAI=.59, FSIQ=.60) predictive values.

Conclusions: Use of GAI rather than FSIQ in ID diagnostic decision making resulted in fewer ID cases, but the disqualified cases were equally impaired adaptively, and sensitivity, specificity, and predictive values are comparable for the two methods. Using GAI rather than FSIQ does not appear to be advantageous in diagnostic decision making for ID.

Correspondence: *Mark D. McCurdy, Bachelor of Arts, Psychology; Neuropsychology, Kennedy Krieger Institute, 120 North Collington Ave, 120 North Collington Ave, Baltimore, MD 21231. E-mail: markdavidmccurdy@gmail.com*

C. MCGILL, E. GERST, C. VAUGHAN, P. ISQUITH & G. GIOIA. Tracking Recovery From Concussion With a Monitoring Version of the Behavior Rating Inventory of Executive Function (BRIEF).

Objective: We examined longitudinal changes in parent and child reported executive functioning with a form of the BRIEF modified for children with mTBI to evaluate the utility of the measure for tracking recovery.

Participants and Methods: 22 children (50% male) aged 11 to 18 years ($M = 14.76$, $SD = 1.94$) with recent mTBI (mean post-injury days to: visit 1 = 8.53; visit 2 = 19.97; visit 3 = 39.20) and 25 parents of children (52% male), 5 to 18 years ($M = 13.88$, $SD = 2.23$) age with recent concussion (mean post-injury days to: visit 1 = 8.26; visit 2 = 19.81; visit 3 = 39.89) were evaluated serially using repeated measures MANOVA. Children and their parents completed retrospective baseline and post-injury forms of a modified BRIEF for symptom monitoring: A self-report form with 32 items composing Working Memory, Emotional Control, Task Completion, Planning/ Organization, and Inhibit scales or a Parent form with 31 items composing the same scales with Initiate substituted for Task Completion.

Results: Parent and child reports differed from retrospective baseline reports at the first post-injury visit and improved significantly at each of two subsequent visits. The working memory scale was particularly sensitive to changes during recovery while the emotional control scale returned to baseline functioning more quickly than other scales.

Conclusions: A monitoring form of the BRIEF designed for retrospective baseline and serial assessments exhibited promising evidence as a potential tool for monitoring executive dysfunction and tracking recovery from concussion. Continued refinement is ongoing.

Correspondence: *Catherine McGill, Psy.D., Children's National Medical Center, 111 Michigan Ave, NW, Washington, DC 20010. E-mail: catherine.mcgill@hotmail.com*

M.E. MCKNIGHT & V.P. CULOTTA. Stability of Repeat Neuropsychological Assessment Profiles in Children with Dyslexia.

Objective: Few studies have examined repeat neuropsychological evaluations in children with Dyslexia. This study sought to assess test/retest stability in school-aged students diagnosed with Dyslexia by pairing and comparing initial evaluations with subsequent reevaluations and controlling for comorbid conditions. It was hypothesized that there would be no significant discrepancies between the initial neuropsychological profile and paired re-evaluative neuropsychological profiles.

Participants and Methods: This study examined 14 school-aged children consecutively referred to an outpatient neuropsychological practice for assessment and subsequently diagnosed with Dyslexia and re-evaluated after an average interval of 3.7 years. Each child's initial scores were compared against his/her scores from reevaluation. Children were compared against themselves on measures of intellectual, academic, neuropsychological, and behavioral functions. Evaluative measures included the WISC IV, WJ III, GPP, RCF, VMI, WRAML-II, Word Fluency, and CBCLs.

Results: Paired two tailed t-tests revealed a statistically significant decrease in Full Scale IQ.

Conclusions: Assessment of test/retest reliability revealed a significant discrepancy in Full Scale IQ scores across the interval testing and relative stability in the measures of the WJ III, GPP, RCF, VMI, WRAML, Word Fluency Test, and CBCL. The significant decrease in Full Scale IQ may reflect the general impact of language based learning disorders on overall IQ and may indicate sensitivity of IQ tests to achievement. Findings will be discussed in relation to existing studies examining learning disabilities and the measurement of intelligence.

Correspondence: *Vincent P. Culotta, Ph.D., NeuroBehavioral Associates, 5565 Sterrett Pl, Suite 320, Columbia, MD 21044. E-mail: vculotta@nbatests.com*

M.D. SADY, C.G. VAUGHAN, P.K. ISQUITH & G.A. GIOIA. Factor Analysis of the Post Concussion Symptom Inventory (PCSI) for Children Ages 5-12.

Objective: The factor structure of symptom ratings on the Post-Concussion Symptom Inventory (PCSI), a component of Pediatric ImPACT, was explored.

Participants and Methods: Children aged 5-7 ($n=47$) and 8-12 years ($n=206$) completed the self-report PCSI within 30 days of concussion. Combined confirmatory/exploratory factor analysis was used for both age groups. The resulting factor structure was then submitted to confirmatory analysis on a sample of 103 uninjured 5-7 and 407 8-12 year-olds.

Results: For 8-12 year olds, 25 PCSI items were assigned to factors based on previous research. Two items with weak factor loadings and six items with poor item-total correlations were dropped, and one item was moved based on modification indices. Model fit for the remaining items was acceptable, and the final factor structure included four factors for 17 items. For 5-7 year olds, the initial model was also built by assigning the 13 PCSI items to factors. Factor loadings were strong, and no modifications were suggested. Model fit was poor according to some indices, though likely because of the small sample. The final model included three factors. Internal consistency was generally strong within factors and correlations between factors were moderate for both age groups. Confirmatory analysis on uninjured samples indicated slightly lower, yet comparable, factor loadings, internal consistency, and model fit.

Conclusions: Exploratory and confirmatory factor analyses of the PCSI supported a three factor model using 13 items for 5-7 year-olds group and four factors using 17 items for 8-12 year-olds. Common Physical, Cognitive, and Emotional factors resulted, with an additional Fatigue factor for older children. The PCSI structure is generally consistent with concussion symptom scales factors described in the literature. Moderate correlations between factors suggest distinct yet related groups of symptoms, with replication of the factor structure in a normative sample.

Correspondence: *Maegan D. Sady, Ph.D., Pediatric Neuropsychology, Children's National Medical Center, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850. E-mail: maegan.sady@gmail.com*

H.W. SESMA, K.L. WIJK, T. HERMODSON-OLSEN, D. RAMSTROM & A. SESMA. Parent and Teacher Ratings of Executive Function Are Differentially Related to Performance-based Measures of Attention and Working Memory.

Objective: Assessment of child executive dysfunction relies heavily on parent and teacher ratings, but these often do not correlate with child performance on clinical tests. The purpose of this study is to examine the relation between informant ratings of working memory and inhibition on the Behavior Rating Inventory of Executive Function (BRIEF) and performance-based measures of similar constructs using the test of variables of attention (TOVA) and the Working Memory Index from the Wechsler Intelligence Scale for Children-Fourth Edition (WISC-IV WMI).

Participants and Methods: Participants were consecutive outpatients evaluated in a university pediatric neuropsychology clinic who consented to have their deidentified clinical data used for research. The mixed clinical sample included 65 children ages 6-15 (44 boys). Children completed the WISC-IV and TOVA, and one parent and one teacher completed the BRIEF. Samples sizes for correlation analyses between measures ranged from $N=32-54$.

Results: Parent ratings of both working memory and inhibition were not related to omission or commission errors on the TOVA but were significantly negatively correlated with response time (RT) variability ($r_s = -.41^{**}$ and $-.44^{**}$, respectively), such that greater executive dysfunction was associated with more inconsistent responding. Teacher ratings on the BRIEF were not related to TOVA performance. Parent ratings of working memory were not significantly related to performance on the WISC-IV WMI, but the correlation between teacher ratings of working memory and the WISC-IV WMI was marginally significant ($r = -.29+$). Unexpectedly, parent ratings of inhibition were significantly related to child performance on the WISC-IV WMI ($r = -.31^*$).

Conclusions: Parent ratings of executive dysfunction were related to TOVA RT variability. Findings converge with previous reports that TOVA RT variability has greater reliability and validity than omission or commission errors. Teachers' ratings of working memory were more related to WISC-IV WMI than parents'.

Correspondence: *Heather W. Sesma, Ph.D., Pediatrics, University of Minnesota Medical School, Mayo Mail Code 486, 420 Delaware St. S.E., Minneapolis, MN 55455. E-mail: hwsesma@umn.edu*

D. WAHLSTROM, D.L. COALSON & S. ENGI RAIKORD. Validity of New WPPSI-IV Working Memory, Processing Speed, and Inhibitory Control Subtests Using Factor Analytic Techniques.

Objective: The Wechsler Preschool and Primary Scale of Intelligence – Fourth Edition (WPPSI-IV) represents a significant revision of its predecessor, the WPPSI-III (Wechsler, 2002). Clinicians are likely to view the revised test structure as the most significant change, based on its obvious impact on neurological assessment, interpretation, and clinical diagnosis. The revised test structure includes new measures of working memory and inhibitory control, as well as significant revisions to measures of processing speed. These changes are intended to broaden the scale's construct coverage and align it to modern cognitive, neuroscientific, and intelligence theories. Example items from each new subtest will be displayed, and preliminary factor-analytic data will be provided as validity evidence for the new measures, as well as the revised test structure.

Participants and Methods: Analyses are based on preliminary data from the standardization sample, which was stratified to meet current census targets on age, parent education, sex, and race/ethnicity. Results from confirmatory factor analysis of multiple models will be presented separately for children aged 2:6-3:11 and 4:0-7:6, due to differences in the subtest composition of the scale within each age band.

Results: Similar to more recent revisions of other Wechsler intelligence scales (Wechsler, 2003, 2008), results indicate support for the WPPSI-IV's expanded factor structure, including factors of working memory and processing speed.

Conclusions: Results will be discussed within a neuropsychological framework: Parallels will be drawn between these data and cognitive neuroscience data supporting the importance of these constructs in young children.

Correspondence: *Dustin Wahlstrom, PhD, Pearson Clinical Assessment, 5601 Green Valley Drive, 75 East River Rd., Bloomington, MN 55437. E-mail: dustin.wahlstrom@pearson.com*

E. ZIMMERMAN, T.G. BURNS, N.A. DEFILIPPIS & H. MIRSAL-IMI. Proposed Score Adjustment Formula for California Verbal Learning Test-Children Version Executive Functioning Process Scores.

Objective: Research has demonstrated a child's ability to learn verbally presented information on the California Verbal Learning Test-Children's Version (CVLT-C) is sensitive to effects of a traumatic brain injury (TBI) (Donders & Giroux, 2004; Mottram & Donders, 2005); however, the executive functioning (EF) process scores are not well validated (Vanderploeg, Schinka, & Retzlaff, 1994). A proposed adjustment formula has been suggested to make the CVLT-C a more independent measure of EF. This study examines the adjustment formula with the Delis Kaplan Executive Functioning System-Verbal Fluency subtest (DKEFS-VF).

Participants and Methods: 52 participants (63.5% male), ages 8-16 years-old who were referred for a neuropsychological evaluation were included. Participants had a diagnosis of a TBI and were administered the CVLT-C and DKEFS-VF subtest for convergent validity. To examine the degree of correlation before and after the application of the adjustment formula, bivariate correlations were conducted.

Results: Using SPSS statistical package-18.0, significant correlations at $p < .01$ were observed between the CVLT-C's adjusted total number of perseverations with both phonemic ($r = -.389$) and semantic fluency ($r = -.344$), in comparison to the absence of the adjustment formula ($r = .161$ and $r = .272$). Similarly, significance was found at $p < .01$ when applying the formula to the CVLT-C's total number of intrusions with phonemic ($r = -.358$) and semantic fluency ($r = -.415$), than without ($r = -.129$, $p = .362$ and $r = -.197$, $p = .161$).

Conclusions: When applied to the CVLT-C's specified EF constructs, the application of the adjustment formula appears to yield a more independent and meaningful measure of EF constructs specific to language. Correspondence: *Ellie Zimmerman, Argosy University-Atlanta, 4561 Olde Perimeter Way, #2101, Atlanta, GA 30346. E-mail: Ellie.l.zimmerman@gmail.com*

Drug/Toxin-Related Disorders (Including Alcoholism)

R. GONZALEZ, R.M. SCHUSTER, N. CRANE, J. VASSILEVA & E.M. MARTIN. Decision-Making Performance Influences the Relationship between Amount of Cannabis Use and its Negative Consequences.

Objective: Deficits in decision-making (DM) are reported among cannabis users, yet little is known on how they affect the negative consequences that arise from cannabis use. We examine how DM, as assessed by the Iowa Gambling Task (IGT), may influence relationships between amount of cannabis use and its negative consequences, as assessed by the Marijuana Problems Scale (MPS).

Participants and Methods: 54 young adults completed the IGT and the MPS. They identified cannabis as their drug of choice, used cannabis in the last 30 days, and were free of critical mental health,

medical, and other substance use confounds. We conducted a linear regression with IGT net score and amount of cannabis use as independent variables – MPS score was the dependent variable. Three regressions were conducted, with each having a different parameter of cannabis use (i.e., cannabis use in the last 30 days, last 12 months, and lifetime).

Results: Significant IGT x cannabis use interactions were significant for the last 30 days and 12 months (p -values = .04), and suggested a trend toward significance with lifetime use (p = .06). Follow-up tests of the interactions revealed that across all models, greater amounts of cannabis use were associated with higher MPS scores among participants with lower IGT scores (p -values = .003 to .02; R^2 = .17 to .30), but not among those with better performance (p -values > .63). This was not accounted for by differences in amounts of cannabis use or MPS scores between better and poorer performers on the IGT (all p -values > .26).

Conclusions: DM was found to influence the relationship between amount of cannabis use and the negative consequences experienced by users. Amount of cannabis did not affect the number of consequences reported by those with better DM. In contrast, those with poorer DM experienced more negative consequences with more cannabis use. It may be that those with better DM are better able to inhibit their cannabis use in situations where it may lead to negative consequences. Supported by K23DA023560 to RG.

Correspondence: *Raul Gonzalez, Ph.D., Psychiatry, University of Illinois, Chicago, 1601 W. Taylor St., MC 912, Room 40S, Chicago, IL 60612. E-mail: rgonzalez@psych.uic.edu*

R. GONZALEZ, R.M. SCHUSTER, N. CRANE, E.M. MARTIN & J. VASSILEVA. Decision-Making Influences the Relationship between Cannabis Harm Perception and Negative Consequences Reported from its Use: Preliminary Findings.

Objective: Addiction is often defined as compulsive use of a substance despite experiencing repeated negative consequences from its use, and has been associated with deficits in decision-making (DM). General perceptions of a drug's harm may influence its use and the magnitude of personal negative consequences reported. Here, we examine this hypothesized relationship and how it may be influenced by DM.

Participants and Methods: Participants were 54 young adults who identified cannabis as their drug of choice, used cannabis in the last 30 days, and were free of important medical, mental health, and other substance use confounds. They completed the Iowa Gambling Task (IGT; a measure of decision-making) and the Marijuana Problems Scale (MPS; a self-report questionnaire on problems experienced from cannabis use in the last 90 days). Perceptions of harm from cannabis use were assessed with the Cannabis Harm Perception (CHP) questionnaire: a self-report measure being developed to assess negative perceptions of cannabis use.

Results: Linear regression with IGT and CHP as IVs and scores on the MPS as the DV revealed a significant interaction (p < .01). Greater perceived harm on the CHP was associated with more cannabis problems on the MPS, but only among those with poorer DM (R^2 = .57, p < .0001). No significant relationships emerged between CHP and MPS among those with better DM (R^2 = .01, p = .59).

Conclusions: Our preliminary findings are the first to examine and report that DM influences the relationship between general perceptions of harm from cannabis use and the degree to which an individual endorses negative consequences. Those with better DM may have more accurate self-assessments of the negative events they experience from cannabis use and may be less influenced by their general perceptions of cannabis' harmful effects. For those with poorer DM, the negative events they report from cannabis appear to be strongly influenced by their general perceptions of cannabis' harmful effects. Supported by K23DA023560 to RG.

Correspondence: *Raul Gonzalez, Ph.D., Psychiatry, University of Illinois, Chicago, 1601 W. Taylor St., MC 912, Room 40S, Chicago, IL 60612. E-mail: rgonzalez@psych.uic.edu*

M. KRENGEL, P. JANULEWICZ, J. CHAMBERLAIN, J. YUAN, M. VALMAS & K. SULLIVAN. Gulf war illness: A meta-analytic review of cognitive findings.

Objective: Gulf war veterans continue to suffer from chronic multisystem illness, including cognitive concerns. Several research studies on cognitive correlates have been conducted since the end of the Gulf War and researchers have often but not consistently found diminishment in areas of short-term memory, attention, motor speed and mood, relative to non-deployed era veterans and norms. When examining potential causative factors such as neurotoxicant exposures, highly exposed groups have been found to be more impaired relative to minimally exposed. It was the purpose of the current study to critically review the literature on the neuropsychological deficits in GW III veterans and conduct a meta-analysis to more adequately describe the cognitive correlates of GW-deployment.

Participants and Methods: Twenty-seven studies met inclusion criteria. Each study was reviewed methodologically by 2 trained raters using a systematized critique form adapted for this study. Dependent variables were classified based on cognitive domain and data were analyzed in relationship to relevant predictor variables. Analyses from each paper were entered into a large database and the average effect sizes computed by domain listed above.

Results: Overall analyses were compared for GW ill and non-ill veterans and showed more discriminating results than GW deployed versus era veterans. Exposure variables also showed different effect sizes in the cognitive domains of interest.

Conclusions: By systematically reviewing the literature on GW illness and cognitive correlates and determining the average effect size per cognitive domain, it is possible to determine the extent to which cognitive impairment occurs in this population. Similar meta-analytic reviews would help to clarify equivocal results in health symptoms and neuroimaging findings in this population.

Correspondence: *Maxine Kregel, Ph.D., Neurology, Boston University School of Public Health, 725 Albany St, Suite 7B, Boston, MA 02118. E-mail: mhk@bu.edu*

S. LEBLANC-MENZIES, J.C. KEILP, A.K. BURKE, M.A. OQUENDO & J.J. MANN. Smoking in Depression: Associations with Cognition and Cognitive Risk Factors for Suicide Attempt.

Objective: Cigarette smoking is associated with a variety of deficits in cognitive performance, encompassing psychomotor, memory, and executive functions. In major depression, smoking is a risk factor for suicidal behavior. Smoking in depressed patients may be related to more severe cognitive impairment, and possibly to cognitive deficits associated with suicide attempt risk.

Participants and Methods: 95 participants with current major depression and a reported history of smoking, 176 depressed non-smokers, and 63 non-smoking non-patient volunteers were administered a battery of neurocognitive tests assessing motor speed, psychomotor performance, attention, memory, abstraction, working memory, language fluency, and impulse control.

Results: Smokers performed more poorly than all other groups on speeded measures, including Choice Reaction Time (p =.004), WAIS Digit Symbol (p =.001), A Not B Timed Reasoning (p =.01), and Category Fluency (p =.002), but also on WAIS Vocabulary (p =.01), an estimate of intelligence. Controlling for Vocabulary, differences in A Not B and Category Fluency became marginally non-significant. Smoking was not related to performance on measures that consistently discriminate past suicide attempters, including a computerized Stroop task and Buschke Selective Reminding Test (Keilp et al., 2001; Keilp et al., in press).

Conclusions: Depressed smokers were slowed in terms of reaction time, processing speed, and semantic fluency relative to depressed non-smokers. It is unclear if this is a direct result of nicotine exposure, or a compensation for more severe slowing in the context of their depression. Smoking was not related to other cognitive impairments that discriminate suicide attempters, suggesting that its contributions to risk are independent of neurocognition.

Correspondence: *Simone LeBlanc-Menzies, M.S., Molecular Imaging and Neuropathology, New York State Psychiatric Institute, 1051 Riverside Drive, New York, NY 10032. E-mail: spleblanc@gmail.com*

D.F. MARSHALL, S.J. WALKER, A.C. VEDERMAN, K.A. RYAN, A.L. WELDON, L. GROVE, E.H. SAUNDERS, M. KAMALI, K. ADAMS, M.G. MCINNIS & S.A. LANGENECKER. The Impact of Substance Use Disorder on Cognitive Functioning in Euthymic Bipolar Patients.

Objective: A strong association has been reported between Substance Use Disorders (SUD) and Bipolar Disorder (BD), although few studies have investigated the cognitive functioning in these often comorbid conditions. This study aimed to elucidate the cognitive performance of euthymic BD with or without a lifetime history of SUD using cognitive factor scores.

Participants and Methods: One hundred forty-eight individuals with BD in the euthymic state, 74 without SUD and 74 with SUD, and 98 Healthy Controls (HC) were matched on age and education. All participants were selected from the Prechter Longitudinal Study of Bipolar Disorder and completed diagnostic interviews, neuropsychological testing, and symptom severity scales.

Results: The BD with SUD group experienced more hypomanic episodes ($p=0.05$) compared to those without SUD. There was a significant group effect for visual memory ($p<0.001$), psychomotor speed and dexterity ($p<0.001$), inhibitory control ($p=0.002$), processing speed with interference resolution ($p<0.001$), and verbal fluency and processing speed ($p=0.045$), with both BD groups exhibiting poorer performance compared to the HC group. BD with SUD exhibited numerically poorer performance than BD without SUD in all but two (emotion processing and inhibitory control) cognitive areas. Logistical regression indicated that psychomotor speed and dexterity is a significant predictor of whether the person was (or was not) abusing substances.

Conclusions: Euthymic bipolar patients showed dysfunction for visual memory, executive functioning, and fine motor skills, with comorbid SUD displaying poorer cognitive performance than those without SUD. Correspondence: *David F. Marshall, Ph.D., University of Michigan, 2101 Commonwealth Blvd., Suite C, Ann Arbor, MI 48105. E-mail: davimars@med.umich.edu*

J. PAXTON, J. VASSILEVA, R. GONZALEZ, P.M. MAKI & E.M. MARTIN. Neurocognitive performance in drug dependent males and females with PTSD symptoms.

Objective: Sex differences in neurobiological mechanisms of addiction are well documented. Still, findings on neurocognitive function among male and female substance dependent individuals (SDIs) have been inconsistent, suggesting that additional neurocognitive risk factors should be identified. Given that PTSD has been shown to negatively affect cognition and is common in SDIs, we compared neurocognition among male and female SDIs with varying severity of PTSD symptoms.

Participants and Methods: Participants with a history of cocaine and/or opioid dependence were administered the Immediate Memory Test (IMT) assessing sustained attention and inhibitory control. Participants were classified as PTSD+ or PTSD- using cutoff scores from the PTSD Checklist-Civilian version (PCL-C). Groups consisted of 52 PTSD+ males, 245 PTSD- males, 28 PTSD+ females, and 98 PTSD- females and did not differ significantly in HIV status. Self reported depression and attention difficulties were included as covariates.

Results: We found a significant sex by PTSD interaction, $F(1, 417) = 7.66, p = .006$ for discrimination scores. PTSD+ females demonstrated a significant deficit in discriminability compared with PTSD- females ($p < .05$). A significant sex by PTSD interaction for correct detections, $F(1, 417) = 5.40, p < .05$, indicated that sustained attention was significantly impaired among the PTSD+ females compared with PTSD+ males ($p < .05$). In females, a significant negative relationship between correct detections and PCL-C avoidance/numbing symptoms was uncovered.

Conclusions: PTSD symptoms were associated with deficits in sustained attention in female, but not male SDIs, representing progress in efforts to delineate sex-specific risk factors for neurocognitive deficits among SDIs.

Supported by R01DA21421 to Jasmin Vassileva

Supported by HHS R01 DA12828 to Eileen M. Martin

Correspondence: *Jessica Paxton, Ph.D., University of Illinois Chicago, 1601 W. Taylor Street, Chicago, IL 60612. E-mail: jpaxton@psych.uic.edu*

J. PAXTON, G. VASILEV, K. BOZGUNOV, I. RAYNOV, R. NASLEDNIKOVA, E. MARTIN, R. GONZALEZ & J. VASSILEVA. Amphetamine dependence is associated with greater impairment in neurocognitive aspects of impulsivity than heroin dependence.

Objective: Given the different pharmacological properties of amphetamines and opiates, much interest has arisen in comparing neurocognition in amphetamine dependent individuals (ADIs) and heroin dependent individuals (HDIs). Studies comparing ADIs and HDIs on tests of impulsivity are often complicated by the prevalence of polysubstance dependence. Thus, the current study compared performance on tests of motor and cognitive impulsivity in a sample of "pure" ADIs and HDIs in a unique population of "pure" users in Bulgaria.

Participants and Methods: We compared the performance of 63 control participants, 42 ADIs, and 63 HDIs on a test of motor impulsivity, the Immediate Memory Test (IMT), and a test of cognitive impulsivity, the Cambridge Gambling Test (CGT). Groups were well-matched and the effects of age, cannabis use, and alcohol were included as covariates.

Results: The groups differed significantly in response times on IMT target trials, $F(2, 158) = 5.23, p = .006$, with ADIs performing significantly slower than controls ($p = .04$) and HDIs ($p = .02$). Groups also showed a marginally significant difference in advantageous decision making on the CGT, $F(2, 162) = 3.13, p = .05$. Specifically, ADIs showed impairment making beneficial decisions (i.e., betting more when odds were better) than HDIs ($p = .02$) and controls ($p = .07$).

Conclusions: Thus, "pure" ADIs showed less efficient inhibitory control and difficulty making advantageous choices compared with "pure" HDIs. Exploration of the relationship between neurocognitive impulsivity, trait impulsivity, psychiatric characteristics, and dependence severity will provide further insight about cognitive and motor impulsivity deficits observed in "pure" ADIs.

Supported by R01DA21421 (JV)

Correspondence: *Jessica Paxton, Ph.D., University of Illinois Chicago, 1601 W. Taylor Street, Chicago, IL 60612. E-mail: jpaxton@psych.uic.edu*

B. REED, D. WOODS, J. CRANE & M.N. BATES. An Association of Chronic Low-Level Hydrogen Sulfide Exposure With Psychomotor Speed.

Objective: Inhaling high concentrations of hydrogen sulfide (H_2S) gas is rapidly fatal. Chronic low-level exposures, typically industrial, have been inconclusively linked to negative cognitive outcomes. We tested cognitive outcomes using data from a "natural experiment" in which an urban population has been chronically exposed to low-level H_2S from geothermal sources.

Participants and Methods: Data are from 888 participants in CHEERS (Chronic H_2S Exposure Effects—the Rotorua Study) aged 18 to 65. It is a representative sample, stratified for H_2S exposure (which varies according to local geography). This exposure was interpolated from data from a network of passive H_2S samplers set out across Rotorua in the summer and winter of 2010. The yearlong estimated average H_2S exposure for each participant's residence is the exposure measure. Three tests that require rapid cognitive processing and fine motor responses were evaluated: Simple Reaction Time (SRT; mean RT), Grooved Pegboard (GP; total time to completion), and Digit Symbol (DS; total correct).

Results: Each outcome was modeled in a separate regression with the covariates age, sex, education, income, ethnicity, handedness, and Na-

tional Adult Reading Test score. Age, but no other covariate, was weakly related to H₂S ($R^2 = .009$, $df = 855$, $p = .005$). For SRT the R^2 for the whole model was .13 and the effect of H₂S was significant, $p = .01$. For GP the R^2 for the model was .30 and the effect of H₂S was significant, $p = .019$. For DS the R^2 for the model was .35 and the effect of H₂S was significant, $p = .049$. In each case, higher H₂S was associated with better cognitive performance. In each case the effect size was very small.

Conclusions: We find no evidence of harmful effects of chronic low level H₂S, but rather, find associations suggesting small beneficial effects. Additional modeling is needed. It is pertinent to note that recent evidence indicates endogenous H₂S is a cell-signaling molecule with beneficial effects in inflammatory and cardiovascular conditions.

Correspondence: *Bruce Reed, PhD, Neurology, University of California-Davis, UCDAAC (127a), 150 Muir Road, Martinez, CA 94553. E-mail: brrreed@ucdavis.edu*

J. VASSILEVA, J. PAXTON, K. BOZGUNOV, I. RAYNOV, R. NASLEDNIKOVA, L. SEGALA, F. MOELLER, E. MARTIN, R. GONZALEZ & G. VASILEV. Neurocognitive Impulsivity in Abstinent Heroin and Amphetamine Users.

Objective: Heroin and amphetamine users are characterized by prominent neurocognitive deficits in impulsivity, some of which are reversible with abstinence. The different pharmacological profiles of opiates and stimulants suggest that some of these deficits could be substance-specific; however, this is hard to determine due to the high rates of polysubstance dependence among users. To address this difficulty, we conducted the current study in Bulgaria, where polysubstance dependence is not as common and where we have access to a pool of fairly “pure” and abstinent users of heroin and amphetamines.

Participants and Methods: We tested 98 users of heroin ($n=63$) or amphetamines ($n=35$) with no current abuse or dependence on any other substance (except nicotine and caffeine). All participants were currently abstinent and most were characterized by protracted abstinence (mean length of abstinence=403 days). We administered 7 tasks measuring different dimensions of impulsivity: 1) Iowa Gambling Task (IGT); 2) Cambridge Gambling Task (CGT); 3) Delayed Reward Discounting Task (DRDT); 4) Balloon Analogue Risk Task (BART); 5) Immediate Memory Task (IMT); 6) Stop Signal Task (SST); 7) Go/No-go task (GNG).

Results: Amphetamine users were characterized by more pronounced neurocognitive impulsivity than heroin users, evidenced by greater discounting of delayed rewards on the DRDT ($p=.03$) and by greater risk-taking propensity on the BART ($p=.03$). They also showed longer latencies than heroin users to catch ($p=.008$) and target stimuli ($p=.007$) on the IMT.

Conclusions: Overall, amphetamine users evidenced more impulsive responding than heroin users on two reward-based neurocognitive tasks

of impulsivity (DRDT and BART). They were also characterized by more inefficient information-processing on a motor impulsivity task (IMT) requiring rapid responding. Results suggest that some neurocognitive impairments in impulsivity in amphetamine users are long-lasting and are manifested even after protracted abstinence.

Supported by R01DA21421 (JV)

Correspondence: *Jasmin Vassileva, Ph.D., Psychiatry, Univ Illinois, 1601 W. Taylor St. (MC 912), Room 421, Chicago, IL 60612. E-mail: jvassileva@psych.uic.edu*

E. WEBER, K.A. BLACKSTONE, J.E. IUDICELLO, E.E. MORGAN, D.J. MOORE, I. GRANT & S.P. WOODS. Neurocognitive Deficits are Associated with Risk of Unemployment Among Methamphetamine Dependent Adults.

Objective: Unemployment rates are high among chronic methamphetamine (MA) users and carry a significant economic burden, yet little is known about the neurocognitive and psychiatric predictors of employment in this vulnerable population.

Participants and Methods: The present study examined this issue in 63 participants who met DSM-IV criteria for MA dependence within the last 18 months relative to 47 comparison subjects without histories of MA use disorders. Participants with HIV infection, severe neuropsychological or psychiatric conditions that might affect cognition (e.g., seizure disorder, schizophrenia), or a positive breathalyzer or urine toxicology screen on the day of testing were excluded. Enrolled participants completed a comprehensive neurocognitive, psychiatric and neuromedical evaluation.

Results: Consistent with previous research, a logistic regression revealed MA dependence as a significant predictor of full-time employment status ($p=0.025$; odds ratio=2.84), even when including demographic and neuropsychiatric factors on which the groups differed (i.e., education, ethnicity, and other substance dependence diagnoses) as covariates. Within the MA-dependent sample, a follow-up regression indicated that employment status was independently predicted by global neurocognitive functioning ($p<0.05$) along with history of intravenous MA use ($p<0.01$) in a model that also included hepatitis C infection and neuropsychiatric factors (e.g., MDD, ASPD). At the domain level, the neurocognitive effect was driven by tests of motor coordination and working memory ($ps<0.05$).

Conclusions: These findings indicate that neurocognitive deficits play a significant role in the employment status of MA-dependent individuals, and highlight the need for vocational rehabilitation and supported employment programs that assess and address cognitive skills in this population. Correspondence: *Erica Weber, HIV Neurobehavioral Research Center, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: eweber@ucsd.edu*

THURSDAY AFTERNOON, FEBRUARY 16, 2012

Invited Symposium: Applied Memory and Hippocampal Functioning: Effects of Age and Disease

Chair: Ramona Hopkins

1:30–3:00 p.m.

R.O. HOPKINS, B. KIRWAN, C.E. STARK & A.M. BRICKMAN. Applied Memory and Hippocampal Functioning: Effects of Age and Disease.

Symposium Description: Memory is extremely complex in the kind of information that is represented in the brain, the processes associated with it, and its distribution across a variety of neural systems. Whereas most investigators agree that the hippocampus is involved in memory,

debate remains regarding the specific information the hippocampus processes. Aging, neurological disorders, and systemic illness can result in atrophy or damage to the medial temporal lobe memory system and are associated with memory impairments. This symposium will discuss the effects of age and disease on memory. The symposium will briefly review the hippocampal memory system and memory processes, such as pattern separation, and subsequently discuss the specific effects of aging and disease on memory. Participants will: (1) develop an understanding of the role pattern separation plays in memory impairments from patients with selective hippocampal damage; (2) understand age-related changes in memory and that age-related pattern separation ability provides a framework for evaluating memory using high-resolution imaging; (3) understand distinct hippocampal subregions in memory changes associated with normal aging and AD; and (4) develop an understanding that systemic medical illnesses can have profound and long-term deleterious effects on memory functioning.

Correspondence: *Ramona O. Hopkins, PhD, Psychology, Brigham Young University, 10S2 SWKT, Provo, UT 84602. E-mail: mona_hopkins@byu.edu*

B. KIRWAN. Pattern Separation Processes in the Hippocampus: Evidence from Amnesia.

The structures of the medial temporal lobe, particularly the hippocampus, are critical for memory for everyday facts and events (declarative memory). One of the functions of the hippocampus is to make overlapping or similar information as dissimilar as possible through a process known as pattern separation. Pattern separation is necessary in order to avoid retrieval errors any time one needs to remember two overlapping events—as in the case of parking one's car in the same lot day after day. Behaviorally, memory errors due to interference increase in the case of hippocampal damage or degeneration, possibly due to reduced pattern separation functioning. I will present an overview of the medial temporal lobe memory system and data from patients with selective hippocampal damage that demonstrate a disproportionate impairment in pattern separation processes relative to age- and education-matched controls. Standard recognition memory in these same patients is not impaired relative to controls.

Correspondence: *Brock Kirwan, Psychology Department, Brigham Young University, Provo, UT Utah. E-mail: kirwan@byu.edu*

C.E. STARK. Where did I put my keys? Tales from the hippocampus for anyone over 30.

Several computational models and studies in the rodent have suggested that the hippocampus (and the dentate gyrus in particular) play a key role in memory by a process called pattern separation. By transforming similar representations of similar events into discrete representations (orthogonalization), memories can be formed rapidly without suffering high levels of interference. This process is thought to be a critical component for memory functions often ascribed to the human hippocampus (e.g., episodic memory, recollection, etc.). In the last decade, an animal model of normal cognitive aging has emerged that emphasizes changes within the hippocampal circuitry that are critical for pattern separation. Recent advances in scanning techniques and behavioral paradigms have allowed us to observe these changes in humans. Here, I will present behavioral, high-resolution fMRI, and microstructural DTI data showing that pattern separation ability declines with age and is tied to functional changes in the dentate gyrus / CA3 region of the hippocampus and to the integrity of the perforant path (the input to the dentate gyrus.CA3). Together, these findings provide a framework for evaluating age-related memory changes and how they may differ from those changes associated with early Alzheimer's disease.

Correspondence: *Craig E. Stark, Department of Neurobiology and Behavior, Irvine, CA 92697-3800. E-mail: cestark@uci.edu*

A.M. BRICKMAN. Considering the contributions of hippocampal and cerebrovascular dysfunction in Alzheimer's disease.

Among the most significant advances in Alzheimer's disease (AD) research over the past twenty years is the integration of biologically-relevant data with well-defined clinical information. High resolution neuroimaging techniques are at the forefront, allowing for the appreciation of structural and functional changes in the aging brain that might provide insights into the pathogenic mechanisms of the disease, operationally-defined objective biological markers of disease state, and clues about strategies for disease prevention. In recent years, data from neuroimaging and molecular studies have been used to codify a hypothetical model of disease pathogenesis. This model emphasizes the initiating role of beta amyloid deposition followed by tau accumulation and, ultimately, gross hippocampal volumetric loss that lead to the neuropsychological syndrome that defines the disorder. However, high resolution functional neuroimaging techniques suggest that AD does not affect the entire hippocampal formation, but rather targets molecularly and functionally distinct subregions. Current AD models de-emphasize the role of cerebrovascular disease in the clinical disease expression,

despite consistent evidence. The current presentation will discuss recent work implicating distinct hippocampal subregions in memory changes associated with normal aging and AD, the contribution of cerebrovascular changes to the AD phenotype, and the potential mechanistic interaction between the two.

Correspondence: *Adam M. Brickman, Department of Neurology, College of Physicians and Surgeons, Columbia University, New York, NY 10032. E-mail: amb2139@columbia.edu*

R.O. HOPKINS. Life after Critical Illness: Where did my memory go?

In the United States, ~55,000 patients are hospitalized in the intensive care unit (ICU) each day and two-thirds of ICU days are accounted for by people over 65 years old. Progress in critical care has led to decreased mortality rates among individuals admitted to intensive care units. For many survivors of critical illness, intensive care unit hospitalization can lead to a life of significant functional limitations, especially with regards to cognitive functioning. Whereas neurologic dysfunction is widely understudied in critical care and medical populations, current data suggest a high prevalence of neurologic disturbances and cognitive impairments in patients who survive critical illness, including severe and persistent memory impairments. Recent neuroimaging data find neuropathological abnormalities including lesions, significant generalized atrophy and hippocampal atrophy. Mechanisms of brain injury among ICU survivors include hypoxemia, hyperglycemia and hypotension. Here I will present behavioral and brain imaging data showing that critical illness and / or its treatment result in medial temporal lobe damage and significant memory impairments that persists years after the illness. Further, impaired memory contributes poor functional outcomes including low rate of return to work and decreased quality-of-life. Mechanisms of injury will be reviewed and implications for rehabilitation and neuropsychology will be discussed.

Correspondence: *Ramona O. Hopkins, Psychology Dept, Brigham Young University 10S2 SWKT, Provo, UT 84602. E-mail: mona_hopkins@byu.edu*

Symposium 4: Transdisciplinary Collaboration Between Neuropsychology and Speech-Language Pathology

Chair: Alexander Quiros

1:30–3:00 p.m.

A.E. QUIROS, N. CASTILLEJA, W. SCHAMBER, A. SCHELLER & A. KIMBELL. Transdisciplinary Collaboration Between Neuropsychology and Speech-Language Pathology.

Symposium Description: Although it is easy to find research supporting the use of transdisciplinary teams in the health care practice (Reilly, 2001; Thylefors, Persson, & Hellstrom, 2005), little has been written specifically on the collaboration between Neuropsychologists and Speech-language Pathologists (SLPs) in such teams. The importance of such collaboration becomes evident when one considers that deficits in expressive or receptive language can lead to misdiagnoses (Weinberg and Emslie, 1991, Riccio et al., 1993; Geffner, 2010, Geffner, 2011). As members of a transdisciplinary team, SLPs offer insight into how language and auditory processing overlap with constructs often assessed by neuropsychologists (i.e. memory, IQ, Autism spectrum disorders, behavioral problems, etc). To accomplish this, SLPs use a variety of assessment tools that evaluate the interaction of cognitive and language skills that is evident when testing skills such as understanding of concepts, inferences, sequencing, categories, and analogies. All of these assessment tools can play a vital role in medical and school settings where transdisciplinary teams evaluate, diagnose, and treat individuals recovering from stroke, TBI, or other brain injuries as well as children who

struggle with specific language disorders, Autism-spectrum disorders, ADHD, and learning disorders. Attendees of this symposium will gain knowledge about the role and expertise of the SLP, as well as learn how they themselves can appropriately use the same speech and language assessment tools in their own research and assessment. Furthermore, emphasis will be placed on the collaboration between neuropsychologists and SLPs in both the medical and school setting.

Correspondence: *Alexander E. Quiros, PhD, Pearson, 9406 Sundance Dr, Pearland, TX 77584. E-mail: Alexander.Quiros@pearson.com*

N. CASTILLEJA. The Role of Speech Language Pathologists in Trans-disciplinary teams.

Most in psychology have only a vague notion of the role and work of a Speech Language Pathologist (SLPs). SLPs are professionals who focus on evaluation and treatment of communication across the lifespan, from infancy to geriatrics. The overall objective of services is to optimize an individual's ability to communicate in social, educational, and work settings. The area of "communication" encompasses skills in language (oral and written comprehension and expression), speech (articulation, fluency, and voice), interpersonal communication skills, and areas of cognition that affect communication such as auditory attention and memory, sequencing, and problem-solving skills. SLPs work in private practice and in medical and educational settings, and provide clinical services that include screening, assessment, consultation, diagnosis, intervention, progress monitoring, and referral to other disciplines (such as psychologists, for additional testing in the areas of cognition, attention, and memory). Neuropsychologists attending this presentation will have a better understanding of the areas of expertise covered by an SLP and will leave with a better understanding of how an SLP can enhance transdisciplinary research, assessments and treatments.

Correspondence: *Nancy Castilleja, 19500 Bulverde Road, San Antonio, TX 78259. E-mail: Nancy.Castilleja@Pearson.com*

W. SCHAMBER. Tools Used by Speech-Language Pathologists to Assess Audition.

Speech-language Pathologists (SLPs) are also key members of transdisciplinary research, assessment, and treatment teams, because of their expertise in the area of auditory processing. An accurate assessment of auditory processing allows clinicians to understand how auditory difficulties may impact the development of language, social and academic skills, as well as the expression of daily living skills. The information is also essential in the differentiation of auditory processing disorders from auditory comprehension delays or auditory attention difficulties in children, adolescents, and adults. This is especially important when attempting to differentiate between ADHD and an auditory processing disorder (Geffner, 2010; Geffner, 2011). Since there may not always be time to refer a client for a full assessment of auditory skills, two assessments used by SLPs may also provide neuropsychology with an adequate screening of skills in this important area—the SCAN-3 and the Auditory Skills Assessment (ASA). Those who attend this presentation will learn more about the role of auditory processing in differential diagnosing and the various assessment tools available for assessing auditory processing in children, adolescents, and adults.

Correspondence: *Walter Chamber, 5601 Green Valley Drive, Bloomington, MN 55437. E-mail: wrschamber@gmail.com*

A. KIMBELL & A. SCHELLER. Collaborating with Speech-Language Pathologists in Medical and School Settings.

In both medical and some school settings, where interdisciplinary teamwork is common practice, SLPs are frequently a part of the evaluation and treatment processes. In both of those settings, SLPs evaluate, diagnose, and treat speech, language, cognitive-communication, and swallowing disorders. Across both settings, there is an opportunity for neuropsychologists and SLPs to collaborate on speech/language focused recommendations, targeted treatment for their patients/students, verifying evaluation findings, and tracking progress.

For example, in hospitals, rehabilitation facilities, and residential treatment facilities, SLPs provide cognitive rehabilitation for patients who have suffered brain injuries or strokes, and who, as a result, have cognitive and communication problems. As our population ages, the possibility of neurological disorders and associated speech, language, and cognitive communication impairment increases.

Persons with neurological disorders or brain injuries may have difficulty with receptive and/or expressive language, written language, social communication skills, and cognition, all of which SLPs are trained to assess and treat. Aphasia testing is particularly enhanced by the contributions of SLPs due to their detailed knowledge of aphasiology and training in the specialized techniques of aphasia examination.

In school settings SLPs provide evaluation and treatment for special education related needs, including cases common in neuropsychological practice, such as TBI, specific language disorders, Autism-spectrum, ADHD, and learning disorders. Schools often serve children returning from rehab as well as those in restrictive special education settings; and interdisciplinary collaboration is important to ensure complimentary complementary focus for such transitions and specialized services.

Correspondence: *Ann-Marie Kimbell, 60 Sun Valley Dr., Spring Branch, TX 78070. E-mail: Anne-Marie.Kimbell@Pearson.com*

A. QUIROS. Tools Used by Speech-Language Pathologists to Assess Language.

Frequently, Speech-language Pathologists (SLPs) are members of transdisciplinary teams, a service framework in which team members share knowledge for the purpose of obtaining a holistic, integrated view of an individual referred for services. Within the trans-disciplinary setting, neuropsychology would most likely benefit from the SLP's expertise in assessing language and auditory processing skills. Specifically, input from a language evaluation conducted by an SLP aids in the differential diagnosis of disorders such as ADHD, Autism Spectrum Disorders, Expressive Language Disorder, Mixed Expressive/Receptive Language Disorder, Learning Disorders, and Aphasia, for example. In addition to interviews and a thorough review of history, SLPs use a wide variety of research-validated assessment tools. Examples of assessments often used by an SLP to assess language include the: Clinical Evaluation of Language Fundamentals (CELF-4), Preschool Language Scales (PLS-5), Peabody Picture Vocabulary Test (PPVT-4), Bracken Basic Concept Scale (BBCS-3:R and BBCS:E) Cognitive-Linguistic Quick Test (CLQT), and Western Aphasia Battery. This presentation will discuss the types of clinical questions that may be addressed with these assessment tools, how they can be incorporated into neuropsychological research or assessment, and how they can be used to guide differential diagnosis.

Correspondence: *Alexander Quiros, 9406 Sundance Dr, Pearland, TX 77584. E-mail: Alexander.Quiros@pearson.com*

Symposium 5: In Memoriam: A Neuropsychological Appreciation for the Life of Byron P. Rourke

Chair: Ken Adams

1:30–3:30 p.m.

K.M. ADAMS. In Memoriam: A Neuropsychological Appreciation for the Life of Byron P. Rourke.

Byron Patrick Rourke (1939-2011) was a charter member of INS as well as a servant of the Society as an officeholder on the Governing Board, as Secretary, and its President in the 1981-1982 term. Of the professional organization memberships he held, his INS affiliation was dearest to him. The present symposium will bring together colleagues in a celebration. They will bring personal remembrances, informed historical perspectives, and a long view of Byron's work as a neuropsychologist in a fashion he would have recognized as something of an academic

wake. The individual presentations will consider his work in the roles and realms of mentorship, fostering neuropsychological organizations, Non-Verbal Learning Disabilities (NLD), his impact on pediatric neuropsychology, his neuropsychological journal editorships, his creation of the University of Windsor neuropsychology program, and his life in his family.

Presenters include:

H. Gerry Taylor: Seminal Contributions to Pediatric Neuropsychology

Jacobus Donders: Rourke Seeing the Bigger Picture: Multivariate Analyses and Subtyping

Sean B. Rourke: Byron Patrick Rourke—A Gentleman, Scholar and Family Man

Harry van der Vlugt: Byron Rourke Q & A

Correspondence: *Kenneth M. Adams, Ph.D., Psychiatry, Department of Veterans Affairs & The University of Michigan, Mental Health Service (116), VA Medical Center, Ann Arbor, MI 48105. E-mail: kmadams@med.umich.edu*

Poster Session 4: Cancer/Emotional Processes/Psychopathology

1:45–3:15 p.m.

Cancer

D.M. AASE, M. PRIMEAU, C. RAIMAN, E. MELIAN, K. BARTON, J. LEE & V. PRABHU. Preoperative and Early Postoperative Cognitive Functioning in Patients with Primary Brain Tumors.

Objective: Cognitive dysfunction is common in patients with primary brain tumors prior to intervention. Surgical intervention may improve cognitive functioning in some patients (e.g., Teixidor et al., 2007). A few studies have found that cognitive deficits predict clinical characteristics such as tumor pathology or radiographic progression (Primeau et al., 2008; Meyers & Hess, 2003). The goal of the present study was to examine pre- and postoperative cognitive performance to identify associations with disease characteristics prior to adjuvant treatment.

Participants and Methods: From a pool of 60 primary brain tumor patients referred over the past five years for neuropsychological evaluation, this study identified 21 who had both pre- and postoperative exams. Mean postop days to retesting was 49, and mean age was 41. Analyses included disease factors and measures from both time points sensitive to change in CNS tumor patients (i.e., Trail Making, verbal fluency, and verbal recall).

Results: For the sample, considerable stability in cognitive functioning was observed postoperatively. Nonparametric tests found that preoperative cognitive deficits did not predict tumor type (WHO grade I or II versus grade III or IV), nor did tumor type predict postoperative decline. Rather, significant decline in verbal fluency was associated with the presence of postoperative seizures (Fisher's Exact $p < .05$).

Conclusions: Results were somewhat counterintuitive in that both groups were heterogeneous in outcomes and high-grade glioma patients did not show more dysfunction. In addition to treatment variables, that tumor-related seizures affect neurocognitive status has been recognized (Klein et al, 2003).

Correspondence: *Darrin M. Aase, Ph.D., Loyola University Medical Center, 2160 South First Ave, Maywood, IL 60153. E-mail: daase@lumc.edu*

B. ARONOVITCH, P. ROBAEY, S. MAGGI, C. LAVERDIÈRE & A. MOGHRABI. Verbal Learning Strategy Following Treatment of Acute Lymphoblastic Leukemia (ALL) in School-Age Children.

Objective: Acute lymphoblastic leukemia (ALL) is the most common of all pediatric malignancies, with a survival rate of approximately 80%.

A wide range of neuropsychological and other adverse effects have been associated with treatment, including deficits in IQ, attention, visuospatial ability, and memory. This study focused on verbal learning and was aimed at demonstrating differences in strategies and identifying associated individual risk factors, such as sex and age at diagnosis.

Participants and Methods: The California Verbal Learning Test was used to assess verbal learning in 25 children treated for ALL with intrathecal chemotherapy and cranial radiation therapy and 19 healthy sex-matched controls.

Results: The learning effect across all participants on the first 5 trials was highly significant. Age and sex differences were detected such that girls treated for ALL demonstrated a relative deficit in the number of words recalled (after 4 or 5 repetitions), and children diagnosed before or at 32 months of age performed more poorly on the first 5 trials, especially at the second and third repetitions. Children treated for ALL recalled significantly fewer words than the control group in a delayed recall trial. Differences in strategy were observed where the primacy effect was larger in the control group and the recency effect was larger in the treatment group. The recency effect was larger for children diagnosed before and at 32 months.

Conclusions: These results provide strong support for enhanced retroactive interference in children treated for ALL, especially in those treated at an earlier age. These results may be useful in designing more individualized cognitive rehabilitation strategies.

Correspondence: *Blair Aronovitch, Carleton University, 378 Metcalfe St, Ottawa, ON K2P1S8, Canada. E-mail: blair.aronovitch@gmail.com*

A. DORFMAN, P.D. COLE & W.W. TRYON. A Study of the Acute Effects of Chemotherapy on Neurocognitive Function Among Pediatric Cancer Patients.

Objective: Despite improvements in cancer therapies that have resulted in increased survival rates among children with cancer, various chemotherapeutic agents have been associated with acute neurotoxicity, including impairments in neurocognition. Methotrexate (MTX) is a crucial component in the treatment of a number of childhood cancers but is most often associated with these problems in pediatric populations. Studies examining the effects of chemotherapy in children actively undergoing treatment are limited and findings are inconsistent. We examined the effects of MTX chemotherapy on neurocognition within three days following treatment administration.

Participants and Methods: The study sample was comprised of 19 patients (11 males, 8 females) primarily of Hispanic origin (52.6%) with mixed cancer diagnoses. Mean age at the time of testing was 12.8 years. Participants completed a comprehensive battery of tests prior to receiving MTX chemotherapy and within 72 hours following treatment.

Results: Primary findings indicated that pediatric patients experience significant declines in verbal learning and memory functions following treatment with MTX chemotherapy. Results revealed that younger children may be at increased risk for verbal memory impairment and other cognitive issues while treated with MTX.

Conclusions: Overall, results indicate that pediatric cancer patients may experience significant verbal learning and memory deficits soon after receiving chemotherapy with MTX even in the absence of observable symptoms of acute neurotoxicity (i.e., seizures). These findings augment prior research and support a need for children treated with MTX to receive intervention services shortly after treatment initiation to support and enhance verbal learning and memory functions.

Correspondence: *Ava Dorfman, Ph.D., Psychiatry and Psychology, Cleveland Clinic Foundation, P57, 9500 Euclid Avenue, Cleveland, OH 44195. E-mail: dorfmaa@ccf.org*

K. EDELSTEIN, B.J. SPIEGLER & L.J. BERNSTEIN. Self-Reported Neurocognitive Concerns and Neuropsychological Test Performance in Adult Brain Tumor Patients.

Objective: To examine self-reported neurocognitive difficulties, symptoms of anxiety and depression, and performance on standardized neuropsychological tests in adult brain tumor patients.

Participants and Methods: Fifteen adults (20-62 years old; mean \pm SD: 43.4 \pm 14.0) diagnosed with a brain tumor between the ages of 16 and 56 (37.8 \pm 12.1) participated in this study. Time since diagnosis ranged from 0.3-23 years (5.7 \pm 6.2). Participants completed standardized neuropsychological tests and questionnaires about mood (BDI, STAI). Self-reported neurocognitive difficulties were measured using the Neurocognitive Questionnaire (NCQ), developed to monitor neurocognitive functioning in adult survivors of childhood cancers across four domains: Task Efficiency (NCQ-TE), Emotional Regulation (NCQ-ER), Memory (NCQ-M), and Organization (NCQ-O).

Results: Full scale IQ (WASI) was average (103.3 \pm 11.4; range 80-118). All four NCQ domains showed some association with Anxiety (NCQ-TE, $r=.65$, $p=.008$; NCQ-ER, $r=.53$, $p=.044$; NCQ-M, $r=.49$, $p=.07$; NCQ-O, $r=.73$, $p=.002$). Two of the domains were correlated with performance on standardized verbal tasks (NCQ-TE, $r=.56$, $p=.03$; NCQ-M, $r=.53$, $p=.04$) but not other neuropsychological performance domains. NCQ-TE was also correlated with longer time since diagnosis ($r=.65$, $p=.009$).

Next, we split the sample based on tumor location. Patients with subcortical tumors ($n=7$) endorsed more NCQ-O problems ($t(13)=2.35$, $p=.04$) and Anxiety ($t(13)=-2.15$, $p=.05$) than did patients with cortical tumors ($n=8$). In contrast, patients with cortical tumors obtained poorer scores on tests measuring speed ($t(13)=2.10$, $p=.06$) and executive function ($t(13)=2.25$, $p=.04$).

Conclusions: We are continuing to explore the role of tumor factors (location, prognosis, time since diagnosis), adjustment (anxiety, depression) and test sensitivity/specificity to better understand the relation between objective measures of performance and subjective concerns in adult brain tumor patients.

Correspondence: *Kim Edelstein, PhD, Princess Margaret Hospital, 610 University Ave, Toronto, ON M5G 2M9, Canada. E-mail: kim.edelstein@uhn.ca*

K.M. FITZGERALD, S. PATWARDHAN & C. MEYERS. Primary Central Nervous System Lymphoma: Disease and Treatment-Related Effects on Neurocognitive Functioning.

Objective: In Primary Central Nervous System Lymphoma (PCNSL), both disease and treatment processes can render significant time-related effects on neurocognitive function (NCF) which may be difficult to differentiate, particularly due to the insidious nature of progression in PCNSL. The present study investigated the specific effects of radiation therapy on cognition, while parsing out the effects of progressive disease.

Participants and Methods: Aspects of cognition were assessed using subtests from the Wechsler Adult Intelligence Scale – Third edition (Block Design, Digit Span), Controlled Oral Word Association task, and Hopkin's Verbal Learning test. Two groups of PCNSL patients participated: patients treated with whole brain radiation (WBRT) ($n=10$) and not yet treated with any radiotherapy ($n=10$). The latter were included to control for effects of progressive disease. Groups did not significantly differ in terms of time since diagnosis or demographic variables (mean age = 55.5; mean years of education = 12.35). Analysis of variance was used to explore the differences in NCF as a function of radiation therapy status, using time since diagnosis as a covariate.

Results: Preliminary analyses suggest that radiation therapy was associated with significantly lower performance in visuospatial construction, visual-motor tracking, and verbal memory. Significant differences in performance were not noted in auditory attention or multi-tasking.

Conclusions: While the effects of radiation therapy and disease progression are both time-related processes, when accounting for disease progression effects, by matching for time since diagnosis, radiation therapy appears to be related to reduced performance in the aforementioned domains. Further investigation of the time-related effects of radiation therapy on NCF, which exceed those related to disease progression alone, may help further inform radiation treatment planning.

Correspondence: *Kara M. Fitzgerald, M.A., University of Houston, 55 Cobblestone dr., Groton, CT 06340. E-mail: karamfitzgerald@gmail.com*

C.B. GOPIN & S.G. SCHAFFER. Differential pattern emerges on Continuous Performance Test: Comparison between children treated for Acute Lymphoblastic Leukemia and those diagnosed with Attention-Deficit/Hyperactivity Disorder.

Objective: Children who were diagnosed with Acute Lymphoblastic Leukemia (ALL) and subsequently received prophylactic central nervous system chemotherapy treatment often report attention difficulties several years after treatment. Since the construct of attention can be subdivided into distinct processes, it is important to ascertain which specific aspect is impacted in this population. We examined the pattern of Continuous Performance Test (CPT) performance in children who were previously treated for ALL and compared their profile to that of a well-characterized cohort of youngsters diagnosed with Attention Deficit Hyperactivity Disorder (ADHD).

Participants and Methods: The CPT was administered to 7 children diagnosed with ADHD and 8 treated for ALL. Group performance was compared using a series of t-tests. Additionally, T-scores were dichotomized [within normal limits (WNL; $T < 60$) vs. atypical ($T \geq 60$)], and chi-square analyses were conducted to determine whether the groups differed in the number of children who exhibited impairment.

Results: Analyses revealed significant group differences in reaction time (RT) such that the ALL group responded more slowly than the ADHD group across conditions ($p < .05$). Further, hit RT block change approached significance ($p = .086$). Pearson Chi Square was significant ($\chi^2 = 4.77$, $p < .05$) for hit rate RT. None of the ADHD children exhibited dysfunction, while half of the ALL group demonstrated impairment.

Conclusions: Performance on most CPT subscales was comparable across the two groups. However, despite limited power, the ALL children were found to exhibit a significant processing speed deficiency, which is likely secondary to leukoencephalopathy.

Correspondence: *Chaya B. Gopin, Ph.D., Neurology, NSLJ, 75-59 263rd Street, Glen Oaks, NY 11004. E-mail: cgopin@gmail.com*

T. SIMONEAU, M. RAY, K. ONDERKO, K. CONWAY, L. BAILLIE, S. MIN, D. TRAN, A. ROYSTON, R. PORTER, S. MCMAHON, R. BENNETT, P. WALKER & J. GRIGSBY. Breast cancer alone is not an independent risk factor for cognitive impairment.

Objective: Chemotherapy for breast cancer (BRCA) has been associated with cognitive impairment (CI), but methodologic weaknesses make the results inconclusive. Some have argued that cancer itself may be a risk factor for CI. Our objective was to assess whether stage 1 to 3 BRCA, prior to chemotherapy, is associated with CI.

Participants and Methods: Chemotherapy for breast cancer (BRCA) has been associated with cognitive impairment (CI), but methodologic weaknesses make the results inconclusive. Some have argued that cancer itself may be a risk factor for CI. Our objective was to assess whether stage 1 to 3 BRCA, prior to chemotherapy, is associated with CI.

Results: Simple t-tests found differences on COWAT ($p < 0.05$) and SDMT ($p < 0.01$), but none of the other measures. We then developed adjusted regression models for each of the ten dependent variables, controlling for age, education, ethnicity, stage of cancer, anxiety, depression, pain, and fatigue. Values of R for the models ranged from 0.067 to 0.353. Addition of covariates to the models eliminated all between-groups differences.

Conclusions: The results suggest that, with the appropriate covariates included, the effects of BRCA itself on neuropsychological functioning is probably negligible.

Correspondence: *Jim Grigsby, PhD, Psychology, University of Colorado Denver, 1200 Larimer Street, Campus Box 173, Denver, CO 80217-3364. E-mail: jim.grigsby@ucdenver.edu*

T.H. HEINKS-MALDONADO, K. WINGEIER, C. SCHAEFER, V. LORY, M. STEINLIN & K. LEIBUNDGUT. Off to a Bad Start: Attention and Memory Impairment in Children with Brain Tumors before Medical Intervention.

Objective: Extensive research has shown that survivors of childhood cancer may demonstrate a consistent pattern of neurocognitive deficits especially when the malignancies and/or the treatments (surgery, chemotherapy, radiation therapy) involve the Central Nervous System (CNS). Even without CNS involvement negative effects of chemo- and radiation therapy on cognitive functions have been shown. So far mostly children who have been off treatment for one year or longer have been included in studies on cognitive outcome. Few studies have investigated the “baseline” of cognitive abilities before the start of any treatment.

Participants and Methods: In the study presented here all children between the ages of 4 and 16 (n=43; mean age= 9.5 years) hospitalized at the University Children’s Hospital Berne for treatment of malignancies underwent extensive neuropsychological assessment. Neuropsychological testing sessions were completed within days following initial diagnosis and before start of medical interventions such as surgery, chemo- and/or radiation therapy.

Results: Results show that children with brain tumors show significantly worse performance on tests of long-term memory and attention compared to children with non-CNS malignancies. The two groups did not differ, however, in other cognitive areas (FSIQ, performance speed, executive functions, short-term memory).

Conclusions: This shows that children with malignancies involving the CNS present with memory and attention deficits even before surgery, chemo- and/or radiation therapy further contribute to cognitive decline. Future steps of this study will include follow-up assessments of all patients after end of medical treatment as well as implementation and evaluation of cognitive training methods.

Correspondence: *Theda H. Heinks-Maldonado, PhD, Neuropediatrics, University Children’s Hospital Berne, Inselpital, Berne 3010, Switzerland. E-mail: theda.heinks-maldonado@insel.ch*

S. HILE, R. ANNETT, S. ERICKSON & B. AGEE. Neurocognitive Deficits and Parental Adjustment Predict Functional Impairment in Acute Lymphoblastic Leukemia and Lymphoma: A Pilot Study.

Objective: Childhood cancer survivors are at risk for long-term neurocognitive and psychosocial morbidities (Dickerman, 2007; Krull et al., 2008). Research has seldom examined the relationship between these morbidities thus little empirical evidence exists concerning the overall salience of these and how they translate into functional impairment. A model of the neurocognitive and psychosocial risk factors associated with functional impairment in children treated for leukemia/lymphoma was examined. The objectives were: 1) to characterize the frequency/severity of functional impairment 2) identify significant neurocognitive and psychosocial determinants of functional impairment.

Participants and Methods: 50 child-parent dyads were enrolled. Eligibility criteria included: children ages 4-19 years who were at least 2 years post diagnosis with leukemia/lymphoma. Participants were recruited through a pediatric oncology late effects clinic. Procedures for parents included the completion of psychosocial and functional impairment questionnaires, while a brief neuropsychological exam was administered to children.

Results: 26% of the sample evidenced clinically significant functional impairment. Significant neurocognitive deficits were also evident. Regression analyses indicated that neurocognitive deficits did not predict functional impairment. However, parental stress was a significant predictor of functional impairment, $R^2 = .13$, $F(1,45) = 6.730$, $B = .361$, $p = .013$.

Conclusions: Although children demonstrated both neurocognitive deficits and functional impairments, neurocognitive deficits did not predict these functional difficulties. Results favor psychosocial factors, such as parental stress, as a predictor of overall functional impairment.

Correspondence: *Sarah Hile, Psychology Department, University of New Mexico, 1 University of New Mexico, MSC03 2220, Albuquerque, NM 87131-0001. E-mail: shile@unm.edu*

S. HILE & R. ANNETT. Detecting Patterns of Missingness in Pediatric Clinical Trial Data.

Objective: Missing data in longitudinal neuropsychological studies is a critical problem for developmental research. Missing data results in a loss of significant data, degrades the performance of confidence intervals, reduces statistical power, and biases parameter estimates, and thus interpretation of results (Nakai & Kai 2011). Determining whether the pattern is missing completely at random, missing at random or not at random requires a systematic approach. This study presents secondary analyses of clinical trial data from the Children’s Cancer Group (CCG) that identify procedures for detecting patterns of missingness in longitudinal pediatric designs.

Participants and Methods: CCG conducted a study examining the effects of cranial radiation therapy (CRT) and the presence or absence of intrathecal methotrexate on neurobehavioral, neuropsychological, and academic achievement functioning in children treated for acute lymphoblastic leukemia. Children were assessed at 9, 21, and 48 months post diagnosis. Independent t-tests were used to compare participants who dropped out versus participants who continued the study. Groups were compared across relevant study variables such as age, education, IQ, and treatment group.

Results: Detailed treatment by time analyses are presented. Analyses revealed patterns of missingness in age, education and VIQ/PIQ/FSIQ, though treatments by time seldom revealed significant differences. Additionally, there were no significant differences in dropout across the two treatment groups.

Conclusions: Results indicate that the missing data was not a function of age, education, IQ, or treatment groups. These results provide evidence suggesting that the data in this pediatric trial is missing at random.

Correspondence: *Sarah Hile, Psychology Department, University of New Mexico, 1 University of New Mexico, MSC03 2220, Albuquerque, NM 87131-0001. E-mail: shile@unm.edu*

R.A. HOWARTH, W.E. REDDICK, J.M. ASHFORD, J.O. GLASS, S. WU & H.M. CONKLIN. Examining the Value of Structural Neuroimaging in Predicting Response to Methylphenidate among Childhood Cancer Survivors.

Objective: Previous research has demonstrated the efficacy of methylphenidate (MPH) in addressing attention problems experienced by some childhood cancer survivors. Given potential medical contraindications, adverse side effects, or parental preference to avoid stimulants, there is a need to identify predictors of individual response prior to initiating a medication trial. Accordingly, the current study investigated patient-specific predictors of MPH response, including baseline structural neuroimaging variables, among childhood brain tumor (BT) and acute lymphoblastic leukemia (ALL) survivors.

Participants and Methods: Childhood cancer survivors (BT=35, ALL=33) participated in a 12-month, open label trial of MPH. The sample was 11.1 ± 3.1 years of age and 4.3 ± 2.6 years since treatment at the time of baseline assessment. Ratings on the Conners’ Teacher Rating Scales (CTRS) were gathered as a real-world measure of attention regulation. MRI exams were performed (1.5 Tesla whole-body imager) at pre-medication baseline, yielding tissue volume measurements for variables of interest (e.g., white matter, grey matter).

Results: Using the Reliable Change Index (RCI) and CTRS, 61.7% of the sample was classified as responders. Multivariate linear mixed models indicated more problems reported by teachers at baseline was predictive of MPH response ($t=4.0$, $p<.001$) with grey matter volume accounting for additional independent variance ($t=2.1$, $p<.05$). Demographic (e.g., age, gender) and clinical factors (e.g., diagnosis, treatment intensity) were not predictive of medication response.

Conclusions: MPH was shown to mitigate attention difficulties experienced by childhood cancer survivors, particularly those displaying greater problems at pre-medication baseline. Further investigation of the association between grey matter volume and medication response may assist with upfront identification of children most likely to benefit from pharmacologic interventions.

Correspondence: *Robyn Howarth, Ph.D., Department of Psychology, St. Jude Children's Research Hospital, 262 Danny Thomas Place, Mailstop #740, Memphis, TN 38105. E-mail: robyn.howarth@stjude.org*

R. JAYAKAR, T.Z. KING, R. MORRIS & N. KRAWIECKI. Normal Semantic Clustering Despite Verbal Memory Impairment in Long Term Survivors of Pediatric Brain Tumors.

Objective: In the verbal memory context, semantic clustering is the ability to actively impose organization on verbal material to create a mental filing system that helps with efficient encoding/retrieval. As adult survivors of pediatric brain tumors have decreased verbal memory, we assessed if survivors exhibit poorer semantic clustering in comparison to healthy adults.

Participants and Methods: We analyzed long-delay free recall (LDFR) performance and the semantic clustering ratio of survivors ($n=42$) and controls ($n=40$) on the California Verbal Learning Test (CVLT). Groups did not differ on age ($M=24$ yrs), education ($M=13$ yrs), and gender but differed on ethnicity (survivors 83% Caucasian; controls 46% Caucasian). Survivors were on average 18.9 years ($SD=4.6$) post-diagnosis.

Results: LDFR was significantly different ($t=-3.37, p=.001$) between groups with survivors scoring lower, but semantic clustering was not significantly different ($t=-2.9, p=.77$). For survivors, Pearson correlations of treatment related variables with LDFR and semantic clustering were obtained. There was a significant association between age at diagnosis and semantic clustering ($r=.32, p=.04$), but not LDFR ($r=.13, p=.43$). There was a significant association between radiation and LDFR ($r=-.45, p=.003$), but not semantic clustering ($r=-.26, p=.09$). Thus, older age at diagnosis was correlated with better semantic clustering and presence of radiation was correlated with poorer LDFR.

Conclusions: Long-term survivors exhibited normal semantic clustering despite verbal memory impairment. This suggests isolated damage to memory systems but preserved language and executive function. As semantic organization is an adult skill, our findings highlight that neurological insult at a younger age may impede an individual's ability to learn how to actively impose an organization on verbal material. Furthermore, although radiation may be negatively affecting verbal memory overall, it does not seem to be influencing the development of semantic clustering skills.

Correspondence: *Reema Jayakar, B.A. Honours (Psychology), Psychology, Georgia State University, Apt 1402, 1750 Commerce Drive NW, Atlanta, GA 30318. E-mail: reemajayakar@gmail.com*

C. KARLSON, E. MANNING, H. BETTY, S. LEIST-HAYNES, J. CRIDDLE & T. ELKIN. Brief Neurocognitive Screening For Pediatric Brain Tumor Patients.

Objective: Research on pediatric brain tumor (BT) patients has identified subtle long-term neurocognitive deficits in areas such as attention and executive functioning. With this knowledge comes the need for brief neurocognitive screening measures that can be administered in regular clinic settings to guide early neuropsychological intervention. It was the purpose of this study to examine the feasibility and sensitivity of a brief screening measure, the Leiby-Asbell Neurocognitive Screening Examination (LANSE) for Children and Adolescents, in a regular clinic setting for pediatric BT patients compared to pediatric traumatic brain injury (TBI) patients.

Participants and Methods: The LANSE is a brief (20-25 minute) neurocognitive screener of patient orientation, attention, executive functioning, language, verbal and visual memory, and visual-spatial func-

tioning (Leiby & Asbell, 2007). BT and TBI patients between 6 and 17 years were administered the LANSE during regular clinic visits. Participants were 11 BT patients (M age=9.64, $SD=3.59$; 64% White; months from injury=36.72, $SD=45.45$) and 8 TBI patients (M age=12.63, $SD=4.03$; 75% White; months from injury=6.71, $SD=8.12$). **Results:** BT patients ($M=4.00, SD=3.10, range=0$ to 10) exhibited a similar number of domains of probable neurocognitive impairment as TBI patients ($M=3.88, SD=2.23, range=1$ to 8), $t=.09, p=.94$. BT patients ($M=.75, SD=.12, range=.57$ to .93) also exhibited a similar level of impairment as TBI patients ($M=.81, SD=.07, range=.69$ to .93), $t=1.26, p=.11$. Common domains of impairment for both BT and TBI patients were attention, executive functioning, and verbal memory.

Conclusions: The LANSE can be feasibly administered during regular pediatric BT clinic visits. Pediatric BT patients show similar probable cognitive impairment as pediatric TBI patients, indicating a need for comprehensive neurocognitive rehabilitation services after cancer treatment. Data collection is ongoing.

Correspondence: *Cynthia Karlson, Ph.D., University of Mississippi Medical Center, 2500 North State Street, Jackson, MS 39216. E-mail: ckarlson@umc.edu*

S. KESLER, H. HOSSEINI & D. KOVAKKATTU. Abnormal Cortical Networks Following Breast Cancer and Chemotherapy.

Objective: As many as 75% of breast cancer survivors show significant cognitive deficits with women receiving adjuvant chemotherapy being 5-8 times more likely to develop these deficits. Neuroimaging and cognitive studies have thus far suggested a prefrontal-striatal profile of impairment. However, this profile is often indicative of a more distributed injury. The aim of this study was therefore to examine large-scale anatomic networks in these women.

Participants and Methods: We acquired high-resolution, volumetric MR images from 37 primary breast cancer survivors (age 43-67, mean = 54 + 6.1) and 38 age, education and IQ-matched healthy female controls. All women in the breast cancer group received chemotherapy treatment and were, on average, 4.5 years off-therapy. We constructed a gray matter correlation network from 90 cortical and subcortical regions, corrected for total brain volume and age. We then applied graph theoretical analyses to compare network statistics between the groups across a range of network costs.

Results: Compared to controls, the breast cancer group showed significantly reduced clustering coefficient, a measure of a network's functional segregation, and significantly decreased small-worldness, a measure of the network's economical capacity - the ability to balance the conflicting demands of functional segregation and functional integration. Small-worldness was lower particularly at higher network costs. The breast cancer group also demonstrated disrupted frontotemporal network hubs, which are important for efficient network integration and communication.

Conclusions: Breast cancer and chemotherapy appear to disrupt large-scale brain anatomic networks in terms of regional connectivity and global integration. These alterations are associated with reduced network efficiency and increased vulnerability to insult. These findings may help explain the often subtle, executive-memory profile of cognitive deficits in these women. Correspondence: *Shelli Kesler, PhD, Psychiatry, Stanford University, 401 Quarry Road, MC5795, Stanford, CA 94305. E-mail: skesler@stanford.edu*

C. KIMBERG, T. BRINKMAN, M. HUDSON, C. PUI, D. SRIVASTAVA & K. KRULL. Concordance Between Parent and Child Behavioral Ratings and a Continuous Performance Test in Survivors of Childhood Acute Lymphoblastic Leukemia.

Objective: Roughly 20-40% of long-term survivors of childhood acute lymphoblastic leukemia (ALL) are reported to demonstrate impairments in attention and processing speed, albeit classification procedures vary between behavioral ratings and direct assessment. The purpose of this study was to compare behavioral ratings across parent-child dyads with direct assessment of attention.

Participants and Methods: Long-term child survivors of ALL treated at St. Jude Children's Research Hospital on the Total XV protocol were recruited for a comprehensive neuropsychological battery. Intra-class correlations (ICCs) were utilized to compare concordance between parent and child ratings of attention, hyperactivity and aggression. Multivariable linear regression models, adjusting for sex and age, were used to examine associations between ratings and assessment of attention on the Conners' Continuous Performance Test (CPT-II).

Results: To date, 65 parent-child dyads (54% female; mean child age = 13.6 years; mean age at diagnosis = 5.8 years) have completed all study measures. ICCs indicated moderate agreement between parent and child ratings of attention, hyperactivity, and aggression (0.40, 0.55 and 0.45 respectively; all $p < 0.05$); concordance increased when analyses were restricted to children ≥ 11 years of age. Child ratings of aggression were the strongest predictor of direct assessment of attention ($B = .54$, $t(59) = 3.15$, $p = .003$). Parent ratings did not predict child performance.

Conclusions: Preliminary data supports the need for comprehensive assessment of attention in a survivorship population, including multi-informant ratings and performance based measures. Future research should explore factors related to differential associations, including treatment intensity, as well as child and family characteristics.

Correspondence: *Cara Kimberg, St. Jude Children's Research Hospital, 262 Danny Thomas Place, Mail Stop 735, Memphis, TN 38105. E-mail: carakimberg@stjude.org*

T.Z. KING, R. JAYAKAR, R. MORRIS & N. KRAWIECKI. **The Moderating Role of Processing Speed in Predicting Adaptive Living Skills in Adult Survivors of Childhood Brain Tumors.**

Objective: The increasing number of long-term survivors of childhood brain tumors in recent years compels clinical researchers to examine the predictors of independent living. Research literature highlights the importance of processing speed in examining cognitive outcomes in survivors of cancer. We predicted that processing speed would be a significant moderator of adaptive behavior in adult survivors of childhood brain tumors.

Participants and Methods: We examined the role of processing speed, using Oral Symbol Digit Modality Test, in predicting adaptive living skills, using Scales of Independent Behavior – Revised (SIBR). Thirty eight survivors of childhood brain tumors and thirty nine demographically matched controls completed testing (Age M = 24 years old). Survivors were on average 6 years old at time of diagnosis and completed testing on average 20 years after diagnosis.

Results: Regression analyses showed that there was a significant interaction ($\beta = .616$, $p = .014$) of processing speed and group membership. For survivors, high processing speed was associated with greater independent living skills; whereas, for controls processing speed was not associated with outcome. Overall our model accounted for 31% of the variance ($p = .014$) in independent living skills.

Conclusions: These findings highlight the utility of oral processing speed in predicting outcomes in adult survivors of childhood brain tumors who are on average 20 years post-diagnosis. Future studies should examine how processing speed moderates the association between predictor and outcome variables.

Correspondence: *Tricia Z. King, Ph.D., Psychology, Georgia State University, P.O. Box 5010, Atlanta, GA 30302. E-mail: tzking@gsu.edu*

J. LUXTON, T. BRINKMAN, C. KIMBERG, C. PUI, D. SRIVASTAVA, M. HUDSON & K.R. KRULL. **Use of the Attention Network Test in Survivors of childhood acute lymphoblastic leukemia.**

Objective: Survivors of childhood acute lymphoblastic leukemia (ALL) often demonstrate attention problems on standardized neuropsychological tests, albeit contributions of underlying attention networks are poorly understood. The Attention Network Test (ANT) was used to examine attention networks (alerting, orienting, and executive control) in a cohort of ALL survivors.

Participants and Methods: Seventy survivors of ALL (mean [SD] current age=14.6 [4.8] years; time since diagnosis=6.7 [4.4] years) completed a bat-

tery of neuropsychological tests measuring attention, working memory, and executive function. Tests included the ANT and standard clinical measures: continuous performance test (CPT-II), D-KEFS subtests, and digit span. Attentional networks were examined in accordance with clinical performance and established risk factors (i.e. treatment intensity, age, and sex).

Results: ANT performance quantified network components through reaction time (alerting effect = 31.9 msec, orienting effect = 39.4 msec, and executive control = 115.6 msec). ANT executive control was associated with measures of sustained attention (CPT reaction time $r = -0.50$, $p < 0.001$, omissions $r = -0.3$, $p < 0.01$) and working memory (digit span $r = 0.39$, $p < 0.001$). ANT orienting was associated with measures of cognitive flexibility ($r = 0.32$, $p = 0.01$). Alerting was not significantly associated with any tested construct. Females demonstrated slower reaction times for orienting effects ($p = 0.05$). Age at diagnosis and treatment intensity were examined across functional attention networks and found to be non-significant.

Conclusions: Attention and working memory processes in ALL survivors are associated with functions of an anterior attention system. Standard clinical neuropsychological measures fail to capture alerting contained in the ANT, suggesting a unique contribution of this test and need for further investigation.

Correspondence: *Kevin R. Krull, PhD, Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, MS 735, Memphis, TN 38105-3678. E-mail: kevin.krull@stjude.org*

J. LUXTON, T. BRINKMAN, C. KIMBERG, C. PUI, D. SRIVASTAVA, M. HUDSON & K.R. KRULL. **Use of the N-Back task to assess working memory in survivors of childhood acute lymphoblastic leukemia.**

Objective: The N-Back task is often used in functional brain imaging studies to activate working memory networks, albeit its association with clinical outcomes has not been well studied in children. The purpose of this study was to compare performance on the N-Back to clinical indices of working memory, attention and processing speed in survivors of childhood acute lymphoblastic leukemia (ALL), who are at increased risk for impairment in these processes.

Participants and Methods: Long-term survivors of childhood ALL (N=70; mean [SD] age=14.4 [4.7] years; mean time since diagnosis=6.4 [4.2] years) completed the N-Back task and clinical measures, including digit span, spatial span and the continuous performance test (CPT-II). Performance on the N-Back was compared to clinical measures and potential risk factors such as age, sex, and treatment intensity.

Results: Performance on the N-Back task was associated with digit span ($r = 0.46$, $p = 0.04$) and spatial span ($r = 0.57$, $p = 0.009$), albeit only in survivors ≥ 17 years of age. For survivors < 17 years of age, performance on the N-Back was more closely associated with indices of sustained attention ($r = 0.59$, $p = 0.001$). Females demonstrated slower reaction times for 0- ($p = 0.04$), 1- ($p = 0.04$), and 2-Back tasks ($p = 0.001$). Survivors diagnosed < 6 years of age demonstrated worse performance on 0- ($p = 0.04$), 1- ($p = 0.006$), and 2-Back tasks ($p < 0.001$). Treatment intensity was unrelated to N-Back performance.

Conclusions: Reduced performance on the N-Back is associated with common neurocognitive risk factors in survivors of ALL. However, the task appears to assess different constructs at different ages and, thus, further research is recommended.

Correspondence: *Kevin R. Krull, PhD, Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, MS 735, Memphis, TN 38105-3678. E-mail: kevin.krull@stjude.org*

E. MOLZON, T. BRINKMAN, C. KIMBERG, L. MULLINS, C. PUI, D. SRIVASTAVA, M.M. HUDSON & K.R. KRULL. **Child Executive Functions and Parenting Factors in Survivors of Childhood Acute Lymphoblastic Leukemia.**

Objective: Treatment of childhood acute lymphoblastic leukemia (ALL) is associated with increased rates of neurocognitive and psychosocial sequelae, though the impact of these problems on parenting style is poorly understood. The aim of this study was to examine the association between parenting style and executive functions in survivors of childhood ALL.

Participants and Methods: Participants included 70 parent-child dyads (mean [SD] current child age = 14.2 [4.63] years; time since diagnosis = 7.9 [1.40] years). Parents completed self-report questionnaires pertaining to parenting perceptions and style, while children completed a comprehensive neuropsychological battery, including assessment of intellectual abilities and executive function. Hierarchical multiple regression models were constructed to predict the association between child executive functions and parenting style/perceptions. Current age, risk stratum (i.e. proxy for treatment intensity), child intelligence, and maternal education were included as covariates.

Results: Children who completed more intense chemotherapy treatment protocols were perceived by parents as more vulnerable [$f(5,62) = 3.21, p = 0.012$], and higher perceived vulnerability was associated with increased parental overprotection [$f(5,62) = 8.03, p < 0.001$]. Children with lower performance on measures of executive function were less likely to be delegated decision making authority by their parents, as were of children of younger age, and those who had mothers who were less educated [$f(5, 58) = 9.07, p < 0.001$].

Conclusions: These preliminary data indicate that specific child factors (e.g. risk stratum, executive functioning) are associated with parenting style and perceptions, and suggest that parents respond adaptively to their children, based on developmental age, vulnerability and neurocognitive abilities.

Correspondence: *Kevin R. Krull, PhD, Epidemiology & Cancer Control, St. Jude Children's Research Hospital, 262 Danny Thomas Place, MS 735, Memphis, TN 38105-3678. E-mail: kevin.krull@stjude.org*

I. MONTOUR-PROULX, A. DOWNIE, S. GUGER, E. CAIRNEY, M. GREENBERG & K. MANDEL. Effects of Triple Intrathecal Therapy on Working Memory Functioning in Survivors of Acute Lymphoblastic Leukemia: Preliminary Results from a Canadian Multi-Centre Study.

Objective: Recent studies have demonstrated that while chemotherapy-only regimens, including prophylactic intrathecal treatment of the brain, have significantly increased survival rates in patients with leukemia, neurotoxic effects remain. A multi-centre study was designed and funded to investigate risk factors associated with neurocognition in survivors who have completed POG 9605 or CCG 1952 treatment protocols for at least 2 years.

Participants and Methods: Preliminary analyses (Independent-Samples and One-Sample T-tests, Correlation) were conducted to investigate the effects of Triple Intrathecal Therapy (ITT; Methotrexate, Cytarabine, Hydrocortisone) on working memory in the 19 participants recruited to date. Nine patients received Intrathecal Methotrexate (IT) only, whereas 10 received ITT. Working memory was assessed using tasks from a standardized test (WISC-IV) and a parent completed questionnaire (BRIEF).

Results: Statistical analyses revealed no significant group differences on the standardized test of working memory (WISC-IV Working Memory Index; WMI) or the parent completed behavioural measure (BRIEF Working Memory score; WMS). However, the mean WMS score obtained by the ITT group approached the threshold for clinical significance and their scores on the WMI varied more than those obtained by the IT group. For the entire sample, the mean score obtained on both measures was significantly different from mean scores found in the normative samples. There was no significant correlation between WMI and WMS scores.

Conclusions: These preliminary findings suggest that while the type of prophylactic treatment administered to the brain does not affect differently working memory, children receiving intrathecal treatment are at greater risk of experiencing difficulties than their healthy counterparts. Possible explanations regarding poor correlation between results obtained on standardized tests and behavioural measures will be explored and presented in the poster.

Correspondence: *Isabelle Montour-Proulx, PhD, Oncology, Children's Hospital of Eastern Ontario, 401 Smyth Road, Ottawa, ON K1H 5L1, Canada. E-mail: montour@cheo.on.ca*

S.D. OLDHAM, R.D. GREENE, C.K. MILLER, A.M. EVERAERTS, J.N. HOOK & B.A. PYYKKONEN. Domain-specific Cognitive Performance Among Adult Survivors of Cancer Treated with Chemotherapy: A Meta-analysis of Prospective, Longitudinal Studies.

Objective: Multiple studies report a pattern of cognitive decline following chemotherapy (Janelsins et al., 2011). Many of these studies have been critiqued for failing to account for pre-treatment cognitive ability. This has fostered calls for greater reliance upon prospective, longitudinal studies (Wefel et al., 2011). The current study reviewed domain-specific effect sizes among longitudinal, prospective studies examining the impact of chemotherapy upon cognition.

Participants and Methods: Potential peer-reviewed articles were identified through a review of electronic databases utilizing search terms specific to chemotherapy, cognition, and longitudinal studies. Inclusion criteria included: (a) prospective design, (b) pre- and post-treatment testing, (c) employment of reliable/valid cognitive measures, (d) chemotherapy as primary treatment for non-CNS cancers, (e) adult patients, and (f) publication of measure-specific mean scores and standard deviations. Mean domain-specific effect sizes were calculated for change scores from pre- to post-treatment across studies. 12 studies, published from 2004 to 2006, were identified as appropriate for this study.

Results: A small effect size for memory was evident (Cohen's $d = -.34$), suggesting improvement from pre- to post-treatment conditions. All other effect sizes were smaller than .20. Though minimal, the remaining effect sizes suggested small improvements. The lone exception was visuo-construction, which evidenced very modest decline (Cohen's $d = .02$).

Conclusions: Though existing research often suggests some degree of cognitive decline in individuals undergoing chemotherapy, the current meta-analysis revealed little change in cognitive performance following chemotherapy. Though, consistent widespread deficits in cognitive functioning were not evident in this analysis, this does not preclude individual risk factors for chemotherapy-related cognitive decline.

Correspondence: *Samuel D. Oldham, M.A., Wheaton College (IL), 501 College Ave Suite 3402, Wheaton, IL 60157. E-mail: samueloldham@gmail.com*

M. PARSONS, H. MOORE, G. YUE, L. RYBICKI & V. SIEMIONOW. Processing Speed and Fatigue After Adjuvant Chemotherapy for Breast Cancer.

Objective: Understanding of fatigue and cognitive dysfunction during chemotherapy (CT) is often limited by lack of baseline assessments, appropriate controls and correlative neurophysiologic (NP) measurements. This pilot study seeks a means to assess physical and mental fatigue associated with CT for breast cancer (BC).

Participants and Methods: Patients undergoing CT for BC and age-similar controls were evaluated prior to treatment, during CT (after 3-4 cycles), and at one year. Testing included a brief fatigue inventory (BFI), brief mental fatigue assessment (BMF), Digit Symbol Coding (DS) and Symbol Search (SS) subtests of the Wechsler Adult Intelligence Scale III and a physical task (sustained elbow flexion with assessment of endurance time and perceived effort). Electroencephalogram (EEG) and electromyogram (EMG) recordings were obtained during the cognitive and physical tasks respectively. Data were analyzed using repeated measures ANOVA.

Results: Eight pairs completed the first two evaluations and 7 pairs completed all 3 (1 pair withdrawn due to second malignancy). BFI scores demonstrate a trend toward greater fatigue in patients than controls at baseline ($p=0.08$). BFI is significantly greater for patients during CT ($p<0.001$) and remains greater at 1 year ($p=0.016$). BFI is also greater among patients during CT than at baseline ($p=0.037$). Physical endurance and perception of effort were unchanged in either group across any time points. Subjective mental fatigue (BMF) is similar for the two groups at baseline; BMF scores increase significantly during CT for patients relative to controls ($p=0.033$) but recover to no difference at one year. The Processing Speed Index remains stable at all three time points for both groups.

Conclusions: CT is associated with significant changes in subjective physical and mental fatigue, while objective performance on physical and cognitive tasks is preserved. Mental fatigue improved by one year, but perception of physical fatigue persisted. EEG and EMG analyses are under way.

Correspondence: *Michael Parsons, Cleveland Clinic, 9500 Euclid Avenue, P-57, Cleveland, OH 44195. E-mail: parsonm2@ccf.org*

S.Y. PATWARDHAN & C.A. MEYERS. Assessment of Cognitive and Neurobehavioral Effects of IFN- α Treatment among Patients with Chronic Myelogenous Leukemia.

Objective: Cytokine therapy, particularly Interferon- α (IFN- α), is commonly associated with impaired verbal memory, attention, psychomotor processing speed, and executive function. However, evidence regarding deleterious effects of IFN- α among Chronic Myelogenous Leukemia (CML) patients is limited. This study investigated changes in neurocognitive function (NCF) and symptoms of CML patients receiving standard or pegylated IFN- α . It was hypothesized that NCF performance and symptom scores of CML patients would decline following IFN- α treatment.

Participants and Methods: Sixteen CML patient participated (mean age=50.69 \pm 12.75 years, female=50%, right handed=94%) and were treated with IFN- α for 4.25 \pm 2.35 months. Analyses of serum cytokines revealed that at baseline, TNF- α (81%), IL-8(56%), and IL-6(75%) were within 1.5SD compared to the normal population. NCF domains of verbal memory, verbal fluency, attention, psychomotor processing speed, and executive function were assessed. Measures of depression and anxiety were administered.

Results: Longitudinal changes in NCF were analyzed with paired-samples t-tests. Standardized scores were used for all NCF tests and raw scores were used for symptom measures. Verbal memory (Long Term Retrieval=2.53, $p<0.05$, Continuous Long Term Retrieval=2.38, $p<0.05$) and verbal fluency (COWA=2.25, $p<0.05$) declined. Patients reported significant increase in symptoms of depression (BDI-II=-3.14, $p<0.05$). Other NCF test performance and symptom scores remained stable and may be explained by practice effects. There was a significant increase in post-treatment TNF- α (-3.21, $p<0.05$) that did not correlate with concurrent cognitive changes. Levels of the other cytokines remained unchanged.

Conclusions: In this study, preliminary analyses revealed that IFN- α treatment was associated with impaired verbal memory, declined verbal fluency, and report of worsening depression among CML patients. However, impairments in NCF did not correspond with changes in cytokine levels.

Correspondence: *Surabhi Y. Patwardhan, MA, Department of Psychology, University of Houston, 126, Heyne Building, University of Houston, Houston, TX 77204. E-mail: sypatwardhan@uh.edu*

K.S. WALSH, L. KRIVITZKY & E. WELLS. Neurocognitive Trajectory in a Case of Pediatric Paraneoplastic Limbic Encephalopathy.

Objective: Paraneoplastic syndromes are rare neurological disorders affecting the central and peripheral nervous system, and are secondary to a primary cancer. Little is known about these syndromes in children, particularly with regard to neurocognitive impairment and recovery over the course of the disease and associated with CNS changes and treatment.

Participants and Methods: We present the case of a pre-school aged female diagnosed with paraneoplastic limbic encephalitis at age 3. A retroperitoneal neuroblastoma was resected, and immunotherapy was initiated (cyclophosphamide and rituximab). Three neuropsychological assessments were completed with the patient over the first year of recovery, the results of which will be presented, in conjunction with associated MRI findings and treatment course.

Results: Upon initial assessment, there was evidence of bilateral temporal, hippocampal, and cerebellar T2 hyperintensities. Acute neurological and neurocognitive impairments included short-term memory

impairment and significant behavioral and sleep dysregulation. Changes in temperament, aggression, emotional dysregulation, perseverative and self-injurious behaviors were documented. Baseline neuropsychological testing (based only on parent questionnaire and observation) revealed severe behavioral dysregulation. Follow-up evaluations (3 months and 12 months) revealed several strengths including age appropriate general intellectual and pre-academic abilities. Continued deficits associated with limbic and hippocampal pathology included difficulties with memory (encoding, storage and retention), behavioral regulation, and other aspects of emerging attention/executive functioning skills.

Conclusions: In this case of pediatric paraneoplastic limbic encephalitis, improvements in neuropsychological functioning appear to be associated with improvements on MRI and declining anti-Hu antibody counts. Correspondence: *Karin S. Walsh, PsyD, Division of Pediatric Neuropsychology, Children's National Medical Center, 111 Michigan Avenue NW, Suite 1200, Washington, DC 20010-2970. E-mail: kwalsh@cnmc.org*

A.L. WONG, A. DAVTYAN, K. BARRERA, F. HERNANDEZ, A. BOWEN, E. BEIER & S.K. PATEL. Glucose as a Predictor of Neurobehavioral Dysfunction in Cancer Patients.

Objective: Neurobehavioral dysfunction in cancer patients is primarily attributed to the effects of chemotherapy; however, recent studies suggest these symptoms are present even prior to adjuvant treatments. We hypothesized that cancer patients' health status, as indexed by Complete Blood Count (CBC) values, particularly glucose, would be associated with neurobehavioral functioning prior to initiation of cancer treatment.

Participants and Methods: The current sample consists of 80 postmenopausal women newly diagnosed with non-metastatic breast cancer. In this ongoing study, a neurocognitive/behavioral assessment and blood draw is conducted prior to any treatment. CBC values obtained within 30 days of testing were extracted from medical records, and a body mass index (BMI) was calculated for each participant. Patients with a history of diabetes or heart disease were excluded from these analyses.

Results: Preliminary analyses indicated that there were no significant relationships between BMI and glucose level and that it was not necessary to control for participants' weight in subsequent analyses. Analyses showed significant inverse relationships between glucose levels and neurocognitive functioning, specifically in verbal memory recall, processing speed, and psychomotor ability. Patient's glucose levels were further categorized into those within normal levels (69-109) and those with elevated values (110 and above). Significant differences emerged in self-report measures such as fatigue but not on neurocognitive performances.

Conclusions: Glucose levels are associated with neurocognitive performance in newly diagnosed breast cancer patients, prior to any cancer treatment. Women with abnormal glucose levels report behavioral symptoms such as fatigue, but may not necessarily demonstrate neurocognitive dysfunction. These results suggest that further research is warranted.

Correspondence: *Andrew L. Wong, M.A., Clinical Psychology, Fuller Theological Seminary, 1501 S. Fifth Avenue, Arcadia, CA 91006. E-mail: alwong83@gmail.com*

Emotional Processes

C. ABEARE & C. DUMITRESCU. The Emotion Word Fluency Test: Characterizing Performance in Healthy Young Adults.

Objective: The objective of the current study is to characterize performance on the Emotion Word Fluency Test (EWFT; Abeare et al. 2009) in healthy young adults. Normative data is provided as well as a characterization of words produced and order of words produced in the sample. Quantitative analysis of more qualitative aspects of responses has been shown to be useful in other contexts. Such data can ultimately be useful in making subtle differentiations in test-taker or group performance characteristics.

Participants and Methods: Participants were 128 undergraduate students (52% female; median age = 20). Participants completed several measures as part of a larger study. The order of test administration was counterbalanced. The EWFT administration was always preceded by commonly used verbal fluency measures (COWAT and Animals).

Results: The mean number of emotion words produced was 11.26 (SD = 3.13), which is comparable with previous samples (Abeare et al., 2009). The novel aspect of the current study is in the characterization of responses. In total, 359 different emotion word responses were generated across the group of participants. We present frequencies of emotion words produced on the EWFT as well typical response ordering, to give a sense of the typicality of responses and response patterns. In addition, lexical properties of responses were examined.

Conclusions: The EWFT has been shown to be reliable (Abeare et al., Submitted) and is accumulating construct validity (Abeare et al., 2009) and incremental validity evidence (Abeare et al. Submitted) to support its use in clinical settings. The EWFT taps into an emotionally salient aspect of executive functioning (aka hot executive functions). The reported data will be useful in characterizing individual and group performance on the EWFT for research and clinical purposes. In addition, examination of responses provides a sense of the emotion word lexicon of healthy young adults. Ongoing research is examining this in older adults and patient groups.

Correspondence: *Christopher Abeare, Ph.D., University of Windsor, 401 Sunset Ave., Windsor, ON N9B 3P4, Canada. E-mail: cabear@uwindsor.ca*

S. BONNER, M. SMITH, M. NORRIS, J. OSTERHAGE, D. FLECK, M. CERULLO, S. STRAKOWSKI, J. LEE, J. ELIASSEN & P. SHEAR. Scanner Noise Impacts Attentional Performance and Self-Reported Affect.

Objective: The first goal of this study was to confirm that a modified affective Posner task, similar to one used in previous neuroimaging work, is successful in inducing frustration in healthy individuals. The second goal was to examine the impact of scanner noise on task performance and self-reported mood and arousal.

Participants and Methods: 32 participants (mean age = 21.2 years; 28.1% male) with no self-reported history of neurological disorder or mental illness completed three blocks of an affective Posner task designed to induce frustration through monetary contingencies and rigged feedback. At the end of each block, participants rated their mood, arousal level, and sense of dominance. During the task, half of the participants heard noise recorded from a 4T MRI system running an echo planar sequence commonly used in a fMRI recorded MRI scanner noise; half heard no noise.

Results: Repeated measures ANOVAs revealed significant effects of noise on mood, $p < .05$, and arousal $p < .10$, with the noise group endorsing more discomfort on both measures. There were also significant effects of task block on mood, $p < .05$, and arousal, $p < .05$, with lower mood and greater arousal under the monetary and rigged feedback conditions.

Conclusions: The task successfully induced frustration, with participants endorsing more negative mood and increased arousal across blocks. In addition, the scanner noise had a significant effect on self-report, suggesting that the acoustic qualities of MRI enhance frustration effects on this task and that scanner noise may influence mood and arousal during similar fMRI tasks.

Correspondence: *Shawna Bonner, BA, Psychology, University of Cincinnati, 453 Missouri Ave, #2, Cincinnati, OH 45226. E-mail: shawbo88@gmail.com*

G. BRIGGS, C. CHAREST-GIRARD, M. KUNZ, M. PICHÉ, E. VACHON-PRESSEAU & P. RAINVILLE. Multimodality of Measures Increases the Validity of Studies Examining the Neurophysiology of Pain and Emotions.

Objective: The complexity of pain and emotions continues to challenge researchers aiming to better understand their determinants. This

presentation stresses the importance of combining measurements of a variety of neurophysiological responses to study acute pain. These include behavioral responses (i.e. subjective evaluation of pain and facial pain expressions), automatic motor responses (i.e. withdrawal reflex), reactive stress hormones (i.e. cortisol), autonomic reactivity (i.e. skin conductance response) and brain activations (i.e. blood oxygenation level-dependent).

Participants and Methods: The necessity of a multimodal model will be illustrated by a series of experiments examining how individual differences in regional brain activity reflect differences in various output channels.

Results: First, we show that distinctive brain activations in frontal and limbic networks are explaining variance associated with inter-individual differences in withdrawal reflex amplitude, skin conductance response and subjective pain experiences induced by acute noxious stimuli (Piche et al., 2010). We secondly present results showing that facial expressions of pain are positively associated with thalamocortical responses to acute noxious heat stimuli, while frontostriatal activity is inversely coupled with facial expressiveness (Kunz et al., 2011). Finally, we recently found that the increases in the concentration of salivary cortisol produced during fMRI experiments involving acute noxious heat stimuli are associated with reduced responses in several pain-activated brain regions (Vachon-Preseau, in preparation).

Conclusions: Altogether, this demonstrates the complementarities of these measures that can be combined to enlighten the multiple mechanisms involved in pain and emotions.

Correspondence: *Gabrièle Briggs, Université de Montréal, 918, avenue d'Oxford, Montréal, QC H4A 2X4, Canada. E-mail: gabrielle.briggs@umontreal.ca*

L. BURTON, D. HENNINGER, J. MIRMAN & E. LEVY. Verbal Fluency, Personality, and Gender.

Objective: The objective of this study was to evaluate gender patterns in the relationships between cognitive skills which have shown gender differences, and personality.

Participants and Methods: One hundred eighty two (126 female, 56 male) university participants were administered the Thurstone Verbal Fluency Test, the Vandenberg Mental Rotation Test, and the NEO-FFI as a measure of the 5 personality factors.

Results: The male participants scored higher than the female participants on the spatial test, and the female participants scored higher than the male participants for the verbal fluency test, as reported by other researchers. Female participants reported more extraversion and agreeableness than the male participants.

The 5 personality factors were not related to spatial ability, but several interesting relationships with verbal fluency were found. Extraversion was correlated with verbal fluency for both the male and female participants.

For the male participants, verbal fluency was also positively associated with agreeableness, and for the female participants, verbal fluency was associated with openness and conscientiousness.

Conclusions: Thus, the relationships between cognitive variables and personality factors differed between the sexes. These findings are discussed in terms of the common frontal neural substrate of verbal fluency and these aspects of personality, as well as the inherently social nature of language as a communication tool.

Correspondence: *Leslie Burton, PhD, Psychology, University of Connecticut, One University Place, Stamford, CT 06901. E-mail: leslie.burton@uconn.edu*

L. BURTON, J. MAREGA ALLIMANT, R. KINSMAN, A. LEVIN, L. KOVACS, E. KOSKORELOS & J. BAHRAMI. Gender, Personality, and Perception of Vocal Emotion.

Objective: Numerous studies report gender differences in emotional perception. These studies frequently utilize face stimuli or questionnaires; perception of vocal emotion has been less studied. The goal of the present study was to evaluate gender differences in perception of vocal emotion, and relationships with personality variables.

Participants and Methods: One hundred fifteen university community participants (73 female, 42 male) with a mean age of 22.2 years were evaluated on a test of perception of emotion in voices (DANVA2), and measures of the five factors of personality, relational aggression and physical aggression.

Results: Gender differences were found such that the male participants reported higher levels of physical aggression, and the female participants reported greater Neuroticism, consistent with other data. For the male participants, there were strong relationships between better perception of vocal emotion and both greater Extraversion and greater Conscientiousness, all involved in interpersonal functioning. These relationships were not found in the female participants, but there was a relationship between perception of emotion in tone of voice and relational aggression. Women who were better at perceiving the emotional status of others based on vocal cues were less relationally aggressive.

Conclusions: Perhaps greater relational aggression reflects a poor adaptation to diminished ability to perceive the emotional status of others. The present data suggest that the components of effective interpersonal functioning are related in different ways in men and women; it is important to look for these different patterns in analyses.

Correspondence: *Leslie Burton, PhD, Psychology, University of Connecticut, One University Place, Stamford, CT 06901. E-mail: leslie.burton@uconn.edu*

L. BURTON, E. GUTERMAN & G. BAUM. Effect of Prenatal Androgen on Adult Personality: Greater Openness with More Female-Typical 2D:4D Digit Ratios.

Objective: The goal of the present study was to evaluate biological bases of personality in terms of relationships between an index of prenatal androgen level and adult personality factors.

Participants and Methods: One hundred seven university community participants (71 female, 36 male) were evaluated on the five personality factors of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness using the NEO-FFI. Photocopies of their hands were made in order to measure finger length and determine the ratio of the second to fourth digit (2D:4D). It is well-established that 2D:4D ratios are indices of prenatal androgenic activity, and are correlated with many variables showing gender differences, including spatial ability and aggression.

Results: Gender differences were found such that the women indicated greater Neuroticism than the men, and the men had lower 2D:4D ratios than the women for both the left and right hands, as reported by others. Most interestingly, greater Openness was significantly associated with more female-typical (higher) 2D:4D ratios for the entire sample. This was significant for the male sample alone, and was found at a trend level in the female sample alone.

Conclusions: The finding that greater Openness was associated with a more female-typical digit ratio was discussed in the context of other reported gender differences in personality, including Openness, and the literature on the biological bases of certain aspects of personality.

Correspondence: *Leslie Burton, PhD, Psychology, University of Connecticut, One University Place, Stamford, CT 06901. E-mail: leslie.burton@uconn.edu*

S. DELDONNO, Z.J. SCHWAB, M. KIPMAN, S.L. RAUCH & W.D. KILLGORE. The Influence of Cognitive and Emotional Intelligence on Performance on the Iowa Gambling Task.

Objective: Emotional Intelligence (EI), the ability to accurately perceive, understand, manage, and use emotional information to solve problems, is purported to be a capacity distinct from traditional cognitive intelligence. We sought to validate the EI construct by examining the contribution of EI to performance on the Iowa Gambling Task (IGT), a behavioral index of the ability to use emotional cues to guide advantageous decision-making.

Participants and Methods: Thirty-one healthy adults (16 females, ages 18-45) completed an "ability" test of EI (Mayer-Salovey-Caruso

Emotional Intelligence Test; MSCEIT), a "trait" measure of EI (Bar-On Emotional Quotient Inventory; EQi), a measure of standard intelligence (Wechsler Abbreviated Scale of Intelligence; WASI), and the IGT. High and low EI groups were defined by a median split. Data were analyzed with repeated-measures ANCOVA.

Results: For the MSCEIT, there was a main effect of EI group ($p=.03$), with high scorers showing better decision-making on the IGT than low scorers. However, this effect was no longer significant with IQ held constant ($p=.11$). Conversely, there was no main effect of EQi on IGT regardless of whether IQ was controlled ($p=.62$) or not ($p=.82$). Ability EI correlated significantly with performance on the last block of the IGT ($r=.47$), but this effect was lost after controlling for IQ.

Conclusions: Ability EI is a better predictor of performance on an emotional decision-making task than trait EI. However, the considerable shared variance between trait EI and standard intelligence appears to account for this effect. These findings raise doubts about the unique predictive validity of EI beyond standard cognitive intelligence.

Correspondence: *Sophie DelDonno, B.A., McLean Hospital, Harvard Medical School, 115 Mill St., Belmont, MA 02478. E-mail: sdeldonno@mclean.harvard.edu*

E. FINE-FOSTER. Deconstructing the Psychological Components of Emotional Decision Making and their Relation to the Suicide Continuum.

Objective: Research has consistently demonstrated the association between drug use and poor emotional decision making. However, little is known about the psychological components that contribute to the emotional decision-making process. The current study aimed to assess two of the assumptions of the somatic marker hypothesis (Bechara et al., 2000). In addition, the current study aimed to apply research on emotional decision making to another problem of volition: suicidality. Lastly, the current study attempted to replicate research that has found significant associations between suicidality, coping, and autobiographical memory, but in a homeless population.

Participants and Methods: Fifty-four homeless injection drug users between the ages of 16 and 29 were administered the Iowa Gambling Task, the Suicidal Behaviors Questionnaire, the Autobiographical Memory Test, and the Ways of Coping Questionnaire.

Results: Results indicated that, like previous studies of coping and suicidality, homeless young adult injection drug users who utilized maladaptive coping mechanisms were more suicidal. Additionally, individuals with more specific autobiographical memories were better able to utilize adaptive coping mechanisms. However, they displayed higher levels of suicidality. This latter finding was found to be moderated by gender, with females displaying higher levels of suicidality in the presence of more specific negative autobiographical memories. Lastly, more adaptive emotional decision making predicted higher levels of suicide ideation, which was contrary to predictions. However, with further exploration, it was found that strong emotional decision-making acted as a buffer against attempting suicide in those who were ideating.

Conclusions: These results have important implications for assessment and treatment of suicidality.

Correspondence: *Emily Fine-Foster, Ph.D., Clinical Psychology, VA Long Beach Healthcare System, 5901 East 7th Street (06/116B), Long Beach, CA 90822. E-mail: emily.fine.foster.phd@gmail.com*

M. GARON, S. SIROIS & I. BLANCHETTE. Induced mood influences visual treatment of threatening stimuli.

Objective: It has been demonstrated that music influences visuospatial attention. It is unclear whether this effect is due to increased arousal or changes in mood. The nature of stimuli also influences attention; threats are detected more quickly than neutral stimuli. In this study, our first objective was to differentiate between the effects of arousal and mood, by inducing different moods using the same piece of music (heavy metal) to participants who appreciate it and others who don't. Our second objective was to examine whether arousal and mood interact with the nature of stimuli (threat) to influence attention.

Participants and Methods: Three groups of participants (heavy metal fans, non-fans and control groups) performed a visual search task with angry and neutral faces. Fans and non-fans were exposed to the same piece of music before the task.

Results: As expected, music increased positive mood in fans and decreased positive mood in non-fans while the control group's mood remained stable. However, no increase in physiological arousal (measured by pupillary dilation) was observed among participants exposed to the music. In the visual search task, angry (threatening) faces were detected more quickly than neutral faces. This effect was more pronounced in the fan and control groups, and decreased in the non-fan group.

Conclusions: Results suggest that the influence of music on the effect of threatening stimuli may be attributable to the mood induced rather than to changes in arousal. The phenomenon of crossmodal habituation is proposed to account for the results.

Correspondence: *Mathieu Garon, Psychologie, Université de Montréal, 90 tincant d'indy, Montreal, QC H2V 2S9, Canada. E-mail: server345@hotmail.com*

A. GRIGOROVICH, M. GOMEZ, J. FISH & L. LEACH. Relationship Between Neuropsychological Functioning And Severity Of Depression Following Electrical Injury.

Objective: This study investigated the relationship between severity of depressive symptoms and neuropsychological functioning in electrical injury (EI) patients. It was hypothesized that EIs with more severe depressive symptomatology would be more neuropsychologically impaired than EIs with milder symptoms or EIs without depression.

Participants and Methods: Data was obtained from an ongoing study of adult EIs in a rehabilitation hospital. Thirty consecutive patients (28 males) were studied, with a mean (\pm SD) age of 43.4 \pm 10.0 years. All participants completed the Beck Depression Inventory (BDI-II) and a series of psychometric measures of neuropsychological functioning. Using BDI-II scores, participants were assigned to one of three groups: Normal (0-13), Mild-to-Moderate Depression (14-28) and Severe Depression (29-63). A One-way ANOVA analysis was conducted to examine differences between groups.

Results: Age, education and IQ were not significantly different between groups. Time between EI and testing was significantly different between groups, with subjects in the Mild-to-Moderate and Severe groups having longer times than those in the Normal group (9.6 vs. 27.4 vs. 60.4 months, $p=0.022$). Subjects in the Severe group performed significantly worse ($p<0.05$) on measures verbal recall, than subjects in the Mild-to-Moderate or Normal groups. Measures of attention, psychomotor speed, executive function and visual recall were not significantly different between groups.

Conclusions: These results indicate that depression is associated with deficits in verbal memory in EI patients; severity of depressive symptoms may affect the severity of impairment within this domain. These findings also suggest that length of time between injury and testing may influence the severity of depression.

Correspondence: *Alisa Grigorovich, MA, Clinical Research, St John's Rehab Hospital, 285 Cummer Ave, Toronto, ON M2M 2G1, Canada. E-mail: agrigorovich@stjohnsrehab.com*

B.D. HAASE, S.L. WEISENBACH, E.M. BRICENO, A.C. VEDERMAN, K.E. HAZLETT, L.J. RAPPORT, Z. JON-KAR & S.A. LANGENECKER. Angry Error Bias in Major Depression is Associated with Subgenual Cingulate Hyperactivation.

Objective: The literature surrounding emotion processing and Major Depressive Disorder (MDD) often explores affect discrimination deficits in MDD. This study critically examined measures of error biases in the classification of negative emotions for individuals with MDD, and investigated possible neurobiological underpinnings for any significant biases.

Participants and Methods: The Facial Emotion Perception Test (FEPT) was administered to 47 healthy controls (26 women, 11 men) and 33

individuals with MDD (25 women, 8 men) during fMRI. Facial emotion expressions were presented briefly on a screen, and participants were required to respond with which emotion they perceived (Happy, Angry, Fearful, Sad). Misdirected Error Bias for Errors (MEB-E) was developed as a new measure of error bias that is independent of task performance, and measures both directionality and strength of a participant's error biases (as a proportion of total errors of a type).

Results: A one-tailed t test of the MEB-E revealed that individuals with MDD ($M=.35$, $S.D.=.21$) were more likely than healthy controls ($M=.28$, $S.D.=.20$) to incorrectly label faces as angry with trend-level significance, $t(78)=1.56$, $p=.062$, $d=.36$. Regression analyses of imaging data indicated that activation in the subgenual anterior cingulate and dorsal cerebellum was positively correlated with MEB-E for a sad minus neutral contrast.

Conclusions: The interaction of anger-directed bias and associated activation in individuals with MDD creates inappropriate social action contingencies, which could result in the difficult and fractured social interactions often associated with MDD. Understanding the behavioral and neural origins of these biases could be useful in developing targeted symptom-individualized treatments for individuals with MDD.

Correspondence: *Brennan Haase, B.S. Psychology, Neuropsychology, University of Michigan, 2411 Lancashire Dr., #TB, Ann Arbor, MI 48105. E-mail: bdhaase@gmail.com*

J.R. HAMILTON, K.B. FROMING, W.J. FROMING, D.G. NEMETH, A.P. STEGER & L.T. WHITTINGTON. Differential Visual and Auditory Emotion Processing Capabilities in Children.

Objective: Women have consistently outperformed men in a small yet statistically significant manner on nonverbal emotion processing tasks (Brody, 1985). The Comprehensive Affect Testing System (CATS) consists of 13 unique subtests that assess emotion processing across basic emotion communication channels in three broad domains: facial, prosodic, and lexical.

Still in its nascent stage of development, the CATS emotion processing test has not yet been extensively used with children. Therefore, children's visual and auditory emotion processing skills were analyzed in this dissertation research project.

Participants and Methods: Seventy Caucasian (34 male, 36 female) children between the ages of 6 and 13 completed the CATS. Because of the small sample size, a significance level of $p<1.0$ was used to determine if observed differences between groups were significant. Appropriate analyses were then used to compare groups.

Results: No differences between experimental groups were found for Age or Full Scale IQ. A significant gender effect, however, was found with girls outperforming boys on 2 of the 11 emotion processing tasks that involved visual emotion processing. When emotion words or labels were involved in visual tasks, differences between groups lessened. No differences between groups were found on auditory emotion processing tasks.

Conclusions: A trend of females outperforming males in emotion processing research experiments exists, even in children. This was confirmed by the CATS, wherein girls were found to be more skillful in visual emotion processing than boys.

Correspondence: *Darlyne G. Nemeth, Ph.D., M.P., M.P.A.P., The Neuropsychology Center of Louisiana, LLC, 4611 Bluebonnet Blvd, Ste. B, Baton Rouge, LA 70809. E-mail: dgnemeth@gmail.com*

L.M. JENKINS, D.G. ANDREWES, C.L. NICHOLAS, K. DRUMMOND, B. MOFFAT, P. PHAL & P. DESMOND. Emotional Reactivity Following Surgery to the Prefrontal Cortex.

Objective: We measured emotional reactivity in patients following surgical resection of prefrontal cortex (PFC) tumours to determine specific brain regions involved in the subjective experience, behaviour, and physiology that comprise emotions. We hypothesised that PFC lesioned patients would have reduced emotional reactivity compared to a non-cerebral neurosurgical control group.

Participants and Methods: Brain surgery patients were divided into groups using Brodmann areas, as determined by post-surgical MRI registered to MNI space. Patients had lesions to the anterior cingulate ($n=4$), orbitofrontal ($n=7$), ventromedial (VM, $n=5$) or dorsolateral ($n=12$) PFC. The control group comprised 26 extra-cerebral neurosurgical patients. Participants were shown 16 standardised film clips chosen to elicit discrete emotions as EEG, ECG, skin conductance, self-report and facial expression were recorded.

Results: In support of the hypothesis, orbitofrontal lesioned patients displayed less intense facial expressions and had lower heart rate compared to controls, however in contrast to our hypothesis, VM lesioned patients reported more negative emotion than controls. An analysis of EEG alpha asymmetry failed to support theoretical proposals of hemispheric dominance of emotional valence.

Conclusions: The reduced facial expression and sympathetic activation of the orbitofrontal group may be related to the importance of this region for evaluation of emotional information. The increased self-reported emotion of the VM group may be due to a disinhibition of other structures known to take part in emotional processing. A neuroanatomical model was derived from these results, which argues that the behavioural profile associated with VM damage is due to multiple emotional deficits that combine to handicap social functioning.

Correspondence: *Lisanne M. Jenkins, B.A. (Hons), Psychology; The University of Melbourne, Level 12, Redmond Barry building, The University of Melbourne, Parkville, VIC 3010, Australia. E-mail: lisannej@unimelb.edu.au*

L.M. JENKINS, D.G. ANDREWES, C.L. NICHOLAS, K. DRUMMOND, B. MOFFAT, P. PHAL & P. DESMOND. Perception of Emotion in Patients Following Surgery to the Prefrontal Cortex.

Objective: We aimed to investigate which anatomical locations are important for perception of emotional and social information by examining a group of brain surgery patients with discrete lesions to the prefrontal cortex (PFC). It was hypothesised that patients with PFC lesions would be more impaired on these tasks than a control group of non-cerebral neurosurgical patients.

Participants and Methods: Brain surgery patients were divided into groups using Brodmann areas, as determined by post-surgical MRI registered to MNI space. Patients had lesions to the anterior cingulate ($n=4$), orbitofrontal ($n=7$), ventromedial (VM, $n=5$) or dorsolateral ($n=12$) PFC. The control group comprised 26 extra-cerebral neurosurgical patients. Participants completed a forced-choice computerised facial morphing task, a questionnaire that assessed theory of mind and empathy, and measures of the perception of emotion in still facial expressions, vocal expressions, and music from film clips.

Results: VM lesioned patients were impaired at identifying morphed facial expressions overall, and fear expressions in particular, and were additionally impaired on the theory of mind scale. They also rated the still facial expressions, vocal expressions, and music clips as more intensely emotional compared to the control group for both congruent (e.g. positive ratings of positive items), and incongruent (e.g. negative ratings of positive items) ratings.

Conclusions: Patients with VM lesions have both an impaired perception of the emotional value of stimuli, and a tendency to be disinhibited in responses when the task allows. The VM cortex is responsible for emotional evaluation and the inhibitory control of other structures involved in emotional processing.

Correspondence: *Lisanne M. Jenkins, B.A. (Hons), Psychology; The University of Melbourne, Level 12, Redmond Barry building, The University of Melbourne, Parkville, VIC 3010, Australia. E-mail: lisannej@unimelb.edu.au*

W.D. KILLGORE & Z.J. SCHWAB. Emotional Intelligence Correlates with Somatic Marker Circuitry Responses to Subliminal Cues of Facial Trustworthiness.

Objective: Emotional intelligence (EI) involves the ability to accurately perceive, understand, and use emotional information to improve cognition. The neural basis of EI has not been well delineated but may involve the Damasio somatic marker circuitry (medial prefrontal cortex [MPFC], insula, and amygdala). We tested the hypothesis that activation within this circuitry would be correlated with measured of EI during subliminal presentations of untrustworthy faces.

Participants and Methods: Forty-one healthy adults (22 male) ranging from 19 to 45 years of age completed the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) and the Bar-On Emotional Quotient Inventory (EQi). Participants viewed faces varying in trustworthiness. Conscious awareness of trustworthy cues was minimized via rapid presentation of the target face (20 msec) and subsequent masking by a neutral expression (80 msec). Brain activation was correlated with EQi and MSCEIT. Three bilateral search territories comprising the somatic marker circuitry were interrogated ($p<.01$, $k\geq 10$), including MPFC, insula, and amygdala.

Results: Higher MSCEIT correlated with greater left insula and MPFC activation to low facial trustworthiness, but reduced activation of the rostral and middle cingulate gyrus and posterior orbitofrontal cortex. Higher EQi scores were associated with increased bilateral anterior insula responses and reduced amygdala responses to facial cues of untrustworthiness.

Conclusions: During subliminal perception of facial untrustworthiness, both measures of EI were associated with increased responsiveness of insular cortex, a region of the somatic marker circuitry posited to be critical for social emotions and interoceptive processing (i.e., "gut feelings"). Higher EI may involve increased interoceptive sensitivity to stimuli with high social relevance.

Correspondence: *William D. Killgore, Ph.D., Psychiatry; Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

W.D. KILLGORE & Z.J. SCHWAB. Trust Me! Neural Correlates of the Ability to Identify Facial Trustworthiness.

Objective: The ability to identify trustworthy individuals is a critical aspect of human survival. Overt perception of untrustworthiness has been shown to activate the amygdala, but it is not clear how these patterns of activation relate to the actual ability to discriminate facial cues of trustworthiness.

Participants and Methods: Thirty-six healthy adults (20 male) ranging from 19 to 45 years of age underwent fMRI while viewing masked presentations of faces classified as either Trustworthy (T) or Untrustworthy. Conscious perception of trustworthiness cues was prevented via rapid presentation of the target face (20 msec), which was masked immediately by a neutral expression (N) mask (80 msec). Afterward, participants made overt trustworthiness judgments (OTJ) for 100 pairs of faces differing in qualities of trustworthiness. Contrast images comparing T and U fMRI conditions were regressed against OTJ accuracy scores in SPM5. Whole brain analyses were evaluated at $p<.005$, $k\geq 20$ voxels. A search territory within the amygdala was interrogated at $p<.01$, $k\geq 5$ voxels.

Results: OTJ accuracy ranged from 47% to 87%. During T>U contrasts, greater accuracy on the OTJ task correlated with increased activation within face processing regions of the fusiform and lingual gyri, and cerebellar vermis. During U>T contrasts, OTJ accuracy correlated with increased activation within affect processing regions such as the medial prefrontal cortex, insula, and hippocampus, and at a more liberal threshold, bilateral amygdala.

Conclusions: Individuals who were better at discriminating between overtly presented trustworthy and untrustworthy faces showed greater task-related activation of facial feature and affect processing systems during subliminal presentations of facial signals of trustworthiness.

Correspondence: *William D. Killgore, Ph.D., Psychiatry; Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

W.D. KILLGORE & T.J. BALKIN. Sleep Deprivation Degrades Recognition of Specific Emotions.

Objective: Affective processing is particularly sensitive to sleep loss, and insufficient sleep degrades the ability to recognize certain categories of emotion. Because prior studies have only included a limited number of emotion categories, here we evaluated the effects of one night of sleep deprivation and recovery sleep on the 6 basic emotion categories.

Participants and Methods: Healthy individuals (29 males; 25 females) completed the Ekman Emotion Hexagon Test (EHT), which presents a series of 120 standard facial expressions the six primary emotions that have been computer morphed with their most highly confusable ex-

pression counterparts (e.g., happiness-surprise; surprise-fear) to create continua of expressions that differ in discriminability. Participants identified the dominant emotion in each expression. The EHT was administered following a normal night of sleep, again following 23.5 hours of sleep deprivation, and after 12 hours of recovery sleep. Data were analyzed with repeated measures analysis of variance.

Results: There was a significant session x valence interaction ($p=.001$), showing that sleep deprivation was associated with significantly reduced accuracy for identifying happiness and sadness ($p<.05$), which returned to normal following recovery sleep. In contrast, none of the other emotions showed significant declines as a function of sleep loss.

Conclusions: Recognition of the two most common human emotional expressions, happiness and sadness, was degraded by sleep loss, while other more primitive survival-oriented recognition systems remained unaffected. Happiness and sadness are particularly important to prosocial interpersonal behaviors involving affiliation and empathy. Sleep loss may, therefore, have particularly adverse impacts on social communication and interpersonal interactions that require emotional sensitivity. Correspondence: *William D. Killgore, Ph.D., Psychiatry, Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

M. KIPMAN, Z.J. SCHWAB, M.R. WEINER, S. DELDONNO, S.L. RAUCH & W.D. KILLGORE. The Insightful Yet Bitter Comedian: The Role of Emotional versus Cognitive Intelligence in Humor Appreciation.

Objective: The ability to appreciate humor involves both cognitive and emotional processes. Prior research suggests that cognitive intelligence (IQ) is highly correlated with humor appreciation. We evaluated the individual and combined influences of IQ and emotional intelligence (EI) on performance on the Penn Humor Appreciation Test (HAT), a validated measure of the ability to appreciate subtle aspects of humor.

Participants and Methods: 36 healthy adults (18 females) aged 18-45 completed the HAT, the Wechsler Abbreviated Scale of Intelligence (WASI) and two measures of EI; the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) and the Bar-On Emotional Quotient Inventory (EQ-i).

Results: In a hierarchical linear regression, verbal and performance IQ were entered at the first level, followed by stepwise entry of MSCEIT and EQ-i subscales to predict HAT scores. IQ variables accounted for a significant proportion of the variance in HAT ($R^2=0.34$, $p=0.001$). Above and beyond IQ, the MSCEIT Understanding Emotions factor ($b=0.57$) and EQ-i General Mood factor ($b=-0.29$) each accounted for additional variance (combined model $R^2=0.55$, $p=0.04$). In a subsequent analysis, all IQ and EI subscales were entered stepwise to predict HAT performance. In combination, only MSCEIT Understanding ($b=0.80$) and EQ-i General Mood ($b=-0.28$) survived tolerance thresholds ($R^2=0.53$, $p<0.001$).

Conclusions: Both emotional and cognitive intelligence are correlated with humor appreciation. Findings suggest, however, that the most important factors contributing to humor appreciation ability include strong capacities related to labeling and reasoning with emotions in conjunction with a more negative general mood. EI appears to provide better prediction of humor appreciation ability than traditional measures of IQ. Correspondence: *Maia Kipman, Sc.B., Harvard, 115 Mill St., Mail Box 334, Belmont, MA MA. E-mail: Mkipman@mclean.harvard.edu*

A. KOLB, C.A. NOGGLE, M. PILLA, M. MOTYKA, J.C. THOMPSON & J.R. WALL. Correlations Between MMPI-2 Clinical Scales and RBANS Indices.

Objective: Studies of individuals with a variety of psychiatric deficits have shown that increased emotional distress may contribute to decreases in cognitive functioning within a variety of areas (e.g. executive functioning). While establishments have been made, little research has investigated the broader scope of relationships that may present between psychiatric profiles and demonstration of cognitive skills. The current study evaluated the relationship between profiles on the MMPI-2 and performance outcomes on the RBANS to determine whether linear relationships could be established amongst the various factors.

Participants and Methods: An archival data set was utilized for the present study. Participants included 72 individuals who completed the MMPI-2 and the RBANS as part of a more comprehensive neuropsychological evaluation.

Results: Canonical correlation revealed a multitude of significant negative correlations between outcomes on the RBANS indices and renderings of the MMPI-2 clinical scales. Specifically, significant negative correlations were found between the Immediate Memory indices and the Masculinity-Femininity scale; the Visual-spatial/ Construction indices and the F, Hypochondriasis, Masculinity-Femininity and Hypomania clinical scales; the Attention indices and the F, Hypochondriasis, Hysteria, Masculinity-Femininity, Paranoia, Psychasthenia, Schizophrenia & Hypomania scales; the Delayed memory indices and the Masculinity-Femininity scale; and, finally, the Total Scales indices and the F, Masculinity-Femininity, Schizophrenia & Hypomania scales.

Conclusions: Results carry clinical implications as they provide an establishment of the nature of possible relationships between specific clinical scales and areas of cognitive functioning, albeit by using a measure designed more as a screening measure of neurocognitive functioning. Additional findings and implications will be offered.

Correspondence: *Alissa Kolb, M.A., University of Indianapolis, 749 East Dr. Woodruff Place, Apt. B, Indianapolis, IN 46201. E-mail: kolba@uindy.edu*

R.A. DISTEFANO & N.S. KOVEN. Selective Attention, Memory, and Alexithymia: Performances on an Emotional Stroop Task and WMS-III Subtests.

Objective: Alexithymia, characterized by difficulty processing emotions, results in a wide range of impairments. This pattern of dysfunction may be explained, in part, by a deficit in selective attention for emotional information, which may then lead to impaired emotional memory. Currently, the role of attention and memory in alexithymia is unclear.

Participants and Methods: In Study 1, participants ($N = 72$) completed self-report measures of alexithymia, an emotional Stroop task, and an incidental memory task. In Study 2, individuals selected for high ($n = 12$) versus low ($n = 12$) alexithymia completed the WMS-III.

Results: Principal components analysis produced two factors relevant to alexithymia: Emotional Monitoring (EM) and Emotional Clarity (EC). With regard to eStroop, high-EM individuals took longer to respond and made more errors than low-EM individuals, regardless of word type. With regard to incidental memory, high-EC individuals were better at disregarding negative distracters, but less proficient at recognizing negative targets than low-EC individuals. On the WMS-III, high- and low-alexithymics performed equivalently on verbal subtests, offering evidence against an underlying verbal deficit. However, high-alexithymics demonstrated a deficit in visual memory of social scenes and an unexpected strength in working memory.

Conclusions: Alexithymic individuals have a unique pattern of memory performance that appears to be driven by an underlying inability to process emotional information. Moreover, the finding of distinct behavioral correlates for emotion-related processes underscores the utility of examining alexithymia at the facet level.

Correspondence: *Nancy S. Koven, Ph.D., Psychology, Bates College, 4 Andrews Road, 365 Pettengill Hall, Lewiston, ME 04240. E-mail: nkoven@bates.edu*

F. KUMFOR, J.R. HODGES & O. PIGUET. Reduced Emotional Enhancement of Memory in Frontotemporal Dementia.

Objective: Highly arousing events tend to be remembered better than neutral events. This effect is mediated by structures in the temporal lobe including the amygdala. In frontotemporal dementia (FTD), a progressive neurodegenerative brain disorder affecting regions of the temporal lobe, patients' ability to recognise and process emotions is disrupted. Whether these emotional disturbances affect emotional enhancement of memory in FTD is unknown, but we hypothesised that this mechanism would be affected.

Participants and Methods: Eight FTD patients and 13 healthy controls were exposed to an emotionally arousing short story and a closely matched, emotionally neutral one. Recognition memory for the two stories was assessed after a 1-hour delay.

Results: Overall recognition memory of the two stories was better in controls than in FTD patients. Importantly, controls remembered significantly more details from the emotional story, than from its neutral counterpart, whereas the FTD group remembered a similar number of details regardless of its emotional content. Nevertheless, both groups rated each story similarly for emotionality and understanding.

Conclusions: These results show that emotional enhancement of memory is compromised in FTD, and lend further support to the importance of temporal lobe structures for many aspects of emotional processing. The results indicate that although FTD patients perceive an event as emotional, their ability to remember details of the event is no greater than that of similar non-emotional events. This finding has clinical implications for the management of these patients.

Correspondence: *Fiona Kumfor, Neuroscience Research Australia, PO Box 1165, Randwick, Sydney, NSW 2031, Australia. E-mail: f.kumfor@neura.edu.au*

M.M. LITTLE, L. MAJED & C. ABEARE. State and Trait Influences on the Emotion Word Fluency Test.

Objective: The current project examines how Big 5 personality traits, state affect and trait affect influence production of emotion words on the Emotion Word Fluency Task (EWFT; Abeare et al. 2009). The relationships between personality, affect, and verbal fluency have been examined in the literature, however these factors have not been examined in relationship to emotion word fluency. Study 1. examined the relationship between trait affect and production of positive and negative emotion words. Study 2. examined the relationship between personality traits and induced state affect on emotion word production.

Participants and Methods: Study 1. participants included 121 undergraduate students (25 male, 96 female, Age M = 21.42, SD = 4.127). Study 2. participants included 117 undergraduate students (30 male, 87 female, Age M = 21.24, SD = 3.66). Participants in both studies were screened for depression, anxiety, neurological disorder, and other disorders known to affect mood and language functioning.

Results: Two groups were formed by median split for both trait NA and trait PA. In Study 1., a significant NA x PA interaction was found for positive emotion words, demonstrating that individuals who are high on both positive affect and negative affect produce the most positive emotion words. In study 2., we took a more exploratory approach and conducted regressions on Big Five factors and state affect on emotion word production. These analyses revealed that agreeableness and extroversion were negatively correlated with number of negative emotion words produced and that openness to experience and extroversion moderate the relationship between state affect and emotion word production.

Conclusions: We demonstrate that personality variables associated with PA are negatively associated with the number of negative words produced. Further, exploratory analyses suggest state x trait interactions for total emotion words produced. Findings are discussed within the context of individual differences and hot executive functions.

Correspondence: *Melissa M. Little, B.A., Psychology, University of Windsor, 401 Sunset Avenue, Office: 170 Chrysler Hall South, Windsor, ON N9B3P4, Canada. E-mail: cabear@uwindsor.ca*

D.A. LOWE & S.A. ROGERS. Age Differences in Depressive Symptoms Among Cognitively Intact Older Adults.

Objective: Depression is common among older adults and often presents differently than among younger adults. Research supports a link between depression and cognitive decline, but little research exists on depression among adults with no overt cognitive impairment. This study examines age-related differences in depressive symptoms among cognitively intact older adults.

Participants and Methods: Ninety-two cognitively intact older adults (ages 55-99) completed a neuropsychological battery, including the Mini-Mental Status Examination (MMSE). They were divided into four age groups: young-old (55-64), mid-old (65-74), old-old (75-84), and oldest-old (85+). All participants completed the Geriatric Depression Scale (GDS). To assess different symptoms of depression, five GDS factors were examined, based on Adams and colleagues' (2001, 2004) factor analyses: Dysphoric Mood (DYS1), Withdrawal/Apathy/Vigor (WAV), Worry (ANX), Cognitive Impairment (MENT), and Hopelessness (DYS2).

Results: MMSE was negatively correlated with the MENT factor, $p < .01$. Age was positively correlated with total GDS, MENT, and DYS2, $ps < .02$. ANOVAs revealed significant differences between the four age groups for total GDS and the MENT factor, $ps < .05$, with a trend for a significant difference for the DYS2 factor, $p < .05$. Post-hoc analyses indicated that the oldest-old group had higher scores than the young-old and old-old groups.

Conclusions: Among cognitively intact older adults, depression increases with age, which may be particularly due to elevations in hopelessness and cognitive symptoms. Considering distinct age groups, levels of overall depression, hopelessness, and cognitive symptoms of depression were lowest among the young-old, intermediate among the mid-old and old-old, and highest among the oldest-old. These findings suggest that depression increases with age, even in the absence of cognitive impairment, and that older adults may struggle most with specific symptoms of depression, particularly feelings of hopelessness and cognitive concerns.

Correspondence: *Deborah A. Lowe, Department of Psychology, Texas A&M University, 4235 TAMU, College Station, TX 77843. E-mail: dalowe@tamu.edu*

M.M. LUBOMSKI-HALFACRE, K. ALTERESCU, E. MURRAY, J. TWAITE, K. SCORPIO, K.R. SAVAGE, J.L. SPIELMAN, L.O. RAMIG & J.C. BOROD. The Impact of the Lee Silverman Voice Treatment (LSVT) on Facial Expression Frequency in Parkinson's Disease: Preliminary Effects of Emotion and Gender.

Objective: The lack of emotional expressivity in Parkinson's disease (PD) has been shown to create problems with social communication and interpersonal relationships (e.g., Pentland et al., 1987). PD patients are often perceived as exhibiting negative affect and as being unlikable. We examined facial emotional expression in PD patients and demographically-matched healthy controls (HCs) to determine the effect of a voice therapy treatment.

Participants and Methods: Participants were 25 non-demented, early-stage PD individuals (76% male) and 9 HCs (44% male). There were three PD groups: 9 participants received a targeted voice therapy (i.e., LSVT LOUD), 9 received a targeted articulation therapy (LSVT ARTIC), and 7 received no therapy (i.e., untreated). All participants were video-taped, before and after treatment, while producing emotional (happy, sad, and angry) and neutral monologues from the New York Emotion Battery (Borod et al., 1992). Monologues were divided into 15-second segments and evaluated by 12 naïve raters for frequency of emotional expression (i.e., how often facial emotional expressions occurred during each video segment).

Results: A Group X Gender X Time X Emotion mixed-design ANOVA was conducted. There was a significant 4-way interaction ($p = .002$). Women with PD showed a greater increase in the frequency of facial expressions during happiness monologues following LSVT LOUD treatment compared to the other participant groups. In addition, there was a trend ($p = .091$) for the main effect of Gender, with women more facially expressive than men.

Conclusions: Results suggest that LSVT LOUD may be an effective treatment for increasing positive affect with PD. Findings may have implications for improving interpersonal relationships in PD given that PD patients are perceived as showing more negative affect compared to healthy controls. Further, results provide support for research demonstrating that women are more emotionally expressive than men (e.g., Borod & Madigan, 2000).

Correspondence: *Michelle M. Lubomski-Halfacre, M.A., Psychology, Queens College and The Graduate Center of the City University of New York, SB-E318, 65-30 Kissena Blvd, Flushing, NY 11367. E-mail: TLubomski@aol.com*

M.C. PUTNAM, A. DOYLE, N. DOTY, E. O'DONNELL, B. WILLOUGHBY, K. WILSON & E. BRAATEN. An Ecological Approach to Characterizing Pediatric-Onset Mood Disorders.

Objective: Our current understanding of pediatric-onset mood disorders is largely based on laboratory studies of carefully selected groups. The current study included children and adolescents diagnosed with symptoms of a mood disorder (major depression, dysthymia, bipolar disorder, or unspecified mood disorder) after being referred for assessment of psychiatric or learning concerns, primarily by a mental health professional or pediatrician. The goals of the current study were to better characterize: 1) the presenting complaints of parents and the child, 2) the range and frequency of comorbid psychiatric and learning concerns, and 3) the neuropsychological profiles of this clinical population. **Participants and Methods:** Data from a sample of 110 children ages 6 to 18 were included ($M = 10.9$ years, $SD = 3.5$; 65 male). Using DSM-IV criteria, clinicians diagnosed subclinical or clinical symptoms of a mood disorder (39%), anxiety disorder (37%), ADHD (70%), or learning disabilities (47%). Parent (CBCL and BRIEF) and self-report (BASC-2) questionnaires as well as neuropsychological data (measures of executive function, visuospatial functions, and learning and memory) were available.

Results: Children diagnosed with mood symptoms were also likely to be diagnosed with learning difficulties. Parents reported concerns about mood, behavioral regulation, and symptoms of anxiety and ADHD. Children reported more symptoms of depression and greater school-related difficulties. Preliminary neuropsychological data suggested selective deficits in working memory and processing speed in the context of intact intellectual ability.

Conclusions: Findings suggest a high rate of comorbidity between pediatric-onset mood disorders and learning disabilities, which may be related to weaknesses in aspects of executive function. Findings also highlight the importance of parent and child presenting complaints as these may have predictive validity in differential diagnosis.

Correspondence: *Mary C. Putnam, PhD, Psychiatry, Massachusetts General Hospital, Learning and Emotional Assessment Program, 151 Merrimac Street, Suite 500, Boston, MA 02114. E-mail: mputnam1@partners.org*

M. STRAND, M. ORAM & ÅSA. HAMMAR. Major Depression in Remission and Partial Remission. A Modified Version of the Emotional Stroop Test.

Objective: Investigating emotional information processing in remission and partly remission from depression, and exploring the possibility to model complex emotional information processing in an experimental paradigm

Participants and Methods: 20 patients, diagnosed with MDD, in remission or partial remission and a control group matched for age, gender and years of education participated.

Participants were subjected to a computer version of the emotional Stroop task, including both facial and written emotional information and presented simultaneously on the computer screen. The task was to ignore the happy or sad facial information and identify the congruent or incongruent written information, or vice versa.

Results: The patient and control group exhibited similar response patterns, being more affected by facial emotional information than written emotional information presented simultaneously, ie. a Stroop effect in favour of the facial emotional information. Patients and controls made few mistakes when identifying congruent facial and written information, however, the patient group made significantly more mistakes regarding positive valence than negative, thus indicating a bias regarding positive emotional information.

Conclusions: It seems that the emotional Stroop paradigm is a sensitive tool regarding the processing of simultaneously presented visual emotional stimuli, and that it can differentiate between patient and control groups regarding processing of emotional information. Further research including severely depressed patients and patients in complete remission is needed in order to replicate findings.

Correspondence: *Mari Strand, phd candidate, Institute of Biological and Medical Psychology, University of Bergen, Norway; Jonas Lies vei 91, Bergen 5009, Norway. E-mail: mari.strand@psybp.uib.no*

Psychopathology/Neuropsychiatry (Other)

A. BENOIT, M. BODNAR, A.K. MALLA, R. JOOBER, L. BHERER & M. LEPAGE. Changes in Memory Performance Over a 15-month Period in Relation to Achieving Symptomatic Remission After a First-Episode Psychosis.

Objective: A substantial proportion of patients display a poor clinical outcome after a first-episode of psychosis (FEP) despite receiving early and equal treatment opportunities. Our previous work showed verbal and working memory at first assessment were significantly compromised in FEP patients with a poor clinical outcome vs. those with a good outcome (Bodnar et al, 2008, *Br J Psychiatry*, 193: 297-304). However, it is unclear whether these differences in memory performance are stable over time in relation to outcome.

Participants and Methods: Verbal, visual, and working memory data were collected at beginning of treatment and 15 months later and were compared between 17 remitted and 53 non-remitted non-affective FEP patients. Remission was defined as mild or less on 8 key symptoms maintained from month 12 to month 18 (Andreasen et al, 2005, *Am J Psychiatry*, 162: 441-449).

Results: Analyses revealed a significant [group x time x memory domain] interaction ($F=5.30$, $p=0.004$). Further analyses revealed non-remitted patients displayed significantly worse performance in visual memory at first assessment ($F=8.21$, $p=0.003$) and in verbal memory at first assessment ($F=6.47$, $p=0.006$) and at follow-up ($F=19.49$, $p<0.001$) compared to remitted patients. Also, over the 15 month follow-up period, verbal memory performance significantly improved in both the non-remitted ($t=-3.73$, $p<0.001$) and remitted ($t=-4.37$, $p<0.001$) patients.

Conclusions: These results suggest verbal memory deficits may be a stable cognitive marker of poor clinical outcome in FEP patients. Despite memory improvement over time, the non-remitted patients showed poorer performance at both time points compared to the remitted patients. Earlier identification of a poor outcome may encourage clinicians to pay closer attention to these patients in the form of alternative treatments, either pharmacological or psychosocial, in hope of a more favourable outcome.

Correspondence: *Audrey Benoit, B.Sc., UQAM, 6875, LaSalle Blvd, Montreal, QC H4H 1R3, Canada. E-mail: audrey.benoit@douglas.mcgill.ca*

C.M. CONSIDINE & S. PAIVIO. Alexithymia Assessed through Auditory-Affective Perception and Interpersonal Problems as Mediators of the Relationship between Trauma and Depression.

Objective: Alexithymia involves difficulty identifying and describing emotions and has been linked to a variety of psychological problems, particularly exposure to trauma, interpersonal difficulties, and depression. Currently, alexithymia is most commonly assessed through self-report questionnaires. A neuropsychological test may be a more valid assessment of alexithymia because it uses a performance-based design and focuses on the underlying cognitive process in question: affective-processing. This impaired processing may be useful in testing an explanatory model for the relationship between trauma exposure and the subsequent development of alexithymia, interpersonal problems, and depression.

Participants and Methods: Fifty-three undergraduate students pre-screened for trauma exposure, were given questionnaires measuring alexithymia, interpersonal problems, and depression, and then administered a neuropsychological test of auditory-affective perception. Correlational analyses compared the neuropsychological measure with the alexithymia questionnaire. A hierarchical regression tested a mediational model.

Results: Performance on the neuropsychological measure of auditory-affective perception did not significantly correlate with the alexithymia questionnaire ($p > .05$). Alexithymia was found to partially mediate between trauma exposure and depression ($p = .03$). The over-all model was significant, $F(2, 50) = 25.17, p < .001$, adjusted- $R^2 = .48$.

Conclusions: Regression analyses supported self-reported alexithymia as a partial mediator of the relationship between trauma exposure and depression, suggesting that depressive symptoms developed following trauma exposure are partially related to the development of alexithymic symptoms. Auditory-affective perception performance was not significantly correlated with the measure of alexithymia, suggesting self-reported alexithymic symptoms are independent of the ability to recognize auditorially-presented emotions; possible explanations and theoretical implications are discussed. Correspondence: *Ciaran M. Conzidine, M.A., Psychology, University of Windsor, 461 Rosedale Ave., Windsor, ON N9C2N3, Canada. E-mail: considic@uwindsor.ca*

E. DAWSON, P.K. SHEAR, S.M. STRAKOWSKI, D.E. FLECK, C.M. ADLER & M.P. DELBELLO. Impulsivity as a Predictor of Psychosocial Functioning in Adults with Bipolar Disorder Recently Hospitalized for Acute Mania.

Objective: Psychosocial functioning among adults with bipolar I disorder (BPD) is often impaired, even during periods of symptom remission. While disease severity characteristics and executive dysfunction predict poorer psychosocial functioning in this population, the potential effects of impulsivity are less clear. This study assessed whether specific subcomponents of impulsivity are significantly related to psychosocial functioning in this population.

Participants and Methods: Ninety-four adults with BPD completed measures of trait and state impulsivity (i.e., the Barratt Impulsiveness Scale-11, Stop Signal Task, Delayed Reward Task, and Degraded Stimulus Continuous Performance Test) while hospitalized for a manic or mixed mood episode ($n = 60$ and 34 , respectively). Psychosocial functioning during the month prior to hospitalization was measured using the Longitudinal Interview Follow-Up Evaluation (LIFE), a structured interview that is clinician-administered.

Results: Correlations were performed between selected LIFE items and impulsivity scores. Only trait impulsivity (i.e., Barratt Impulsiveness Scale-11) during hospitalization was significantly correlated with psychosocial functioning during the prior month. Specifically, greater perceived impulse control was associated with higher life satisfaction. In addition, among the 36 participants who were employed at least part-time, better perceived impulse control was associated with better functioning in the workplace. Impulsivity did not correlate with completion of household chores or friendship quality.

Conclusions: In the current study, trait but not state impulsivity was associated with psychosocial functioning among adults with BPD hospitalized for acute manic symptoms. These results suggest that chronic impulsiveness may impact everyday functioning in this population; targeting a reduction in trait impulsiveness may therefore help to reduce morbidity associated with BPD.

Acknowledgement: 5 R01 MH066626-04 (PI: Strakowski)

Correspondence: *Erica Dawson, PhD, University of Michigan, 2101 Commonwealth Blvd., Suite C, Neuropsychology Section, Ann Arbor, MI 48109. E-mail: dawsonel@gmail.com*

K. DOUGLAS & M. SPIERS. Personality Correlates of Risk Taking Behavior on the Balloon Analogue Risk Task.

Objective: The Balloon Analogue Risk Task (BART) has been studied for its relationship to psychopathy, substance abuse, and impulsivity.

The BART is regarded as a proxy for real-world risk taking, and neuroimaging (fMRI) suggests that risk taking behavior on the BART is associated with prefrontal cortical activation. Given its possible frontal correlates, the present study examined whether the BART is associated with aspects of personality that have been theorized to reflect a deficit in prefrontal circuitry within the frontal lobe.

Participants and Methods: A total of 34 undergraduate students, screened to exclude learning disability and mood disorders, completed self-report personality inventories assessing sensation seeking (Sensation Seeking Scale; SSS), impulsivity (Barratt Impulsiveness Scale; BIS), and callous-unemotional traits (Inventory of Callous-Unemotional Traits; ICU), as well as the BART.

Results: We found that the BART showed significant, moderate to large correlations with the SSS ($r = .56, p < .01$) and ICU ($r = .43, p < .05$), but not the BIS ($r = .19, ns$). In a stepwise linear regression model, sensation seeking (SSS score) was the only significant predictor of BART performance ($b = 1.20, SE_b = 0.31, p = .001$) and accounted for 30% of the variance in task performance, with higher sensation seeking scores predicting greater risk taking on the BART. Follow-up analysis demonstrated that, among the four SSS subscales, "Thrill and Adventure Seeking" showed the strongest link to BART performance ($b = 2.73, SE_b = 0.69, p < .001, r^2 = .31$).

Conclusions: These findings suggest that the BART is sensitive to sensation seeking traits in healthy individuals, but may be of lesser utility in identifying impulsive or callous-unemotional (i.e., antisocial-spectrum) patterns of behavior. Future study of these traits within relevant clinical samples is needed to corroborate our preliminary findings.

Correspondence: *Kara Douglas, B.S., Drexel University, 12 Brookshire Ln, Philadelphia, PA 19116. E-mail: krd43@drexel.edu*

E. ESTEVIS, M.R. BASSO, R. PURDIE & D. COMBS. Self-Reported Symptoms of Depression and Neuropsychological Function in Inpatients: A Comparison of Two Depression Indices.

Objective: Major depressive disorder corresponds with cognitive impairment, but factors contributing to deficits are incompletely defined. Prior research has examined the relationship between self-reported symptoms and cognitive impairment, often yielding inconsistent findings. This implies that some self-report measures of depression may be more predictive of neuropsychological deficit than others. The present study examined the relationship between neuropsychological function and self-reported depression using a commonly administered measure, the MMPI-2, and a more recent index, the Chicago Multiscale Depression Inventory (CMDI).

Participants and Methods: 70 depressed inpatients (44 females and 26 males; age: $M = 37.3, SD = 12.6$; education: $M = 13, SD = 2.3$) and 37 controls (34 females and 3 males; age: $M = 35.9, SD = 14.8$; education: $M = 15.2, SD = 2.1$) were administered the CMDI, MMPI-2, and a neuropsychological battery including Trailmaking Tests A and B, Grooved Pegboard Test, Control Oral Word Fluency, and the California Verbal Learning Test. Participants were excluded if their MMPI-2 validity indices exceeded published cutoffs.

Results: Correlations between self-reported distress and neuropsychological function were computed. The CMDI correlated significantly with executive function, verbal fluency, new-learning, and psychomotor speed, whereas the MMPI-2 indices failed to achieve significant relationships. The magnitude of correlations for the CMDI with neuropsychological performance were moderate ($r = .2$ to $.4$).

Conclusions: These findings suggest that neuropsychological performance is correlated with self-reported symptoms of distress. CMDI predicts performance on neuropsychological assessments to a greater degree than the MMPI-2 among depressed inpatients. This implies that the CMDI may be a more suitable instrument during neuropsychological assessment of this population.

Correspondence: *Michael R. Basso, Ph.D., Psychology, University of Tulsa, 800 South Tucker Drive, Tulsa, OK 74104. E-mail: michael-basso@utulsa.edu*

A. HAMMAR, A.B. KILDAL & M. SCHMID. Cognitive Functioning in First Episode Depression.

Objective: Depression is associated with cognitive impairment in several domains, however most findings are based on mixed patient groups or recurrent depression. Few studies have investigated cognitive functioning in First episode patients and findings are so far divergent and inconclusive. Based on the scarce literature we hypothesised that patients would show normal cognitive functioning compared to patients with recurrent depression.

Participants and Methods: 31 patients (mean age 26) meeting the DSM-IV criteria for a unipolar first episode MDD diagnosis. Severity of depression was assessed by using the Montgomery Åsberg Depression Rating and the cut-off was set to 20 (mean 26). Thirty one individually matched controls were included in the study.

All participants were examined with an experimental paradigm based on visual search theory in order to investigate effortful and non-effortful information processing. Previous findings of this experimental paradigm show that patients with recurrent depression are impaired on conditions requiring effortful information processing.

Results: Two mixed between-within subject analysis of variance (ANOVA) was conducted to assess the performance of the patient group and control group. The data being used consisted of reaction times. The results showed a significant main effect of condition (effortful and non-effortful), which shows that the scores in the two conditions differs significantly. There were no significant interaction effects between group and either of the conditions.

Conclusions: Depressed patients with first ever treated episode show normal cognitive functioning in effortful information processing. This finding indicates that first ever treated patients differ from patients with recurrent depression in effortful information processing. The patient group will be followed longitudinally in order to investigate the long term course of depression and cognitive functioning.

Correspondence: *Aasa Hammar, phd, University of Bergen, Jonas Liesve 91, Bergen 5009, Norway. E-mail: aasa.hammar@uib.no*

S.R. HOOPER, M.D. DE BELLIS, D. WOOLLEY, A. ANGOLD & J. COSTELLO. Neuropsychological Functioning of Young Adults with Adolescent Limited versus Life Course Persistent Substance Use Disorder (SUD).

Objective: The purpose of this transdisciplinary study is to examine the neuropsychological functioning of young adults with Adolescent Limited (AL) versus Life Course Persistent (LCP) Substance Use Disorder (SUD). It is predicted that the LCP SUD Group will show lower memory and attention/executive functions than the AL SUD group or high risk psychiatric control groups.

Participants and Methods: Seventy-one individuals (Mean = 27 yrs.) with documented SUD (alcohol and/or cannabis) were divided into AL-SUD and LCP-SUD groups, and two psychiatric risk groups (High Risk, Low Risk). There were no group differences on age, handedness, IQ, or ethnicity, but the groups differed in gender ($p < .001$). Selected tasks from the Cambridge Automated Neuropsychological Test Battery (CANTAB) targeting prefrontal cortical functions were used: Intra/Extradimensional Shift (IED), Paired Associates Learning (PAL), Rapid Visual Information Processing (RVP), Spatial Span (SSP), One-Touch Stockings (OTS), and Affective Go/No-Go (AGN).

Results: Controlling for gender, significant group differences were noted on RVP A', $F(3, 128) = 2.94, p < .03$, where the LCP-SUD Group showed better visual attention regulation than the high and low risk psychiatric groups. No other group differences were noted.

Conclusions: In contrast to our hypothesis, findings indicated that individuals with LCP-SUD did not manifest neurocognitive differences on the CANTAB relative to an AL-SUD Group, or to the low and high risk psychiatric comparison groups. In fact, the psychiatric groups actually showed more dysregulated attention than the LCP-SUD Group. These findings point to psychiatric illness as a significant contributor to attention dysregulation, perhaps even more so than long-term SUD.

Correspondence: *Stephen R. Hooper, Ph.D., Psychiatry and Pediatrics, University of North Carolina School of Medicine, The Carolina Institute for Developmental Disabilities, CB# 7255, Chapel Hill, NC 27599-7255. E-mail: stephen.hooper@cidd.unc.edu*

R.Y. IP. Clinical Features of the Neuropsychiatric Patients.

Objective: Clinical features of the neuropsychiatric patients comprise a complex array of symptoms that include neuropsychological, psychiatric, and functional disturbances. The diverse impairments of these individuals necessitate the use of validated measures to capture the heterogeneity of this population. These clinical measures can be used to track patients' progress and evaluate treatment efficacy.

Participants and Methods: The current pilot study explores the neuropsychological, psychiatric and functional status of 25 inpatients on a neuropsychiatric unit at a mental health centre. These patients have been diagnosed with psychiatric and neurological disorders.

The patients were screened using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). Caregivers were requested to complete the Neuropsychiatry Inventory (NPI), Functional Independence Measure and Functional Assessment Measure (FIM & FAM). Patients' socio-demographics were examined in relation to their neuropsychological, psychiatric and functional status. Associations of the NPI with severity of cognitive and functional impairments as measured by the RBANS and FIM & FAM were investigated.

Results: Preliminary findings indicate that cognitive and psychiatric impairments are prevalent amongst the neuropsychiatric inpatients. Correlates of socio-demographic and clinical variables are examined. Effects of the disabling symptoms and the complex biopsychosocial needs of these individuals are discussed.

Conclusions: Tertiary in-patient programs for the neuropsychiatric population are lacking, and published data to evaluate treatment efficacy of these programs are sparse. Further understanding of factors affecting neuropsychological/ psychiatric outcome amongst this population can help target specific interventions to neuropsychiatric patient subgroups in the future.

Correspondence: *Rosa Y. Ip, PhD, Ontario Shores Centre for Mental Health Sciences, 700 Gordon Street, Whitby, ON L1N 5S9, Canada. E-mail: ipr@ontarioshores.ca*

E.A. LONG, P.K. SHEAR, N. MILLS, C. ADLER, S. STRAKOWSKI & M. DELBELLO. Relationship between Family Environment and Emotional Processing in Adolescents at Risk for Bipolar Disorder and with Bipolar Disorder.

Objective: Emotional processing weaknesses and family dysfunction are documented in adolescents with bipolar disorder (BPD), but less is known about those at high familial risk for BPD (i.e., with a parent with bipolar disorder; HR). This study compared BPD, HR and healthy participants (HC; no family history of mood or psychotic disorder) in the relationship between family environment and emotional processing.

Participants and Methods: 10 adolescents (ages 12-21) with BPD, 17 HR and 13 HC completed assessments of IQ, facial recognition, and facial affect recognition and interpretation. Participants and a parent each completed a family environment measure.

Results: BPD and HR parents reported less expressiveness than HC ($p = .01$) and BPD and HR parents ($p = .02$) and children ($p = .01$) reported more conflict than HC. The groups were similar in facial affect processing. Family environment related significantly to emotional processing. For BPD, higher expressivity was associated with better emotional labeling ($p = .05$), and higher child reported organization with better interpretive ratings of sad-neutral faces ($p = .01$). For HR, greater expressivity related to better labeling of angry faces ($p = .01$), although higher child perceived organization correlated with poorer labeling of fearful faces ($p = .03$) and affective interpretation ratings ($p = .01$). For HC, higher child reported expressivity related to better affect labeling ($p = .04$).

Conclusions: BPD and HR participants reported deficiencies in family environment relative to HC, and aspects of family environment related to emotional processing. Greater expressiveness was consistently related to better affective processing across all three groups.

Correspondence: *Elizabeth A. Long, M.A., Psychology, University of Cincinnati, 4150 Edwards One / Mail Location 0376, University of Cincinnati, Cincinnati, OH 45221-0376. E-mail: gernerea@mail.uc.edu*

B.S. MCKENNA, A.N. SUTHERLAND & L.T. EYLER. Failure to Deactivate Default Mode Regions during Working Memory in Euthymic Bipolar Patients.

Objective: Bipolar patients (BP) have working memory (WM) deficits and reductions in WM-related neuronal activation, even during periods of euthymia. Despite evidence that serious mental illness affects brain networks that turn off during cognitive activity (“default mode”), little is known about such deactivations in BP. A recent study in manic patients found that those who failed to deactivate the default mode network had poorer WM performance. Here, we examined activation in WM brain regions and default mode network deactivation in euthymic BP and how brain responses related to WM performance.

Participants and Methods: Twelve euthymic BP (age=45.3±7.8yrs, 3m) and 12 healthy control (HC) subjects (age=45.13±7.6yrs, 4m) completed an N-back WM task with two load levels during functional MRI. Group differences in behavioral and imaging data were examined with independent-sample T-tests and mixed effects group-by-task-difficulty ANOVAs. For each group, additional whole-brain regression analyses were conducted to examine how activation related to WM accuracy.

Results: Behaviorally, all subjects performed worse as task demands increased, and BP performed more poorly than HC. BP also had significantly more false positive errors at the hardest task difficulty. At both levels of task difficulty, BP failed to deactivate several regions of the default mode network compared to HC. Brain-behavior relationships were distinctly different between BP and HC. For BP, those with greater deactivation in bilateral medial prefrontal, superior temporal, and postcentral gyri performed better on the WM task. For HC, those with better WM accuracy had greater activation in WM-related areas such as bilateral supramarginal gyri, premotor cortex, and left dorsolateral prefrontal cortex.

Conclusions: Consistent with past studies, we found that BP patients have WM deficits during clinical remission. These deficits are associated with a failure to deactivate the default mode network in addition to an inability to adequately engage WM brain regions.

Correspondence: *Benjamin S. McKenna, Ph.D., University of California, San Diego, 3350 La Jolla Village Drive, mail code: 9116A, San Diego, CA 92161. E-mail: bmckenna@ucsd.edu*

M. MORENO DE IBARRA, A. PEREZ, A. PIÑA, M. BARAK, L. VEGA, J. GONZALEZ, M. MORENO & C. JAYARO. Transdisciplinary Advances in Applied Neuropsychology In Venezuela.

Symposium Description: In the 39th Annual meeting of the INS, the Venezuelan team of Applied Neuropsychology, in the poster symposia, introduced the topic of transdisciplinarity in the field of neuropsychology, concluding that transdisciplinarity is not a myth but a promising reality. At that time, the team presented two illustrative cases and a referential theoretical framework of this approach. The contribution of this year is the expansion of that framework considering the advances in practice and the presentation six new cases: Teenager and preschooler cases of ADHD; a case of craniopharyngioma with bilateral vision loss; a case of PDD-NOS; a case of early onset schizophrenia and, a case of TBI. The aforementioned cases support that transdisciplinarity is not only the future of neuropsychology but its present. These cases reflect the maturity that has been achieved in Venezuela in the implementation of the transdisciplinary approach. The team reiterates that no discipline itself can explain complex relations of human behavior, higher functions and their disturbances, therefore the proposition is to develop Applied Neuropsychology in order to introduce other disciplines into this field to enrich it, transcending particular disciplines in a comprehensive approach to cog-

nitive functions and its disorders. In this sense, another step in the formation of new professionals in the area has been done: the design of the specialization in Applied Neuropsychology of Universidad Metropolitana (UNIMET) in Caracas (Venezuela) is now complete. Next step will be the approval from the competent national authorities. The aim is bring the good news the next year.

Correspondence: *Marianela Moreno de Ibarra, Magister Scientiarum, Universidad Catolica Andres Bello, Escuela de Psicologia 3er. Piso Edif Aulas, Av. Teheran Montalban, Caracas 1020, Venezuela. E-mail: mmoreno_223@hotmail.com*

A. NELSON, M. BASSO, E. ESTEVIS & D. COMBS. Neurocognition and Social Functioning in Depressed Inpatients.

Objective: Previous studies have identified deficits in neurocognition and in general social functioning in depressed individuals, although few studies have examined these variables simultaneously within an acutely depressed, inpatient sample. Executive dysfunction is of particular interest, as decreased mental flexibility and problem solving could impact one's occupational and interpersonal functioning. Thus, the purpose of this study was to investigate whether inpatient, depressed individuals demonstrated impaired neurocognition and social functioning compared to a healthy control group, with the expectation that executive dysfunction and depression would predict decreased social functioning.

Participants and Methods: Twenty-nine acutely depressed inpatients and 24 community controls were administered a comprehensive battery of neuropsychological, social functioning, and depression measures.

Results: Results indicated that the depressed group performed lower than controls at a marginally significant level ($p = .06$) on composite measures of attention and executive functioning. The depressed group demonstrated significant social functioning deficits compared to the control group, which regression analyses indicated was largely accounted for by depression and not by executive functioning.

Conclusions: Contrary to previous studies, the depressed group did not perform significantly lower than controls on neurocognitive composite measures. Further, executive functioning was not a significant predictor of decreased social functioning, although increased depression was. Implications of these results for depression treatment and improvement of social functioning is discussed.

Correspondence: *Amelia Nelson, PhD, Milwaukee VA, 421 S 65th St., Milwaukee, WI 53214. E-mail: amelianelsonsheese@gmail.com*

S.J. PONGRACIC & T. ORNSTEIN. Executive Function Abilities in Young Adults with Obsessive-Compulsive Disorder.

Objective: The pathophysiology of obsessive-compulsive disorder (OCD) is thought to be related to frontostriatal abnormalities which affect aspects of executive function (EF). However, findings of executive dysfunction in OCD are mixed, possibly due to the large variability in age (18-72) of previous samples. Young adults with OCD (YA-OCD) are an ideal population for investigating cognitive dysfunction. Examining this group reduces confounds related to frontal lobe development (which matures in early adulthood) and age-related cognitive decline. The purpose of this study was to evaluate whether EF deficits exist in YA-OCD when compared to same-age healthy controls (HC) using a neuropsychological battery.

Participants and Methods: OCD and HC groups each comprised of 14 participants ranging in age from 18-28 years. Participants with OCD were recruited from a university counseling centre and community postings. One test session assessed the following: set-shifting (Wisconsin Card Sorting Task, WCST), inhibition (stop-signal task), and decision-making (Iowa Gambling Task, IGT).

Results: The groups did not differ in age, length of education, and full scale IQ but the OCD group reported moderate OCD symptom severity, mild depressive and extreme state anxiety. YA-OCD made more preservative responses than their same-age peers on the WCST. On the IGT, YA-OCD selected more cards from disadvantages decks, indicating riskier

decision-making. Positive correlations were noted between anxiety and risky card selection on the IGT. Further, anxiety correlated with a higher number of trials needed to complete all six categories on the WCST, perseverative responses, and total, perseverative, and non-perseverative errors. No group differences for inhibition were noted.

Conclusions: State anxiety may have influenced EF abilities in YA-OCD, particularly risky decision-making. This preliminary study supports larger studies of YA-OCD that explore the moderating role of state anxiety on neuropsychological performance.

Correspondence: *S. J. Pongracic, MA, Ryerson University, 5492 Hurst Court, Mississauga, ON L5Y2C5, Canada. E-mail: sponggrac@psych.ryerson.ca*

J.S. ROBINSON & C. LARSON. A Neurocognitive Profile of a Sample of PTSD Diagnosed Individuals.

Objective: Previous literature has suggested that individuals suffering from Posttraumatic Stress Disorder (PTSD) may display poorer performance on neuropsychological tests when compared to matched controls. The current study sought to examine the neurocognitive profile of individuals diagnosed with PTSD against trauma exposed non-PTSD diagnosed individuals. We believe that PTSD diagnosed individuals will exhibit poorer performance on tests of memory, specifically verbal memory.

Participants and Methods: 25 participants who had been screened for exposure to an A1 criterion event consistent with a PTSD diagnosis were recruited. Of this sample 15 met criteria for a diagnosis of PTSD. As part of a larger study, individuals completed a battery of neuropsychological tests that measures a variety of cognitive domains.

Results: Using independent samples t-tests, we found that PTSD diagnosed individuals exhibited poorer performance on measures of list learning memory using the CVLT-II. Specifically we found poorer performance on measures of immediate recall, short delay cued recall, long delay free and cued recall, recall discriminability, and total recognition discriminability, all p 's < .05. Additionally several neuropsychological tests showed a trend towards poorer performance of PTSD diagnosed individuals including delayed recall of story information, and various measures of continuous visual memory. p 's < .10

Conclusions: Consistent with some previous research, we found that PTSD diagnosed individuals exhibited poorer performance on measures of verbal memory. It may be that these poorer performances are related to a neural mechanism that may be a predisposing factor or consequence of PTSD. Further examination of these neurocognitive differences may yield important information about the neural etiology of PTSD or possibly highlight possible areas amenable to specific intervention strategies.

Correspondence: *Jordan S. Robinson, M.A., Clinical Psychology, Univ Wisconsin- Milwaukee, 2441 E.Hartford Ave, Psychology, Milwaukee, WI 53211. E-mail: robin247@uwm.edu*

K.L. LEWIS, J.S. ROBINSON & C. LARSON. ERPs during Emotion Regulation Task Affected by Symptoms of Dissociation in PTSD Patients.

Objective: Previous literature has suggested that one's ability to properly regulate emotion can be affected by psychopathologies such as PTSD. Dissociation, a common PTSD symptom, is also a factor in the emotion regulation process. The study uses the Event-Related Potential (ERP) technique to help assess differences in emotional reactivity and regulation to negative images as a function of dissociation in trauma-exposed sample.

Participants and Methods: Twenty participants screened for exposure to an A1 criterion event consistent with PTSD diagnosis were recruited. Of this sample 9 met criteria for a diagnosis of PTSD. Participants were asked to watch a series of negative and neutral visual stimuli while engaging in an emotional regulation task or passively viewing the pictures while EEG recordings were taken. Following this task participants filled out a series of questionnaires inquiring about dissociative symptoms and experiences they may have experienced.

Results: P3 amplitude was defined as mean signal amplitude 300-700 ms post picture onset. We found that P3 amplitude at POz when attempting to regulate emotional responses to the unpleasant pictures was associated with higher scores on the Dissociative Experiences Scale (DES). Higher DES scores were positively correlated with increased ERPs for the task in which participants decrease negative emotion to unpleasant images ($r=0.503$, $p<0.01$), and the task in which participants increase negative emotion to unpleasant images ($r=0.454$, $p<0.05$). Additionally, higher DES scores were correlated with higher ERPs during passive viewing of negative photos in both the decrease block ($r=0.423$, $p=.056$) and the increase block ($r=0.443$, $p=0.050$), though the results were not significant.

Conclusions: These ERP findings would suggest that those with high levels of dissociation are generally more reactive to the negative stimuli. Further research should be done to examine these effects in emotionally specific traumatic stimuli in traumatized individuals.

Correspondence: *Jordan S. Robinson, M.A., Clinical Psychology, Univ Wisconsin- Milwaukee, 2441 E.Hartford Ave, Psychology, Milwaukee, WI 53211. E-mail: robin247@uwm.edu*

J. BLAISDELL, J.S. ROBINSON & C.L. LARSON. Patterns of Serial Position Recall Effects in a Sample of PTSD Diagnosed Individuals.

Objective: Research addressing neurocognitive differences in PTSD and non-PTSD samples has shown that PTSD diagnosed individuals exhibit poorer performance on measures of verbal declarative memory. Little is known, however, about the specific characteristics of this impairment or its cause. Examination of serial position effects in individuals with PTSD may lead to a better understanding of these subtleties.

Participants and Methods: All participants were screened for exposure to an A1 criterion traumatic event. Of those screened, 15 individuals met criteria for a diagnosis of PTSD. These 15 individuals in addition to 20 control participants were administered the CVLT as part of a larger neuropsychological battery in a study on PTSD.

Results: Consistent with a number of previous studies, comparison of the two groups using an independent samples t-test revealed that PTSD individuals performed significantly worse than controls on immediate recall ($p<0.02$), short delay cued recall ($p<0.04$), and long delay free recall ($p<0.01$). More notably, significant results were also found in regards to serial position effect differences between PTSD individuals and controls. Specifically, PTSD participants were found to recall fewer words from the middle of the stimulus set than controls ($p<0.02$) and more words from the end of the stimulus set ($p<0.01$).

Conclusions: Although similar serial position effects of verbal memory have been examined in other clinical populations, such as in those with Alzheimer's disease, its study in PTSD populations remains sparse. Further examination of verbal recall patterns in persons with PTSD could lead to a greater understanding of the mechanisms of memory dysfunction in diagnosed individuals and ultimately aid in the development of clinical interventions.

Correspondence: *Jordan S. Robinson, M.A., Clinical Psychology, Univ Wisconsin- Milwaukee, 2441 E.Hartford Ave, Psychology, Milwaukee, WI 53211. E-mail: robin247@uwm.edu*

A.H. RODRIGO, A. DAROS, S. GULRAJANI & A.C. RUOCCO. A Near-Infrared Spectroscopy Study of Response Control in Borderline Personality Disorder.

Objective: Borderline personality disorder (BPD) is a serious form of psychiatric illness characterized by deficits in impulse control, or response inhibition, which places patients at increased risk for harm. The functional neural substrates of response inhibition processes in BPD are poorly understood but are thought to involve decreased recruitment of the right inferior prefrontal cortex (PFC). The purpose of the current study was to examine functional activation within the right inferior PFC in BPD patients under conditions of response inhibition.

Participants and Methods: BPD patients and IQ- and demographically-matched non-psychiatric controls completed comprehensive clinical assessments and were excluded if they had any history of psychosis, bipolar disorder, developmental condition, or neurologic illness. Participants underwent functional neuroimaging with near-infrared spectroscopy while completing a visual go/no-go activation protocol.

Results: BPD patients demonstrated a relative decrease in activation within the right inferior PFC during response inhibition compared with non-psychiatric controls. These findings were in the context of equivalent accuracy levels and response latencies between groups on this task and could not be attributed to comorbid psychopathology or general intelligence.

Conclusions: BPD patients show decreased engagement of the right inferior PFC under conditions of response inhibition, which may implicate reduced inhibitory control capacity in this illness. Decreased activation of this region may reflect the pathophysiology of impulsivity symptoms in BPD.

Correspondence: *Anthony C. Ruocco, PhD, Psychology, University of Toronto Scarborough, 1265 Military Trail, Toronto, ON M1C 1A4, Canada. E-mail: anthony.ruocco@gmail.com*

I.M. ROSSO, Z.J. SCHWAB, M.R. WEINER, S.L. RAUCH & J.E. JENSEN. 1H-MRS of Glutamate and GABA Metabolism in the Anterior Cingulate of PTSD Subjects.

Objective: Post-traumatic stress disorder (PTSD) is associated with abnormal function of the dorsal anterior cingulate (ACC). The biochemical correlates of this dysfunction have received surprisingly little study. We used proton magnetic resonance spectroscopy (1H-MRS) to examine whether abnormal dorsal ACC function reflects altered markers of glutamate or GABA metabolism.

Participants and Methods: Ten adults with a DSM-IV diagnosis of PTSD and 10 matched healthy control subjects were scanned on a 4 Tesla scanner. Single voxel 1H-MRS was conducted in the bilateral dorsal ACC.

Results: PTSD and control subjects did not differ significantly in terms of glutamate, glutamine, or GABA levels. There also were no significant group differences in NAA or choline.

Conclusions: This 1H-MRS study of PTSD and healthy adults found no significant differences in markers of glutamate metabolism, GABA metabolism, neuronal viability or cellular membrane metabolism in the dorsal ACC. Prior findings of functional abnormalities in this region are likely mediated by other pathophysiological mechanisms.

Correspondence: *Isabelle M. Rosso, PhD, McLean Hospital & Harvard Medical School, 115 Mill Street, Neuroimaging Center, Belmont, MA 02478. E-mail: irosso@hms.harvard.edu*

D. SCHEINER, J. KEILP, A. BURKE, M. OQUENDO & J. MANN. The Contribution of Posttraumatic Stress Disorder to Explicit Verbal Learning and Memory Performance in Major Depression.

Objective: Verbal learning/memory deficit is the most common neurocognitive impairment in Posttraumatic Stress Disorder (PTSD), but may be related to the high rate of comorbid Major Depressive Disorder (MDD) in PTSD. To evaluate this hypothesis, patients with comorbid PTSD and MDD were compared to patients with MDD alone and healthy non-patients (NP) on measures of learning/memory, attention, working memory and executive function.

Participants and Methods: Subjects were 25 patients with comorbid PTSD/MDD, 142 with MDD alone, and 96 non-patient volunteers. Patient subjects were all currently depressed and medication free. Neurocognitive measures included the Buschke SRT (learning/memory), Continuous Performance Test (attention), A, not B Reasoning Test (working memory), and Wisconsin Card Sorting Test (executive function). Age, gender, and education-corrected z-scores were computed and compared among groups.

Results: PTSD/MDD and MDD alone groups were equivalent in terms of depression symptom severity and prior substance dependence. As

expected, the PTSD/MDD and MDD alone groups performed worse on 6 of 7 SRT variables compared to NP, but the PTSD/MDD group also performed worse on 4 of 7 SRT indices compared to the MDD alone group (all omnibus ANOVA p 's < .003). No group differences were observed on attention, working memory or executive function measures.

Conclusions: Comorbid PTSD/MDD is associated with verbal learning/memory deficits that are worse than those in MDD alone. This difference was not due to concurrent deficits in attention, working memory or executive function. It is unlikely, then, that verbal learning/memory deficits in PTSD can be attributed entirely to the high incidence of comorbid MDD, as some studies have suggested.

Correspondence: *Diane Scheiner, MA, Psychology, Fordham University, 226 Dealy Hall, 441 East Fordham Road, Bronx, NY 10458-9993. E-mail: discheiner@gmail.com*

A. THAMES, V. STREIFF, F. HENDRIX, M. IRANI, S. PANOS, S.M. PATEL, S.A. CASTELLON & C. HINKIN. Depression strongly predicts decision-making deficits after controlling for executive dysfunction.

Objective: Patients with disruptions to the ventral-medial cortex demonstrate severe impairments in personal and social decision-making (Bechara, Damasio et al., 2000). HIV infection preferentially targets frontal-striatal functions, resulting in cognitive deficits in the areas of attention, learning and memory, and executive functioning (Heaton et al., 1995; Reger et al., 2002). Neuropsychiatric features of HIV include depression, apathy, and irritability, all which have also been linked to executive dysfunction (Castellon et al., 1998; Cole et al., 2007). The purpose of the current study was to examine how neuropsychiatric features of depression, apathy, and irritability impacts decision making.

Participants and Methods: Participants ($n = 126$) consisted of HIV+ ($n = 100$) and HIV- ($n = 26$) individuals recruited from local community. Participants were administered a comprehensive neuropsychological battery, the Iowa Gambling Task (to measure decision-making), and scales to measure depression, apathy, and irritability.

Results: HIV+ participants performed significantly more poorly on the gambling task than HIV- participants, $F(1,124) = 13.13, p < .001$. Hierarchical linear regression demonstrated that executive functioning and learning and memory predicted performance on the gambling task $r^2(2, 122) = .064, p < .018$. Of greatest interest to the current investigation, severity of depression predicted performance on the gambling task after controlling for deficits in executive functioning and learning and memory $r^2(1, 124) = .089, p < .013$.

Conclusions: Our findings suggest that depression places individuals at risk for poor decision-making, which may result from decreased responsiveness to rewards (Henriques & Davidson, 2000).

Correspondence: *April Thames, Ph.D., University of California Los Angeles, 760 Westwood Plaza CS-746, Los Angeles, CA 90095. E-mail: athames@ucla.edu*

S.J. WALKER, K.K. MEYERS, A.L. WELDON, L.B. GABRIEL, K.E. HAZLETT, R.E. KAY, K. RYAN, J. ZUBIETA & S.A. LANGE-NECKER. Depression and Neuroticism: State and Trait Effects on Error Monitoring and Reactivity.

Objective: Error processing is integral to learning from feedback and can be impacted by state and trait features. This study examined how error processing varies with Major Depressive Disorder and with Neuroticism. We hypothesized a positive linear relationship between Neuroticism and post-error slowing following commission errors on a parametric go/no-go (PGNG) task, and also that individuals with MDD would most closely approximate healthy individuals with high Neuroticism (i.e., a measure of trait risk).

Participants and Methods: Reaction times to targets after commission errors on the PGNG were measured among 30 healthy participants and 21 individuals with MDD. The HC group was classified in tertiles based on NEO-PI-R Neuroticism score and compared to the MDD group. HC and MDD subsamples matched on Neuroticism will also be examined.

Results: Repeated-measures ANOVA indicated a within-group effect; reaction times as a whole slowed following commission errors, $F(2,$

94)=14.70, $p < .001$. There was no effect of group status on post-error slowing. However, the HC group exhibited greater activation than the MDD group in right parahippocampal and left middle temporal gyri after commission errors. The MDD group exhibited greater activation than the HC group in dorsal cingulate. Increasing PES in general was associated with increased rostral anterior cingulate activation after errors.

Conclusions: Individuals did not exhibit different behavioral post-error slowing based on MDD status or Neuroticism level, perhaps due to insufficient statistical power. Recruitment is ongoing. The differences in neural activation, however, support the incremental utility of assessing trait features (e.g., Neuroticism) as they pertain to risk for maladaptive error-monitoring and/or depressive episodes.

Correspondence: *Sara J. Walker, Ph.D., Psychiatry, Oregon Health and Science University, Mail Code: UHN 50, 3181 SW Sam Jackson Park Road, Portland, OR 97239-3098. E-mail: sarajeon25@gmail.com*

E.H. ZIMAK, J.A. SUHR & E. BOLINGER. The Physiology of Subclinical Psychopathy.

Objective: Psychopathy is characterized by affective and interpersonal deficits that may predispose individuals to antisocial behavior. Psychophysiological deficits characterize incarcerated psychopaths performing affective tasks, yet little is known about the physiological responding of subclinical psychopaths, who endorse psychopathic personality features yet rarely confront the criminal justice system. We hypothesized that subclinical psychopaths would exhibit blunted physiological responses on an affective picture-viewing task relative to controls.

Participants and Methods: Participants were 79 undergraduate males at a Midwestern university. Two groups were formed based on extreme scores (top/bottom 30%) on the Psychopathic Personality Inventory-Short Form: subclinical psychopaths ($N=37$) and controls ($N=42$). Participants' skin conductance response was assessed while they viewed positive and negative images from the International Affective Picture System. Following each picture, participants rated each picture on valence, arousal, and dominance on the Self-Assessment Manikin.

Results: Mixed-models ANOVA showed a significant interaction between group status and skin conductance change for negative, $F(1, 75) = 5.42$, $p = .02$, but not positive pictures, $F(1, 75) = 1.82$, $p = .18$. Bonferroni comparisons indicated that subclinical psychopaths demonstrated an attenuated change in skin conductance relative to controls on negative pictures. Subclinical psychopaths also reported less sadness, $t(74) = -3.00$, $p = .00$, and greater feelings of dominance, $t(75) = 2.20$, $p = .03$, relative to controls on negative pictures.

Conclusions: Results suggest that affective and autonomic deficits are characteristic of non-incarcerated adults males with psychopathic traits. Implications for the understanding of the psychopathy construct and theory will be discussed.

Correspondence: *Eric H. Zimak, M.S., Semel Institute, UCLA, 760 Westwood Plaza, CS-746, Los Angeles, OH 90095-1759. E-mail: EZimak@mednet.ucla.edu*

E.H. ZIMAK, E. BOLINGER & J.A. SUHR. Neuropsychological Underpinnings of Subclinical Psychopathy.

Objective: Subclinical psychopaths have interpersonal (e.g., manipulative) and affective (e.g., callous) features of psychopathy and may engage in socially deviant behavior, yet rarely confront the criminal justice system. Research on subclinical psychopaths can help identify protective factors that prevent them from developing into incarcerated psychopaths. The current study sought to elucidate the neuropsychological functioning of subclinical psychopaths on a risky decision-making task and a response inhibition task.

Participants and Methods: Participants were 79 undergraduate males at a Midwestern university. Two groups were formed based on extreme scores (top/bottom 30%) on the Psychopathic Personality Inventory-Short Form: subclinical psychopaths ($N=37$) and controls ($N=42$). Participants completed the Iowa Gambling Task to measure risky decision-making, and the Stop-Signal Task to measure response inhibition and impulsivity.

Results: T-tests showed that subclinical psychopaths had greater probability of responding on stop-signal trials, $t(75)=2.56$, $p=.01$, and responded more impulsively on no-signal trials, $t(73)=3.10$, $p=.00$, and signal-respond trials, $t(73)=3.20$, $p=.00$, relative to controls. On the final 40 trials of the Iowa Gambling Task, subclinical psychopaths made less risky decisions relative to controls, $t(75)=1.99$, $p=.05$.

Conclusions: Results suggest that subclinical psychopaths were more impulsive and less accurate than controls, on a response inhibition task. Interestingly, subclinical psychopaths performed better on a risky-decision making task. These findings are consistent with Gao and Raine's (2010) theory of adults with psychopathic traits who avoid incarceration (aptly called "successful" psychopaths), which suggests these individuals may have enhanced executive functioning in the context of poor behavioral modulation. Implications of these findings for the understanding of the psychopathy construct will be discussed.

Correspondence: *Eric H. Zimak, M.S., Semel Institute, UCLA, 760 Westwood Plaza, CS-746, Los Angeles, OH 90095-1759. E-mail: EZimak@mednet.ucla.edu*

Psychopathology/Neuropsychiatry (Schizophrenia)

B. FERRERA, A. NIETO, D. FERREIRA, O. DELGADO, S. HESS & J. BARROSO. Action Fluency Impairment in Schizophrenia.

Objective: Schizophrenia is often accompanied by neuropsychological impairments. Verbal fluency has been largely studied and deficits on semantic and phonemic fluency have been reported. However, little is known about action fluency performance. Our first aim was to study action fluency in a sample of schizophrenic patients and a demographically matched control sample. In addition, we sought to compare the prevalence of action fluency deficits with that on the more traditional measures of verbal fluency.

Participants and Methods: We examined 26 patients diagnosed with schizophrenia (CIE-10/OMS) and 23 age-, gender-, years of education-matched control subjects. Three verbal fluency tasks were administered: Action (Verbs), Phonemic (FAS) and Semantic (animals). MMSE was used to examine general cognitive state.

Results: A 2 (group) x 3 (type of fluency measure) repeated measures ANOVA was conducted for correct responses. There was a significant interaction Group x Type. Post-hoc analyses showed that schizophrenic patients scored significantly below normal subjects on Action, Phonemic and Semantic fluency measures. All differences among tasks were significant for the control group (SF>AF>PF), whereas in the schizophrenia group AF and PF were not different. Performance on fluency tasks was not related with MMSE score. 30.7% of schizophrenic patients were impaired in AF (scores below -1.5 SD of control group mean); 50% and 46.5% were impaired in PF and SF, respectively. However, we found no significant differences among the three fluency tasks regarding the proportion of subjects classified as impaired.

Conclusions: Our results reveal that verbal fluency deficits in schizophrenia are not specific for phonemic or semantic cues but they are also present in verb generation. The prevalence of impairment in the three modalities of verbal fluency is similar. The deficits showed by schizophrenic patients in the verbal fluency tasks cannot be directly attributed to a global impairment in cognition.

Correspondence: *Antonieta Nieto, Ph.D., University of La Laguna, Faculty of Psychology, Campus de Guajara, La Laguna 38205, Spain. E-mail: anieto@ull.es*

D. COBIA, M. SCHOEDER, K. BLIZINSKY, J.G. CSERNANSKY & L. WANG. Multimodal Imaging Reveals Compensatory Neural Mechanisms in the Maintenance of Neuropsychological Performance in Schizophrenia.

Objective: Longitudinal structural imaging studies in schizophrenia reveal progressive deformities in cortical and subcortical regions within

specific neural networks; however, these changes occur in the presence of stable neuropsychological and clinical symptomatology profiles. The aim of this study was to utilize a multimodal neuroimaging approach at identifying compensatory processes that may preserve cognitive function and psychopathology.

Participants and Methods: Schizophrenia (SCZ=10) and healthy comparison subjects (COM=10) were recruited at two time-points 2 years apart. Collected data included neuropsychological performance, T1 and diffusion-weighted structural MRI, resting-state fMRI, and N-back task fMRI. Measures assessed include cortical thickness, fractional anisotropy (FA), resting-state connectivity, and BOLD N-back activation. Repeated-Measures ANOVA models, and annualized percent change were the principle change statistics.

Results: Neuropsychological deficits in SCZ were observed and remained stable during interval period. Greater rates of cortical thinning in SCZ compared to COM were evident in posterior parietal, orbital frontal, anterior cingulate, and superior frontal regions. Significant group and time effects, but no interactions between SCZ and COM were observed in superior longitudinal fasciculus FA. BOLD fMRI from the N-back task revealed significant group-by-time interactions ($p < .005$) in left dorsolateral prefrontal cortex and right temporoparietal junction. Increased BOLD activation over time for these clusters was evident in SCZ.

Conclusions: Findings reveal compensatory changes in neural activation occur in synchrony with progressive gray matter changes to maintain cognitive performance over time in schizophrenia; particularly as it pertains to working memory. Findings also increase our understanding of the pathophysiological process in schizophrenia, especially towards later stages. Future directions include confirmation of the results in a larger sample and over an extended time period.

Correspondence: *Derin Cobia, PhD, Psychiatry and Behavioral Sciences, Northwestern University, 710 N. Lake Shore Drive, Abbott Hall 1316, Chicago, IL 60611. E-mail: d-cobia@northwestern.edu*

A.E. DOYLE, N. DOTY, D. TONER, E. HILL, K. CHAMBERT, J. MORAN, C. O'DUSHLAINE, D. RUDERFER, J. SMOLLER, P. SKLAR & E. BRAATEN. Relevance of genetic copy number variants to a pediatric neuropsychology clinic.

Objective: Unprecedented progress has been made recently in the identification of genetic risk variants for psychiatric illness. One of the most interesting findings from this literature is an excess of rare copy number variants (CNVs) that substantially increase risk for disorders in the few who manifest them. Particularly compelling is the unexpected finding that the same CNVs confer risk across schizophrenia, autism and cognitive dysfunction. Such data require further work to identify specific genes driving risk as well as mediators and moderators of outcome. Yet, eventually such findings may yield improved etiologic models and novel treatment targets for these particularly intractable problems. In an effort to advance such work, we are merging state-of-the-art human genetics methods with comprehensive assessment of youth being evaluated in a pediatric neuropsychology clinic at Massachusetts General Hospital. Our hypothesis is that clinics such as this, with patients manifesting both cognitive dysfunction and psychopathology, may be enriched for "rare" CNVs and thus valuable resources for study with regard to clinical translation and outcome tracking.

Participants and Methods: To date, we have obtained extensive phenotyping and DNA on 340 outpatients from this clinic and genomewide genotyping on 74 of these youth.

Results: We have detected both large (> 500kb) and small (between 100-30kb) CNVs in patients in regions highlighted in the recent psychiatric genetics literature. We have also documented an association between genomewide CNV burden and clinical phenotypes.

Conclusions: Results speak to the potential for transdisciplinary approaches that integrate psychiatric genetics in pediatric neuropsychology clinics, particularly clinics that evaluate patients with psychiatric symptomatology.

Correspondence: *Alysa E. Doyle, PhD, CHGR/ Psychiatry, Massachusetts General Hospital, 185 Cambridge Street, CPZN-6, Boston, MA 02114. E-mail: aedoyle@partners.org*

M. GARLINGHOUSE, R.M. ROTH, L.A. FLASHMAN & A.J. SAYKIN. Subjective Ability to Inhibit Impulses is Related to Cortical Thickness of Frontal Regions in Schizophrenia.

Objective: Patients with schizophrenia have been observed have difficulty with inhibitory control on performance-based measures. We previously observed that self-reported difficulty with working memory was associated with frontal lobe volume in this population. In the present study we evaluated whether self-report integrity of inhibitory control was related to cortical thickness in patients with schizophrenia.

Participants and Methods: Participants included 29 patients with schizophrenia and 26 healthy comparison subjects. Participants completed a structural magnetic resonance imaging (MRI) scan, and the Self Report form of the Behavior Rating Inventory of Executive Function - Adult version. Cortical thickness data was generated using FreeSurfer software.

Results: Two significant findings emerged, one being that the patient group reported more problems with their ability to inhibit in daily life than the comparison group. The second was that poorer ability to inhibit, when controlling for age, was predominantly associated with increased cortical thickness in left insular and frontal cortices within the patient group.

Conclusions: These findings are consistent with findings in the literature that disrupted inhibitory processes can be associated with abnormalities in insular and frontal function, and may reflect the presence of a disruption in cortical pruning during maturation. Our findings provide further evidence of a contribution of frontal lobe abnormality to executive dysfunction in the population. Furthermore, the finding of a significant relationship between increased cortical thickness in anterior regions and ability to inhibit in daily life provides additional support for the validity of the use of self report measures of cognitive functioning in patients with schizophrenia.

Correspondence: *Matthew Garlinghouse, Ph.D., Psychology, University of Nebraska Medical Center, 984185 Nebraska Medical Center, Dept. of Psychology, Omaha, NE 68198-4185. E-mail: mgarlinghouse@nebraskamed.com*

K. GICAS, G.N. SMITH, H.A. BAITZ, D.J. LANG, G.W. MACEWAN, L.C. KOPALA, A.E. THORNTON & W.G. HONER. Cognition as a Predictor of Long-Term Functional Outcomes in First-Episode Psychosis: The Moderating Effects of Substance Use.

Objective: Neuropsychological deficits and high rates of substance use disorders (SUD) are prominent features in first-episode psychosis (FEP). Evidence suggests that cognitive deficits are predictive of long-term social dysfunction. The current study examines how substance use moderates the association between cognition and 1-year role functioning outcomes.

Participants and Methods: Sixty-four FEP participants (44 males, 20 females), enrolled in a 1-year treatment program, were classified into two substance use (SU) groups: high risk (current SU and a history of an SUD, $n = 40$) or low risk (abstinent or current intermittent SU without a history of an SUD, $n = 24$). Participants reported use of cannabis, alcohol, and illicit drugs, with 62.5% meeting criteria for a history of an SUD. A composite measure of cognition was computed at baseline. Regression analysis was used to determine whether cognition is a stronger predictor of long-term role functioning for the low risk SU group relative to the high risk group.

Results: Contrary to our hypothesis, better cognitive performance was found to be a significant predictor of higher levels of social and occupational functioning for the high risk SU group, but not for the low risk group ($p < .01$). This effect remained robust after controlling for background variables.

Conclusions: Relative to FEP participants at low risk for SU, the cognitive abilities of substance users appear crucial in facilitating basic role functioning. Future research exploring more complex functional outcomes will define the importance of cognition in non-users and elucidate the extent to which higher cognition protects substance users against functional losses.

Correspondence: *Kristina Gicas, B.Sc., Psychology, Simon Fraser University, 8888 University Dr, Burnaby, BC V5A 1S6, Canada. E-mail: kgicas@sfu.ca*

F. GOULD, S. SABBAG, T.L. PATTERSON, R.K. HEATON & P.D. HARVEY. Predictors of the Accuracy of Self Assessment of Functioning in People with Schizophrenia.

Objective: This study attempted to identify predictors of accuracy in self report, both in terms of accurate self-assessment and over-estimation of current functioning.

Participants and Methods: 195 patients with schizophrenia completed the SLOF. Performance-based measures of neurocognition and functional capacity were employed as well as symptom measures (PANSS and BDI). A friend, relative, or clinician informant was interviewed with the SLOF. Best estimate ratings of functioning based on patient and informant report and interviewer observation were generated. Ratings were generated in: social functioning, everyday activities, and vocational functioning. Patient self-report and interviewer judgment discrepancies were examined.

Results: Patients significantly ($p < .001$) overestimated their vocational and everyday functioning compared to the interviewer judgments; social functioning was also over-estimated non-significantly ($p = .17$). Lower everyday functioning in patients was associated with overestimation of functioning. Patient self-reports were not correlated with performance-based measures, while interviewer judgments were significantly correlated with patients' performance on cognition and functional capacity ($p < .005$). Depression was associated with reduced discrepancies compared to interviewer judgments ($p < .001$). Hallucinations, suspiciousness, grandiosity, and poor rapport were all significantly ($p < .001$) associated with over-estimation of functioning.

Conclusions: Consistent with previous studies in schizophrenia, other neuropsychiatric conditions, and non-clinical populations, mild depression (Mean BDI=15.8) was associated with increased accuracy in self assessment. Several symptoms as well as lower scores on performance-based measures were associated with over-estimation of functioning. These data suggest it may be possible to screen patients for self-report ability, but that even mild levels of symptoms were associated with consistent mis-estimation of everyday functioning capable of biasing treatment study results.

Correspondence: *Felicia Gould, PhD, Psychiatry and Behavioral Sciences, Miller School of Medicine, University of Miami, 1120 NW 14th St, Room 1471 (D-21), Miami, FL 33136. E-mail: fgould@med.miami.edu*

C. HAWCO, M. BODNAR, N. SCHMITZ, A. MALLA, R. JOOBER, A. BENOIT & M. LEPAGE. Patterns of Neurocognitive Deficits in People with Psychosis: Evidence for generalized and domain specific deficits.

Objective: Neurocognitive deficits are often present in patients with psychotic disorders, even at the onset of the illness. These deficits have been suggested to be predictive of clinical and functional outcome. However, the nature of these deficits is still not well understood. One hypothesis states that neurocognitive deficits in psychosis are specific to separate cognitive domains. In contrast, the 'g' factor hypothesis suggests a generalized deficit in neurocognition.

Participants and Methods: We examined the results of neurocognitive tests from a large ($n=198$) group of first episode psychosis patients for the neurocognitive domains of verbal memory, visual memory, working memory, reasoning/problem solving, speed of processing, and attention. We performed three analyses on our data: a factor analysis using principle axis factoring, a hierarchical clustering analysis, and a confirmatory factor analysis (CFA) testing the domain specific and generalized hypothesis, or models that incorporated both hypotheses.

Results: The factor analysis resulted in three factors including separate factors for verbal memory and for visual memory. The hierarchical clustering analysis divided patients into clusters somewhat based on overall cognitive ability, but dividing the data into sub-clusters suggested groups of patients with specific patterns of neurocognitive deficits. For the CFA analysis, the data was best characterized by models incorporating both domain specific and generalized neurocognitive factors.

Conclusions: This pattern of results suggests that neurocognitive deficits in psychosis are best represented by a pattern of both generalized and domain specific neurocognitive deficits, which may have important implications for cognitive remediation within these patients.

Correspondence: *Colin Hawco, Department of Neuroscience, McGill University, 3263 Evelyn, Verdun, QC H4G 2H2, Canada. E-mail: colin.hawco@mail.mcgill.ca*

J.K. JOHANNESSEN, M.D. BELL & J.M. FISZDON. Evaluation of Learning Potential as a Predictor and Outcome of Cognitive Remediation in Schizophrenia.

Objective: Given the impact of cognitive impairment on daily function in schizophrenia, cognitive remediation (CR) may effectively enhance psychiatric rehabilitation. However, evidence that neural substrates of learning are affected in schizophrenia suggests that capacity to benefit from CR is limited. Therefore, assessment of the capacity to improve performance through training, or Learning Potential (LP), could elucidate important individual differences determining the response to CR. This study examined the extent to which LP: (1) is impaired in schizophrenia, (2) predicts skill acquisition in CR, and (3) improves with CR.

Participants and Methods: 40 outpatients were randomized to 8 weeks of CR ($n=27$) or treatment as usual (TAU; $n=13$). LP was evaluated pre- and post-training using a dynamic administration of the CVLT-II, with LP indexed by reliable change in recall after instruction on encoding strategies.

Results: Intake LP classification identified 4 participants as learners, 5 as high-performers, and 31 as non-learners. CR training significantly improved performance on a proximal measure of CR skill acquisition (maximum span on a digit memory training exercise) relative to TAU. Although CR effects appeared most robust and stable in learners, analyses restricted to non-learners also detected significant CR effects on skill acquisition relative to TAU. Hierarchical regression including training condition (CR vs. TAU), baseline memory span, and pre- and post-training LP as predictors of skill acquisition found that significant additional variance was explained by post-training LP (15%) after accounting for effects of CR (13%).

Conclusions: Results suggest that although most participants evidenced impaired LP, significant improvement on a proximal measure of memory training was achieved. Importantly, the association between post-training LP and skill acquisition suggests that LP can be a modifiable and generalizable outcome of cognitive remediation.

Correspondence: *Jason K. Johannesen, PhD, Psychiatry, Yale University, YACHS 116B, 950 Campbell Ave, West Haven, CT 06516. E-mail: jason.johannesen@yale.edu*

M. BANIGAN, P. KAO, J. KOZUBEK, J. MEDINA, J. COSTA, A. SCHMITT, I. DELALLE & C. VANDERBURG. Exosomal miRNA profiling in prefrontal cortices of patients diagnosed with bipolar disorder and schizophrenia.

Objective: Small non-coding RNA molecules (microRNAs, miRNAs) regulate genes involved in brain functions negatively affected by neuropsychiatric disorders. Here we test the hypothesis that exosomes, secretory vesicles that contain miRNAs, harbor differential miRNA content in the postmortem brain tissue of patients diagnosed with either bipolar disorder (BD), schizophrenia (SZ), or of normal controls. An important characteristic of secreted exosomes is their ability to attach themselves to recipient cells, release their contents, and thus potentially modulate the function of the recipient cell. This study may help elucidate neuropathological mechanisms underlying BD and SZ as well as identify biological markers.

Participants and Methods: The sources of the brain tissue included McLean 66 Cohort Collection and BrainNet Europe II. Exosomal miRNA from the frozen postmortem prefrontal cortices (Brodmann area 9, BA9) with well preserved RNA of patients diagnosed with SZ, BD and matching controls, was isolated and profiled by a FLEXMAP 3D microfluidic device. Intra-normalization of the data was performed as described in the Luminex protocol followed by statistical analyses.

Results: Student's *t*-test analysis revealed specific miRNAs to be differentially regulated in BD, SZ, and control samples. Furthermore, cluster and false discovery rate analyses indicate 20 miRNAs to be differentiated in SZ samples in comparison to BD and control samples. The examined BD and control samples have more similarities in levels of expression compared to SZ samples. Statistical significance was obtained by *z*-scores subject to a threshold value determined by a method of machine learning.

Conclusions: The variation of exosomal miRNA content between BD, SZ and control brains may suggest disease-specific disruption of the molecular pathways in the BA9 region. Upon RT-PCR validation of the Luminex results (currently underway), functional studies of miRNA expression will be performed to further illustrate their involvement in BD and SZ.

Correspondence: *Patricia Kao, MS, Pathology, Boston University, 72 E. Concord St, R907, Boston, MA 02118. E-mail: pkao@bu.edu*

N. LAKIS, E. GLASER, M. GERMAIN, A. MENDREK & M.E. LAVOIE. ERP Scalp Topography of Emotional Picture Recognition in Schizophrenia Men and Women.

Objective: Emotional episodic memory is behaviorally impaired in schizophrenia. Nonetheless, there is a large gap in the scientific literature with regards to the neural correlates as well as potential sex differences associated with emotional memory processes in this psychiatric population—despite robust evidence that there are differences in healthy men and women. Using the high spatial resolution of fMRI, previous results by our group have uncovered distinct patterns of cerebral activity in men and women with schizophrenia during recognition memory of positive and negative pictures. The aim of the present study is to investigate the interaction between emotional episodic memory, sex and schizophrenia using the high temporal resolution of event-related potentials (ERP).

Participants and Methods: Raw EEG data, obtained from 56 electrodes, was recorded in 30 patients with schizophrenia (15 women) and 30 healthy controls (15 women) matched for age and intelligence. The episodic memory task consisted of presenting 100 old and 100 new photographic images divided into four categories based on valence (pleasant-unpleasant) and arousal (high-low) selected from the International Affective Picture System. The participants task was to indicate, with a press of a button, which images were new and old.

Results: The results of the early frontal N200 revealed a reduced episodic memory effect in response to both emotional valence and arousal in schizophrenia women relative to healthy women. Analysis of the later central component (LPC) showed a reduced memory effect in men and women with schizophrenia in comparison to same sex controls. However, in men this effect was observed with respect to emotional valence and in women with emotional arousal.

Conclusions: Our findings outline that episodic memory is modulated by emotional valence and arousal differently in men and women with schizophrenia despite comparable subjective emotional experience to the images.

Correspondence: *Nadia Lakis, Psychiatry, Centre de Recherche Fernand-Seguin, 7331 rue Hochelaga, Montreal, QC H1N3V2, Canada. E-mail: nadialakis@gmail.com*

M. LAVOIE, J. BÉDARD-LACROIX, F. GODMAIRE DUHAIME, L. BRUNELLE-HAMANN, I. PLANA, P. JACKSON & A. ACHIM. Social cognition impairments in parents of patients with schizophrenia.

Objective: Social cognition refers to an ensemble of cognitive abilities that allow us to perceive and interpret social stimuli. Three major components can be distinguished: mentalizing, emotion processing and social knowledge. Social cognition is affected in patients with schizophrenia but studies in healthy relatives of these patients are less consistent. The presence of social cognition difficulties in relatives would suggest a potential genetic role of social cognition in schizophrenia. The goal of this study is to evaluate mentalizing, emotion processing and social knowledge in parents of patients with schizophrenia.

Participants and Methods: The Integrated Battery of Social Cognition (IBSC) (Achim et al., submitted) was administered to 27 parents of patients with schizophrenia and 20 controls. The IBSC is composed by two mentalizing tasks, one emotion processing tasks, and one social knowledge tasks.

Results: After controlling for the effect of age, significant group differences are observed in all tasks except in the social knowledge task, with moderate effect sizes (*d*). Surprisingly parents performed better than controls on the social knowledge task.

Conclusions: This study is to our knowledge the first one evaluating simultaneously these three aspects of social cognition in relatives of patients with schizophrenia. Results show that mentalizing and emotion processing are impaired in parents of patients with schizophrenia. On the other hand, social knowledge seems to be preserved in this population. This study thus suggests that only some aspects of social cognition may be related to a genetic risk for developing the pathology.

Correspondence: *Marie-Audrey Lavoie, Université Laval, 2601 de la Canardière, Québec, QC G1J 2G3, Canada. E-mail: marie-audrey.lavoie.1@ulaval.ca*

N. OJEDA, J. PEÑA, E. BENGOETXEA, P. SANCHEZ, A. GARCIA, E. ELIZAGARATE, J. EZCURRA & M. GUTIERREZ. Cognitive Reserve as a Moderator of Outcome in Chronic Schizophrenia.

Objective: Cognitive reserve (CR) is commonly recognized as a moderator of cognitive decline in aging and dementia, but is has not been exhaustively explored in psychosis literature. CR hypothesis suggest that CR may mitigate the adverse effects of brain pathology. On the other hand, previous literature in schizophrenia has highlighted the predictive value of cognition/processing speed regarding functional outcome. We aimed to explore if CR acts as a moderator of the effect of cognitive impairment on functional disability in patients with chronic schizophrenia.

Participants and Methods: One hundred and sixty-five patients with long-term schizophrenia were assessed for clinical symptoms (PANSS), CR (Vocabulary subtest from WAIS-III and total years of formal education completed), neuropsychological functioning (attention, learning and memory, speed of processing and executive functioning) and functional disability (GAF scale).

Results: Patients with low CR presented significantly higher level of negative symptoms, higher functional disability and worse performance in processing speed compared to those patients with high CR. Regression analyses showed that CR moderated the effect of processing speed on functional disability total score and on 3 out of the 4 domains of functional disability (including self-care management, family contact and vocational outcome). The moderating effect of CR on other cognitive domains, in contrast, was not significant.

Conclusions: CR is associated to severity of the illness in our sample of chronic patients with schizophrenia as measured by negative symptoms, functional disability and cognition. Moreover, CR play a moderating effect among the reported associations between cognition and outcome that needs to be further explored. This study was partially funded by the Department of Education, Universities and Research of the Basque Government (BFI 09.123) and EITB-Maratoia (BIO 09/EM/023).

Correspondence: *NATALIA OJEDA, PhD, of Methods and Experimental Psychology, Universidad de Deusto, Avenida de las Universidades 27, Bilbao 48007, Spain. E-mail: nojeda@deusto.es*

N. OJEDA, J. PEÑA, E. BENGOETXEA, A. GARCIA, R. SEGARRA, I. EGUILUZ, J. GARCIA & M. GUTIERREZ. Cognitive Explanations for Discrepancies Between Objective and Subjective Measures of Functional Outcome in First-Episode Psychosis: Insights from Cognitive Rehabilitation.

Objective: Cognitive remediation in schizophrenia aims to improve patient's cognition and outcome. However, objective and subjective measures used for assessing outcome show inconsistent results.

Participants and Methods: 31 patients with First-Episode Psychosis were randomly allocated into experimental group (36 sessions of cognitive rehabilitation) or control group (occupational therapy) for a 3-

month treatment period in addition to treatment as usual. Patients underwent pre and post treatment clinical and neuropsychological assessment. Additionally, we measured post treatment subjective (SF36 completed by the patients) and objective (CGI completed by the clinician) functional outcome.

Results: In the overall sample, objective functioning did not correlate with subjective functioning. However, closer inspection revealed that subjective and objective measures were correlated within the rehabilitation group ($r = -.42$), but not among controls ($r = -.19$). Therefore, we decided to control for variables that differed between groups (changes in insight, negative symptoms and cognition). Semi-partial correlations revealed that the magnitude of the correlation between objective and subjective measures was similar for both groups only when we controlled for cognitive changes (Pearson's $r = -.36$ in rehabilitation group and $-.42$ in control group). Contrary to expected, insight or negative symptoms did not contribute to explain the initial differences.

Conclusions: Our results suggest that changes in cognition may at least partially explain why scores in subjective measures of functional outcome do not usually correspond to objective scores. Nevertheless, the significant improvement in insight measures observed in the cognitive remediation group was not associated to a better accuracy in subjective measures. This study was partially funded by the Department of the Basque Government (ID 2008111010) and EITB-Maratoia (BIO 09/EM/015). Correspondence: NATALIA OJEDA, PhD, of Methods and Experimental Psychology, Universidad de Deusto, Avenida de las Universidades 27, Bilbao 48007, Spain. E-mail: nojeda@deusto.es

J.L. REILLY, T. KHINE, S. SHRESTHRA & J.A. SWEENEY. Deficits in behavioral response inhibition among unmedicated first episode schizophrenia patients.

Objective: Deficits of inhibitory behavioral control are common among patients with schizophrenia. Stop signal tasks (SST) allow for an examination of how successfully planned responses may be inhibited when contextual demands change, and how quickly inhibitory processes may be applied.

Participants and Methods: Eighteen patients meeting DSM-IV criteria for schizophrenia who were early in their course of illness and unmedicated at the time of testing completed a manual SST. All trials began with the presentation of a central fixation stimulus. During 'Go' trials (60% of trials) a green target appeared to the right or left and subjects pressed the corresponding button of a handheld response box. During interspersed 'Stop' trials (40% of trials), a red stop cue replaced the central fixation stimulus at varying delay intervals after the green target was presented and subjects were to inhibit their response. A block of 'Go' trials prior to the experimental task determined a baseline manual reaction time. Twenty-one demographically matched controls were also studied.

Results: Patients and controls showed a comparable increase in reaction time from the baseline Go trials to the Go trials in the experimental condition, indicating a similar slowing of responses when inhibition of the response might be required. Despite similar reaction time findings, patients demonstrated significantly greater response inhibition failures on Stop trials. Task performance was unrelated to clinical symptom ratings in patients.

Conclusions: Acutely symptomatic unmedicated patients with schizophrenia demonstrated deficits in inhibiting context inappropriate responses on a manual SST. Findings suggest that failures of inhibition are not due to a slowing of inhibitory processes, but impairment in the control of response planning and execution.

Correspondence: James L. Reilly, PhD, Psychiatry and Behavioral Sciences, Northwestern University Feinberg School of Medicine, 710 N Lakeshore Drive, Abbott Hall 1315, Chicago, IL 60611. E-mail: james.reilly@northwestern.edu

J.E. ROSEBERRY & S. HILL. Schizophrenia Patients Show Practice Effects on the MCCB Comparable to those Observed in Psychiatrically Healthy Controls.

Objective: Differentiating treatment effects from practice effects is essential to understanding the cognitive impact of antipsychotic medica-

tions. In schizophrenia, practice effects have been observed across a broad range of cognitive domains. However, few studies focus on establishing normative practice effects in this population. This study aims to establish normative expectations for practice effects for the Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) Consensus Cognitive Battery (MCCB).

Participants and Methods: Schizophrenia patients ($n=30$) who were clinically stable and on a stable regimen of antipsychotic medication, were matched on age, education, premorbid intelligence, and current intelligence with a group of psychiatrically healthy controls ($n=32$) and both groups were twice administered the MCCB over a 4-week period.

Results: A repeated measures ANOVA evaluated the main effects of diagnosis and time (initial and 4-week assessments) on the MCCB overall composite score. There was a significant main effect for time ($p < .001$), but not diagnosis or the diagnosis by time interaction. Individual tests were also evaluated and no differential practice effects were observed for the two groups on any test. Effect sizes for improvement ranged from 0.04 to 0.55.

Conclusions: When practice effects were observed, schizophrenia patients and psychiatrically healthy controls displayed similar rates of improvement on testing. Thus, when well matched for education and intelligence, and in the absence of any behavioral, cognitive, or pharmaceutical intervention, schizophrenia patients neither displayed baseline cognitive deficits nor differential practice effects relative to healthy controls. Only when patients show more significant gains than those observed presently, can one entertain the possibility of genuine cognitive improvements

Correspondence: Jarett E. Roseberry, M.S., Psychology, Rosalind Franklin University of Medicine and Science, 3333 Green Bay Road, North Chicago, IL 60064. E-mail: jarett.roseberry@my.rfums.org

E. BOISSEAU, P. SCHERZER, ÉDITH. LÉVEILLÉ, N. DJERROUD & E. STIP. Theory of Mind in Paranoid Schizophrenia: What are we Measuring?

Objective: We postulate that theory of mind is a multifaceted construct and each test measures a different component.

Participants and Methods: A group of 21 diagnosed, young, stable, paranoid schizophrenia patients with mainly positive symptoms on the PANSS, and 29 control subjects were tested on a battery of 5 different measures of ToM, Reading the mind in the eyes test, Faux pas, Hinting Task, C&I (a test taken from popular daytime TV drama series), Strange Stories.

Results: The results showed that of the 9 possible pairs of correlations between the 5 tests, only 2 were significant in the clinical group. The specificity of the tests also varied as witnessed by the effect size that ranged from 0.44 (Reading the Mind in the Eyes Test) to 2.51 (Hinting Task). Qualitative analyses revealed that the deficit was characterized by incorrect attributions of mental states including the attribution of threatening intentions to others (over-mentalisation), or non-interpretative responses (under-mentalisation) and incomplete answers, depending on the test of ToM.

Conclusions: The lack of correlation between the tests within the same group, the variability in the effect size and the variability of under-mentalisation and over-mentalisation errors depending on the tests, are interpreted as confirming the heterogeneity of constructs measured by the tests

Correspondence: Peter Scherzer, PhD., Psychology, Université du Québec à Montréal, CP 5858, Succursale Centre Ville, Montréal, QC H2C 3P5, Canada. E-mail: scherzer:peter_b@uqam.ca

E. BOISSEAU, P. SCHERZER, E. LÉVEILLÉ, N. DJERROUD & E. STIP. Lessons from Cognitive Mediators of Theory of Mind Performance in Paranoid Schizophrenia.

Objective: In a previous study, the variability in results between tests of theory of mind (ToM) led us to argue that theory of mind is a multi-dimensional function with relative independence between the dimensions. If this is so, we hypothesize that the profile of executive functions that have been closely linked to ToM (Glahn et al., 2005; Hardy-Baylé, 2003; Pickup, 2008) should vary between tests that measure different the dimensions of ToM.

Participants and Methods: Twenty one young, stable, diagnosed paranoid schizophrenic patients with mainly positive symptoms on the PANSS

and 29 non-clinical controls were tested on a battery of 5 tests of ToM (Faux pas, Hinting Task, Strange Stories, Reading the Mind in the Eyes, C&I [video clips from popular daytime TV drama series] and a battery of 9 executive function tests (Trails A & B, WCST, Tower of London, working memory, Brixton, Zoo Map, verbal fluidity, Stroop, Hayling).

Results: The results confirm the hypothesis. The correlations between executive functions and ToM were different for each test of ToM. Stroop flexibility explained 56.3% (r^2) of the variance on Strange Stories in the PSz group, Brixton errors explained 39% of the variability on C&I, Zoo Map planning explained 27% of the variability on Faux pas. Digit Span explained 21.2% of the variance on Hinting Task.

Conclusions: The results are interpreted as supporting the notion that at least in this sample of this clinical group, the profile of executive functions mediating performance on different tests of ToM, differs which would support our argument that the dimensions of ToM related to each test, are distinct and independent.

Correspondence: *Peter Scherzer, PhD., Psychology, Université du Québec à Montréal, CP 8888, Succursale Centre Ville, Montréal, QC H2C 3P5, Canada. E-mail: scherzer.peter_b@uqam.ca*

A. BUCHHOLZ, Y. TAKAYANAGI, T. HO, G. GERNER, T.D. VAN-NORSALL, G.K. THAKER & D.J. SCHRETTLEN. Word and Design Fluency Show Different Patterns of Association with Cortical Thickness in Adults with Schizophrenia and Healthy Controls.

Objective: Cortical thinning is well documented in persons with schizophrenia (SZ), frontal and temporal cortices being most affected. Word and design fluency usually are also impaired in SZ. Because these abilities likely depend on frontal and temporal structures, we sought to determine whether adults with and without SZ would show different patterns of correlation between cortical thickness and performance on tests of fluency.

Participants and Methods: Participants included 33 adult outpatients with SZ and 35 healthy controls (HC). We used FreeSurfer v5.1.0 to measure cortical thickness from brain MRI scans obtained on a Siemens 3T machine and correlated regional variations in cortical thickness with cognitive performance. The numbers of acceptable words given during 4 consecutive 1-minute trials of letter (s, p) and category (supermarket items, animals) word fluency, and the number of acceptable drawings produced during a 4-minute design fluency task, were recorded for analyses. We used general linear modeling to examine the association of regional cortical thickness with word and design fluency (controlling for age and sex). We set the initial threshold to $p < .01$ uncorrected, and then corrected results using Monte-Carlo simulation ($p < .01$).

Results: Patients with SZ showed positive correlations ($p < .0001$) between verbal fluency and cortical thickness in middle and superior temporal regions bilaterally. HCs showed positive correlations ($p < .001$) between design fluency and cortical thickness in right lingual, postcentral and supra-marginal regions, and in left insula, cuneus, and precentral cortex.

Conclusions: The SZ and HC groups showed different associations between cortical thickness and cognitive performance. The correlation of thinning in the left temporal cortex with reduced verbal fluency links two well-documented abnormalities in SZ. The involvement of right cortical regions in design fluency also is consistent with previous research, but raises more questions.

Correspondence: *Tracy D. Vannorsdall, PhD, Psychiatry & Behavioral Sciences, Johns Hopkins School of Medicine, 600 N. Wolfe St./Meyer 218, Johns Hopkins Hospital, Baltimore, MD 21287. E-mail: TVannor1@jhmi.edu*

Y. WANG, D. NEUMANN, D. SHUM & R. CHAN. An Exploratory Study of Schizotypy Traits and Empathy Performances in Chinese College Students.

Objective: Schizophrenia is associated with a wide range of neurocognitive and social cognitive functioning such as empathy. However, it is not clear whether at-risk individuals with schizotypy personality trait also demonstrate similar deficits in empathy. The present study aimed to explore the relationship between schizotypy traits and empathy performances in the context of Chinese college students.

Participants and Methods: Seventy college students were to complete an empathy task for pain perception, a set of checklists capturing schizotypy traits, empathy functioning, memory, IQ, and depressive symptoms. Correlation analysis was performed to explore the association between schizotypy traits and empathy performances. Participants were further classified into schizotypy ($n = 15$) and non-schizotypy ($n = 15$) for comparison of empathy performances.

Results: Magical ideation was correlated with fantasy ($r = 0.34, p < 0.01$), social skills ($r = -0.26, p < 0.05$). Physical anhedonia was correlated with perspective taking ($r = -0.30, p < 0.05$), fantasy ($r = -0.31, p < 0.05$), EQ total score ($r = -0.27, p < 0.05$), social skills ($r = -0.25, p < 0.05$). Social anhedonia was associated with personal distress ($r = 0.25, p < 0.05$), EQ total score ($r = 0.24, p < 0.05$), social skills ($r = -0.52, p < 0.001$) and emotional reactivity ($r = 0.32, p < 0.01$). After controlling for depressive symptoms, most of the correlations remained significance. Individuals with schizotypy demonstrated lower social skills ($t = 2.92, p < 0.01$), emotional reactivity ($t = 2.27, p < 0.05$), and higher personal distress ($t = 2.41, p < 0.05$) than those without schizotypy. Individuals with schizotypy also demonstrated lower scores on logical memory ($t = 2.73, p < 0.05$ for immediately recall; $t = 2.79, p < 0.01$ for delay recall) and higher depressive symptoms ($t = 2.80, p < 0.01$) than those without schizotypy.

Conclusions: The current findings indicate that schizotypy traits were significantly associated with empathy performances. Individuals with schizotypy showed worse social skills, emotional reactivity and personal distress than control group.

Correspondence: *Yi Wang, Master, institute of psychology, Chinese Academy of Sciences, 4A Datun road, Chaoyang district, Beijing, China, Beijing 100101, China. E-mail: wangyi@psych.ac.cn*

Symposium 7: Considerations for Structural Neuroimaging in Neurodegenerative Disorders

Chair: Catherine Price

3:15–4:45 p.m.

C. PRICE. Considerations for Structural Neuroimaging in Neurodegenerative Disorders.

Symposium Description: This symposium will highlight recent research employing diffusion weighted imaging and voxel based morphometry analysis to conceptualize structural connectivity and gray matter changes associated with Parkinson's disease (PD), Alzheimer's disease (AD), and prodromal dementia syndromes. Dr. Thomas Mareci, an expert in the physics of magnetic resonance imaging and diffusion theory, will explain methods for modeling translational diffusion and their application for investigating temporal lobe connectivity in rat and human brains. Jared Tanner will present data from a novel imaging investigation examining the reliability of diffusion-weighted frontal-subcortical fiber tracking and discuss the complexities of mapping frontal-subcortical circuitry in PD. Dr. Glenn Stebbins will review data demonstrating the value of translational (mean diffusivity: MD) and directional (fractional anisotropy: FA) diffusion metrics for examining brain-behavior patterns in AD and mild cognitive impairment. Dr. Jennifer Goldman, will review her application of voxel-based morphometry to examine hypothesized gray matter atrophy patterns in non-demented PD, PD mild cognitive impairment, PD with dementia, and non-PD healthy controls. Dr. Bruce Crosson, well-known for his application of structural and functional imaging modalities for the study of subcortical contributions to language, will summarize key symposium points and provide insight into the value of structural imaging for examining the neuropsychology of neurodegenerative disorders.

Correspondence: *Catherine Price, Ph.D., Clinical and Health Psychology, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: cprice@phhp.ufl.edu*

G. STEBBINS. Application of Diffusion Tensor Imaging in Alzheimer's Disease and Mild Cognitive Impairment.

Because of the known relationship between memory function and gray matter structures of the medial temporal lobe, many magnetic resonance imaging (MRI) studies of Alzheimer's disease (AD) and mild cognitive impairment (MCI) have focused on the hippocampus and entorhinal cortex. Fewer studies have investigated the integrity of white matter of these same regions. Diffusion tensor imaging (DTI) is a MRI technique that allows for the interrogation of the microstructural integrity of white matter. Based on increases in translational diffusion (mean diffusivity: MD) and decreases in directional diffusion (fractional anisotropy: FA) damage to white matter can be assessed. Studies have identified regions of increased MD and decreased FA in patients with AD and MCI in all lobes of the brain, as well as medial temporal lobe structures including the hippocampus, entorhinal cortex and parahippocampal white matter. The pattern of white matter integrity disruption tends to follow an anterior to posterior gradient with greater damage noted in posterior regions. Recent studies have exploited inter-voxel directional similarities to develop models of white matter pathways, and have used these models to assess the integrity of inter-cerebral connections. Particular focus has been applied to the parahippocampal white matter and the posterior cingulate. Although many studies have found DTI indicators of impaired white matter in AD and MCI, other studies have failed to detect any differences in MD or FA between the groups, suggesting the need for large replicative studies. These conflicting findings demonstrate that DTI is an evolving technique with select strengths and weaknesses.

NIH P01 AG09466

Correspondence: *Glenn Stebbins, PO Box 100165, Gainesville, FL 32610. E-mail: gstebbin@rush.edu*

T. MARECI. Imaging the White Matter Structure of the Brain with Diffusion-Weighted Magnetic Resonance.

The relationship of structure to function in the brain is central to understanding neural processing in healthy, injured, and diseased brains. Magnetic resonance imaging has become a premier modality for the study of brain structure and function in vivo. Recently, in vivo measures of water translational diffusion have been used to infer tissue structure in regions where this diffusion is restricted by structural features of tissue (e.g., axonal membranes). In this presentation, the fundamental process of water translation diffusion in tissue will be outlined and methods for measuring this translational water diffusion in tissue will be discussed. With these measurements, several methods of modeling translational diffusion (e.g., calculation of diffusion tensor, and the calculation of diffusion displacement probability) are possible and the strengths and limitations of each will be discussed and illustrated. With a suitable representation of the translational diffusion in each image voxel, this information can be used to infer white matter fiber pathways in the brain, which can be related to functional connectivity. Finally, to put this connectivity measure in a quantitative framework, diffusion-derived white matter fiber connectivity can be used to create a graph of the brain as a network of nodes (gray matter) connected by edges (white matter fibers) and analyzed with the tools of graph theory. This approach can be applied to connections in the temporal lobe and used to examine pathological connections in the human brain.

Correspondence: *Thomas Mareci, PO Box 100165, Gainesville, FL 32610. E-mail: thmareci@nbi.ufl.edu*

J.J. TANNER, P.T. NGUYEN, W. TRIPLETT, T. MARECI & C. PRICE. Fiber Tracking Alexander, DeLong & Strick Circuits: Considerations for Reliability and Applications to Neurodegenerative Diseases.

Formally investigating the circuits proposed by Alexander, DeLong, and Strick through diffusion-weighted imaging and associated fiber tracking will help improve understanding of gray-white matter connectivity in neurodegenerative diseases. To date, there have been relatively few studies assessing the reliability of diffusion imaging over time, with this particularly true for fiber tracking. The goal of this talk is to present data on the reliability of fiber tracking frontal-subcortical circuits. Study methods involved repeat scanning of one healthy adult male (age=37)

on ten separate occasions over a one-month period within a 3T magnetic resonance scanner. The protocol involved two T1-weighted and two diffusion-weighted scans (6 direction {b = 100}; 64 direction {b = 1000}). Postprocessing involved a combination of in-house software and freeware (FreeSurfer; FSL). Frontal, caudate, globus pallidus, and thalamus regions of interest (ROIs) were extracted and cleaned by an expert rater. A mixture of the Wishart method was used for fiber tracking. Fiber statistics involved edge weight (connectivity strength) and fiber number (streamlines) between ROIs. Across the 10 scans, gray matter ROIs were stable (coefficients of variation (COV)): left caudate: 2.9%; left GP: 4.6%; left thalamus: 6.9%; left frontal: 0.8%. Edge weights (connectivity strength) were variable (COVs: 19% - 75%). Fiber numbers were also more variable than structure volumes (COVs: 12% - 38%). These results demonstrate that tracking and quantifying frontal-subcortical networks is possible, but investigators need to consider reliability, particularly for fiber tracking between ROIs. Further imaging possibilities and limitations will be discussed for application to neurodegenerative diseases and specific circuits, such as the dorsolateral-prefrontal circuit, which is considered important for working memory.

NINDS K23NS060660 (CP)

Correspondence: *Jared J. Tanner, PO Box 100165, Gainesville, FL 32610. E-mail: jjtanner@phhp.ufl.edu*

J. GOLDMAN. Structural Magnetic Resonance Imaging Markers of Cognitive Impairment and Dementia In Parkinson's Disease.

Cognitive dysfunction in Parkinson's disease (PD) ranges from mild executive dysfunction to severe dementia (PDD), including memory and non-memory deficits. Longitudinal studies report PDD in over 75% of patients. PDD neuropathology remains controversial with Lewy bodies and neurites, Alzheimer's disease, and brainstem/subcortical degeneration. Although neuropathology may represent a "gold standard," structural magnetic resonance imaging (MRI) permits an in vivo evaluation of neuroanatomical correlates of behavior. As such, structural MRI can be used as an in vivo marker of brain atrophy patterns associated with dementia and mild cognitive impairment in PD (PD-MCI) and potentially to predict incipient dementia. Here, I will review structural MRI studies in PDD and PD-MCI and present data from our lab, focusing on gray matter atrophy patterns associated with PD cognitive impairment. Structural MRI studies in PDD using manual segmentation or semi-automated methods such as voxel-based morphometry demonstrate gray matter atrophy in the mesial temporal lobes including the hippocampus and in some studies, also frontal and widespread cortical regions, compared to non-demented PD and healthy controls. Specificity of these MRI findings to PDD will be examined, as well as regional gray matter atrophy patterns in PD-MCI, which have been less consistently detected. Overall, structural MRI studies across the PD cognitive spectrum identify different regional gray matter atrophy patterns and suggest associations with not only severity, but also type of PD-related neuropsychological deficits. These findings support the role of structural MRI as a marker of brain-behavior correlates in PD and potentially, in identifying patients at risk for dementia.

NINDS K23060949

Correspondence: *Jennifer Goldman, PO Box 100165, Gainesville, FL 32619. E-mail: jennifer_g_goldman@rush.edu*

Poster Session 5: Epilepsy/Genetics and Genetic Disorders/Medical Disorders (Child and Adult)

3:30–5:00 p.m.

Epilepsy/Seizures

R. BERMAN & D. TUCKER. Recall of Faces and Facial Affect during the Wada Test.

Objective: Both language and memory lateralization has been extensively studied in the context of the Wada test, but the processing and

subsequent recall of emotional faces during the exam remains unexplored. This study attempts to take advantage of this short-term “lesion-like” manipulation of lateralized ICA injection of a barbiturate to examine the hemispheric contributions to memory for emotional faces. Given that the ICA supplies the amygdala while inferotemporal cortex is supplied by posterior circulation, it is hypothesized that affective processing will be selectively impaired and facial recognition preserved.

Participants and Methods: 8 adults with medically intractable epilepsy were shown two pictures of two actors expressing either a happy, sad, or neutral face during breivital injection in left and right ICAs. Upon clearing of the barbiturate, recognition and recall was tested for both actor and emotion in separate trials.

Results: Thus far data is not showing systematic change in capacity for recognition and recall for faces or emotion related to side of injection.

Conclusions: These preliminary findings raise the possibility of equipotentiality of either amygdala in the memory for emotion for facial affect. Although facial recognition was not predicted to be affected by the ICA injection, in those cases that showed substantial difficulties with actor or affect recall, both abilities appeared to be affected equally. Implications regarding post-surgical outcomes following temporal lobectomy will be discussed.

Correspondence: *Rachel Berman, B.A., University of Texas at Austin, 7744 Northcross Dr., Apt. #N263, Austin, TX 78757. E-mail: rachel.berman@mail.utexas.edu*

G.M. BERRIOS-SIERVO, M. DUCHOWNY, B. KORMAN & G.J. REY. Behavioral Outcomes Following Hemispherectomy in Children With Intractable Epilepsy.

Objective: Investigate behavioral outcomes of children with intractable epilepsy (IE) following hemispherectomy (HG) relative to a group of pre-surgical controls (PC) with hemispheric pathology and epilepsy who were candidates for hemispherectomy.

Participants and Methods: The sample consisted of 16 HG and 20 PC between the ages 6 and 18 years. The Achenbach CBCL was used to assess behavior.

Results: Groups were demographically similar except for younger age of seizure onset for the HG ($p < 0.001$). Gender correlated significantly with Total Problems and Attention, while both gender and seizure frequency were related to Internalizing Problems. After covarying for gender and seizure frequency, HG subjects were rated by parents as significantly less Withdrawn/Depressed ($p = 0.04$) than PC. No other group emotional differences were found. For the combined sample (HG+PC), right hemispheric disease had significantly higher scores on Anxious/Depressed ($p = 0.036$), Rule-Breaking ($p = 0.019$), ODD ($p = 0.031$), and Conduct Problems scales ($p = 0.021$).

Conclusions: Hemispherectomy is a radical but effective intervention for children with IE and hemispheric pathology. While various series have focused on cognitive outcome, very little is known about behavioral changes following this surgery. Our results indicate no worsening of behavior for the HG sample relative to PC's; the overall trend was toward fewer psychiatric symptoms. Right hemisphere disease appears to be associated with greater behavioral issues. This study is limited by its cross sectional design; Longitudinal pre- and post-surgical cohorts would provide greater understanding of the impact of how this procedure impacts behavior and development in children undergoing hemispherectomy.

Correspondence: *Gretchen M. Berrios-Siervo, Psy.D., Dartmouth Medical School, 1 Medical Center Drive, Lebanon, NH 03756. E-mail: gretchen.m.berrios-siervo@hitchcock.org*

L. SALAZAR, S. SURABHI, A.D. FALCHOOK & K.M. HEILMAN. Closure in Epilepsy.

Objective: The left hemisphere develops hypotheses and searches for meaningful patterns, while the right hemisphere is less inclined to search for causal explanations (Wolford et al 2000). The tendency to make predictions and consider the future outcomes, and to learn that these outcomes did not come to fruition, may lead to failure to

obtain a sense of closure. We proposed that an increased need for closure may, in part, underlie the interictal personality syndrome of temporal lobe epilepsy (TLE) proposed by Waxman and Geschwind (1975), and an increased need for closure may be associated with increased sensitivity to unexpected endings of sentence pairs. Thus, we predicted heightened sensitivity to unexpected endings would be increased in people with left TLE and decreased in people with right TLE.

Participants and Methods: Participants with right (12) or left (12) TLE and 10 control participants were asked to read sentence pairs with endings of high, intermediate, or low predictability and to rate how strongly they expected each sentence pair to end the way it did.

Results: We found no difference between groups in ratings between the three types of endings.

Conclusions: Our results did not demonstrate that a reduced or heightened sensitivity to unexpected situational outcomes is a feature of TLE. However, whether or not people with TLE have the same type of emotional response to sentences with ambiguous or unpredictable endings remains a question for future research.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

M.K. FOSTER, R.M. BUSCH, L.L. FERGUSON & C.C. KENNEY. Relationship of Executive Function and Working Memory with Recognition of Emotion in Patients with Temporal Lobe Epilepsy.

Objective: Temporal lobe epilepsy (TLE) is associated with impairment in the recognition of emotion. Performances on tasks of executive function (EF) and working memory (WM) are related to emotional processing which in turn are predictive of social functioning in other populations. If similar relationships between cognitive functions and emotional processing exist in TLE, they could lead to a better understanding of the factors that influence social functioning in individuals with epilepsy.

Participants and Methods: Participants included 41 patients who had undergone temporal lobe resections for treatment of TLE (Left = 22; Right = 19). Mean age at seizure onset was 19.72 years, and mean duration was 21.05 years. All patients completed complex sequencing, problem-solving, attention, and working memory measures. The subtests from the Diagnostic Analysis of Nonverbal Accuracy – 2nd Edition (DANVA2) were used to assess emotion recognition in facial expressions and vocal excerpts from both adults and children. Correlational analyses were conducted to examine the relationships between cognitive functioning and emotion recognition.

Results: Results suggest that affect recognition is significantly positively correlated with EF (r range = .29 to .45), attention (r range = .28 to .34) and WM (r range = .36 to .46) with small to moderate effect sizes.

Conclusions: Preliminary results suggest that cognitive performances are related to the recognition of emotion in individuals with TLE. Further investigation of this relationship in patients with epilepsy may lead to enhanced understanding of emotional processing and the potential impact of impaired emotion recognition on their social interactions and overall quality of life.

Correspondence: *Mary K. Foster, Ph.D., Psychiatry & Psychology, Cleveland Clinic Foundation, P57, 9500 Euclid Ave, Cleveland, OH 44195. E-mail: mary.foster@gmail.com*

S.D. GALE & S.W. HILL. Mesial Temporal Sclerosis and Congruent Temporal Lobe Epilepsy: Lateralization predicted by RAVLT and BVMT-R.

Objective: This study investigated lateralized differences in memory performance in patients with confirmed mesial temporal sclerosis (MTS) and congruent (same hemisphere) temporal lobe epilepsy (TLE). Previous research has suggested limited utility of the BVMT-R compared to the RAVLT.

Participants and Methods: Sixty-nine consecutive patients (40 females; average age=38.7, SD=12.4) with documented MTS and congruent TLE were evaluated on an epilepsy monitoring unit prior to observed seizures. Raw scores for learning (total over trials) and delayed recall were converted to T-scores. T-score differences of greater than or equal to 1 standard deviation (1SD) between BVMT and RAVLT were considered lateralized.

Results: Of the 69 patients, 37 (23 female) had lateralized learning findings and 35 (21 female) had lateralized delayed recall findings. Of these, 82% with lower BVMT-R learning were predicted to have Right MTS ($p=0.07$) and 87% with lower BVMT-R delayed recall were also correctly classified ($p=0.012$). In contrast, RAVLT learning correctly classified 45% of patients with Left MTS and delayed recall correctly classified 55%.

Conclusions: A 1SD difference between BVMT-R and RAVLT delay differentiated between TLE patients with Right or Left MTS. Although the BVMT-R outperformed the RAVLT in predicting side of MTS, this may be artificial since predictive value was only calculated in those with large BVMT-R/RAVLT differences. Still, clinicians often look for lateralized differences in predicting seizure onset as well as congruency of cognitive findings compared to EEG and MRI. In this study, a 1SD delayed recall difference between BVMT-R and RAVLT correctly predicted right but not left MTS.

Correspondence: *Shawn D. Gale, Dept. of Psychology, Brigham Young University, 1060 SWKT, Provo, UT 84602. E-mail: shawn_gale@byu.edu*

D.D. HARGRAVE, R.W. SCHROEDER, R.J. HEINRICHS & L.E. BAADE. A Case Study of a Patient with Somatic Delusions Following Left Anterior Temporal Lobe Resection.

Objective: We present the case of a 33-year-old, left handed, woman who developed somatic delusions 12 years after left anterior temporal lobe resection for refractory epilepsy.

Participants and Methods: The patient was diagnosed with partial and secondary generalized tonic-clonic seizures at two years of age. She continued having seizures until she was 20-years-old. At that time, she underwent anterior temporal lobe resection. This surgery, coupled with medication management, left her seizure free. Twelve years after the procedure, the patient began presenting with somatic delusions. Despite medical evidence to the contrary, she believed that her body was infected with parasites, and that these parasites were the cause of her multiple somatic pains. Previous psychiatric history and family psychiatric history is insignificant. A video EEG study, head CT, and neuropsychological testing were conducted.

Results: Head CT noted her resective surgery, but was otherwise unremarkable. Video EEG documented four unusual motoric events which were not correlated with epileptiform activity, suggesting psychogenic etiology. Neuropsychological testing suggested that the patient was of average ability, premorbidly. On testing, current functioning ranged from average to below average across multiple domains. Personality and psychopathology testing revealed only mild elevations on somatic scales.

Conclusions: Existing literature suggests that depression, anxiety, psychosis, and non-epileptic seizures are the most common psychiatric disorders with initial onset following epilepsy surgery. New onset somatic delusions as seen in this patient are uncommon.

Correspondence: *David D. Hargrave, M.A., Psychiatry and Behavioral Sciences, University of Kansas School of Medicine, 7829 E. Rockhill, Ste. 105, Wichita, KS 67206. E-mail: dhargrave@kumc.edu*

M. HARRIS, D.A. CAHN-WEINER, W. MCMULLEN, V.L. BRUMM, P. GARCIA & K. LAXER. Verbal and Design Fluency in Left vs. Right Temporal Lobe Epilepsy.

Objective: Previous studies have shown design fluency to be sensitive to right frontal lobe dysfunction, and verbal fluency tasks to be subserved primarily by left-hemisphere structures. Studies with frontal lobe epilepsy (FLE) patients have found lateralizing value in verbal and de-

sign fluency tasks, but lateralizing effects of fluency performance in temporal lobe epilepsy (TLE) are inconsistent. We hypothesized that inclusion of error scores would provide more sensitivity for detecting differences between left and right TLE, as has been shown in patients with FLE.

Participants and Methods: Forty-four patients with focal onset TLE (25 left, 19 right), matched for age, education, and seizure duration, and 17 healthy controls were compared on semantic, phonemic, and design fluency (Ruff Figural Fluency). In addition to total number of designs produced, we examined total perseverations and the perseveration ratio. All subjects were right handed.

Results: Group comparisons revealed no significant differences between right and left TLE on phonemic fluency or design fluency total correct, total perseverations, or perseveration ratio. Left TLE subjects scored significantly lower than right TLE on semantic fluency ($p = 0.007$). Both TLE groups scored significantly lower than healthy controls on phonemic fluency ($p = 0.024$), semantic fluency ($p = 0.025$), and design fluency total correct ($p = 0.001$), but did not differ on design fluency perseverations or perseveration ratios.

Conclusions: These results demonstrate that although design fluency performance may be more sensitive than verbal fluency as a general indicator of brain dysfunction related to TLE, in this sample it did not have significant lateralizing value.

Correspondence: *Deborah A. Cahn-Weiner, Ph.D., Neurology, UCSF, 400 Parnassus Avenue, San Francisco, CA 94143-0138. E-mail: Deborah.Cahn-Weiner@ucsf.edu*

L.L. FERGUSON, J.S. HAUT, T. LINEWEAVER, P. KLAAS & R.M. BUSCH. Neuropsychological Outcomes after Pediatric Epilepsy Surgery: Children with Intractable Temporal Lobe Epilepsy are at Risk for Declines in Verbal Memory and Language after Left Temporal Lobectomy.

Objective: Pre and post surgery neuropsychological (NP) assessments are integral for determining risk for cognitive change following epilepsy surgery. Language and memory outcomes after temporal lobectomy (TL) have been extensively examined in adults with epilepsy; differences in outcome based on surgery side are clear. NP outcomes of TL in children are not as well defined. While several studies indicate children maintain stable FSIQ scores after surgery, memory and language outcomes are variable across studies. The current study examines changes in memory and language after TL in children with epilepsy as a function of surgery side.

Participants and Methods: Sixty-three pediatric patients with intractable temporal lobe epilepsy underwent NP evaluations before and after TL. A series of repeated measures ANOVAs were used to assess post surgical changes in memory (verbal and visual) and language (naming and fluency) as a function of side of surgery (left=39:right=24).

Results: There were significant interactions between time and side of surgery on verbal memory and language measures; after left TL, children declined on these measures whereas children with right TL improved. A significant main effect of time was observed in immediate visual memory, with an overall postsurgical improvement in performance across groups. No significant main effects or interactions were observed for delayed visual memory.

Conclusions: Consistent with the adult literature, results suggest that children who undergo left TL are at risk for postsurgical declines in verbal memory and language. In adults, the relationship between presurgical ability and postsurgical cognitive outcome has been found to be moderated by many factors, e.g., pathology, epilepsy duration, age at seizure onset. Future studies should examine these factors in the cognitive outcome of children and seek to determine whether examination of individual cognitive change in children using reliable change indices bears similar results.

Correspondence: *Lisa L. Ferguson, MA, Cleveland Clinic, 9500 Euclid Avenue, P57, Cleveland, OH 44195. E-mail: fergusl3@ccf.org*

T.A. KEARY, R.M. BUSCH, C.J. BELZILE, J.M. CHAPIN, R.I. NAUGLE & T.W. FRAZIER. *Victoria Symptom Validity Test (VSVT) Performance in Patients with Intractable Epilepsy: Replication and Extension of Loring et al. (2005).*

Objective: Loring et al. (2005) observed relationships between VSVT hard item performance and several IQ and memory indices in a sample of epilepsy surgical candidates and suggested a potential confound of low FSIQ on VSVT performance. The present study replicated such findings in a larger sample and formally evaluated whether VSVT performance varied as a function of FSIQ.

Participants and Methods: 404 patients with medically intractable epilepsy completed a comprehensive neuropsychological assessment. Consistent with Loring et al. (2005), one-way ANOVAs and t-tests evaluated differences in WAIS-III and WMS-III performance as a function of VSVT hard scores [per Grote et al. (2000) criteria for an epilepsy surgery sample: 'valid' (score >20), 'questionable' (18-20), and 'invalid' (<18)]. Quantile regression models were constructed for the 10th, 20th, 30th, 40th, 50th, and 60th percentiles of FSIQ. Linear regression analyses examined the potential mediating effects of working memory on the relationship between FSIQ and VSVT performance.

Results: Differences were identified in multiple indices of intellectual and memory measures across the three VSVT three groups, with the 'invalid' group performing more poorly than the 'valid' and 'questionable' groups. The strength of the relationship between FSIQ and VSVT hard item performance decreased as FSIQ increased. Working memory partially mediated the relationship between FSIQ and VSVT performance. Of note, no participant's VSVT score fell in the invalid range identified by the measure's authors.

Conclusions: Results confirm Loring et al. (2005) findings that VSVT is related to performance on measures of intelligence and memory. Results further indicate that working memory is an important partial mediator in relationship between VSVT performance and IQ. Therefore, VSVT performance should be interpreted in the context of scores reflecting working memory, memory, and intellectual functioning, particularly among those with lower FSIQ.

Correspondence: *Therese A. Keary, Ph.D., Neurological Institute, Cleveland Clinic, 9500 Euclid Avenue/ P57, Cleveland, OH, OH 44195. E-mail: tamatthe@kent.edu*

E. LEAFFER, V. HINTON & D. HESDORFFER. *Longitudinal assessment of skill development in children with first febrile seizure.*

Objective: Febrile seizures (FS) are convulsions accompanied by fever > 101o affecting 2-5% of infants and young children. We will assess whether children with a first FS are more likely to have impaired cognitive and motor development and poor behavior compared to control children without FS.

Participants and Methods: Data came from a prospective cohort study of 298 children, aged 6 months to 5 years, who were identified through the emergency department in an urban, low income community. Cases presented with first FS (defined according to NIH, 1980) and controls presented with fever only and no history of seizure. Skills were measured within one month after the event and again one year later. Direct assessment of cognitive and motor ability and parent report of adaptive and behavior skills was collected, and the difference in performance over one year was examined. T-tests were used to assess between group differences in change over time in each domain.

Results: Performance on all measures was comparable for each group at baseline. Over one year, performance for both groups improved slightly or remained stable on all measures and there were no between group differences in change over time.

Conclusions: Results indicate no difference from controls at baseline and no worsening over time of the development of cognitive, motor, adaptive and behavior skills among children with FS. Our findings support prior evidence that first FS does not pose developmental or behavioral consequences in the young child.

Correspondence: *Emily Leaffer, MPH, Columbia University, 244 E 78th Street, Apt 1F, New York, NY 10075. E-mail: emily.leaffer@gmail.com*

M.C. MARSH, N. HOCHSZTEIN & W. MACALLISTER. *Parent Ratings of Executive Dysfunction in Young Children with Epilepsy – the BRIEF-Preschool Version.*

Objective: Executive dysfunction has been documented in pediatric epilepsy populations using both performance-based tasks and behavior ratings of executive functions (EF) in an everyday context. While previous studies have validated the use of the Behavior Rating Inventory of Executive Functions (BRIEF) in pediatric epilepsy, no studies to date have examined the utility of the preschool version of the BRIEF in this population.

Participants and Methods: Therefore, we examined the frequency and severity of BRIEF-Preschool Version (BRIEF-P) scale elevations, as well as the relationship between BRIEF-P ratings and other measures of EF in a preschool-age epilepsy sample. BRIEF-P protocols were completed by parents of 10 children (ages 3-5) with epilepsy.

Results: Significant elevations on the BRIEF-P were seen in 70% of the sample, with elevations across all indices, including the Global Executive Composite (70% elevated), Emerging Metacognition Index (70%), Flexibility Index (20%), and Inhibitory Self-Control Index (50%). Further, elevations were seen on the Working Memory (60%), Inhibit (60%), Planning/Organization (50%), Shift (20%), and Emotional Control (20%) subscales. No significant correlations were found between measures of intelligence and BRIEF-P scales. While BRIEF-P scales differed by seizure type (i.e., individuals with focal seizures displayed more significant problems with shifting and flexibility); no correlations were found with age of onset, seizure frequency, and number of AEDs. With regard to other measures of EF, the BRIEF-P was correlated with several scales of the BASC-2 as well as the CPT-K.

Conclusions: Results suggest that the BRIEF-P is a useful tool for assessment of executive functioning in preschool children with seizure disorders.

Correspondence: *Megan C. Marsh, Ph.D., Epilepsy Center, NYU Medical Center, 111 Lawrence St., Apt. 42C, Brooklyn, NY 11201. E-mail: megan.marsh@nyumc.org*

I. NAGORSKAYA & S. BUKLINA. *Language Disorders in Children With Symptomatic Epilepsies Associated With Cortical Dysplasias.*

Objective: Progressive losses in language in children with epilepsy are called an acquired epileptic aphasia or Landau-Kleffner syndrome that's traditionally associated with lesions in temporal lobes. We suggest that total loss of language in children with epilepsy isn't of aphasic origin.

Participants and Methods: The cognitive performance of 11 children with cortical dysplasias of different localization was evaluated. Neuropsychological assessment by A.R.Luria, MRI, EEG were used.

Results: The type and severity of disorders depend on the age of seizures-onset and its frequency and don't depend on the localization of dysplasias. The language skills were almost intact if the epilepsy onset was at school-going age and if the seizures are rare. The loss of language or its regression can be observed in preschoolers who suffered from everyday repeated seizures with secondary generalization. This disorder resembles "Landau-Kleffner syndrome". A severe seizure frequency strongly affects the development of executive functions.

Conclusions: The loss of language skills in children occurs regardless of laterality and localization of the epileptic focus and depends on aberrant reconstructions in whole language dynamic system. These children often develop acquired frontal syndrome. One can conclude that children display disturbance both in language and executive functions, i.e. functional systems that are the "youngest" cognitive functions in phylogenesis and ontogenesis. One can assume that such severe language impairments aren't aphasia as a localization-related disturbance associated with the local lesion of language areas. We suggest that the proper way to call such a language disorder is not an "acquired epileptic aphasia" or "total aphasia", but "regression of language development".

Correspondence: *Irina Nagorskaya, N.N.Burdenko neurosurgery institute, Zagorevskiy proezd, 3-1-30, Moscow 115547, Russian Federation. E-mail: prosty30@yandex.ru*

S.M. PATEL, A.R. CUIEL, J.L. HORSEFALL & S.Y. BOOKHEIMER. Revised Scoring Technique Improves the Clinical Utility of the Intracarotid Amobarbital Procedure (Wada).

Objective: The Wada procedure can be a useful preoperative tool for predicting postoperative memory outcomes in epilepsy patients; however, the lack of a standard protocol has led to inconsistent findings in the literature. This study employed an incremental scoring system in order to determine whether the interpretation of memory findings on the Wada improves if episodic memory items are weighted more heavily.

Participants and Methods: 51 epilepsy patients were administered a preoperative battery of neuropsychological tests and underwent a Wada. During the Wada, the patients were presented with 6 objects to name and remember and 2 verbal commands to follow. 'Unweighted' raw scores and 'weighted' scores (raw score multiplied by 3 for spontaneous recall, by 2 for cued recall and by 1 for recognition) were correlated with verbal and visual memory measures.

Results: There was a significant positive association between the immediate verbal memory domain score and the weighted score in right hemisphere lesion patients ($r = .30$, $p = 0.02$). There was also a significant positive association between the immediate visual memory domain score and the weighted score in right hemisphere lesion patients ($r = .28$, $p = 0.03$). No significant associations were found between preoperative baseline memory scores and the weighted scores in left hemisphere lesion patients.

Conclusions: These findings suggests that weighting spontaneous recall more than cued, and cued more than recognition, improves the utility of the Wada procedure rather than considering each score with equal weight. This indicates the need for a standardized weighted Wada scoring system to predict postoperative memory outcomes.

Correspondence: *Sapna M. Patel, Ph.D., UCLA, 760 Westwood Plaza, Los Angeles, CA 90095. E-mail: smpatel@mednet.ucla.edu*

D. POTVIN & N. NUSSBAUM. A Widening Gap: The Relation between Seizure Frequency and the Intelligence-Achievement Gap in Children with Intractable Epilepsy.

Objective: On average, children with epilepsy show deficits on measures of intellectual abilities. Despite the clarity of this association, the underlying cause of these intellectual deficits is the subject of long-running and ongoing debate. Although cross-sectional studies have shown a strong and consistent relation between intelligence and seizure variables, findings from longitudinal studies have been somewhat less consistent. Examining the moderating effect of the duration of seizures on the relation between intelligence and academic skills offers a new angle on this old question.

Participants and Methods: Participants were 19 children (16 boys) between the ages of 6 and 19 who underwent comprehensive neuropsychological assessment as part of a pre-surgical assessment. All children completed measures of measures of intelligence (WISC-IV or WAIS-IV) and measures of academic achievement (WJ-III). For the group, duration of seizures ranged from 0 to 16 years. Composites were created to reflect intelligence (VCI, PRI) and academic skills (Letter-Word ID, Calculation, Spelling). Regression was used to investigate whether duration of seizures moderated the relation between intelligence and academic skills.

Results: Duration of seizures significantly moderated the relation between intelligence and academic skills (Change in $R^2 = .075$, $p = .05$).

Conclusions: The relation between intelligence and academic skills was significantly weaker in children with shorter seizure durations (e.g. children more recently diagnosed with epilepsy). In addition, controlling for intelligence, children with shorter seizure duration showed higher levels of academic skills. Given the stability of the basic academic skills measured, these findings support previous research showing a relation between seizure duration and cognitive decline.

Correspondence: *Deborah Potvin, MS Ed, UTAustin, 800 West 38th Street, Apt 13105, Austin, TX 78705. E-mail: deborah.potvin@gmail.com*

A. RITCHIE, D. RITCHIE, G. REY, M. DUCHOWNY, T. RESNICK & W. MITTENBERG. Estimation of Premorbid Intelligence in Children with Intractable Epilepsy.

Objective: The Children's Premorbid Intelligence Estimation (CPIE) consists of regression equations that use demographic variables alone or combined with current WISC-4 subtest scores to estimate premorbid IQ. This study examined the accuracy of CPIE estimates in children with intractable epilepsy by evaluating differences between obtained and premorbid IQ as estimated by demographic variables alone or combined with the Vocabulary and/or Matrix Reasoning subtests.

Participants and Methods: Participants were 20 candidates (mean age=11.7, SD=2.4) for neurosurgical treatment of seizures that were poorly controlled by medications. 65% were Caucasian, 25% Hispanic, and 10% African American. Average parent education was 13.6 years (SD=2.19).

Results: Mean estimated premorbid IQ was 101 (SD=4.9) using demographics (parent education, ethnicity), 90 (SD=13.3) using demographics/Vocabulary, 88 (SD=13.5) using demographics/Matrix Reasoning, and 86 (SD=16.4) using demographics and both subtests. All premorbid estimates were significantly higher ($p < .001$) than obtained WISC-4 IQ ($M = 68$, $SD = 18.6$). Classification accuracy was determined by comparing the percentages of the sample with IQs 1 SD or more below premorbid estimates to the corresponding percentages of intellectually intact children in the WISC-4 standardization sample. 88% overall classification accuracy was obtained with the demographics/Vocabulary method, 84% with demographics/Matrix Reasoning, and 81% using either demographics alone or demographics combined with both subtests.

Conclusions: Premorbid estimates using current abilities may be reduced by the effect of seizures on ability acquisition or by current cognitive impairment. Although the extent of estimated intellectual decline varied, both demographic variables and current abilities appear to provide potentially useful estimates of premorbid IQ in children with intellectual impairment caused by intractable epilepsy.

Correspondence: *David Ritchie, Nova Southeastern University, 3300 College Ave., Davie, FL 33014. E-mail: dritchier@nova.edu*

C.M. SALINAS, A.U. CARBONELL & M. WESTERVELD. Understanding Different Mechanisms of Memory and Attention Problems in Children with Epilepsy and ADHD.

Objective: Children with ADHD and epilepsy have similar cognitive deficits (i.e., both are identified as having attention and memory problems). Although it may be expected that the mechanisms of impairment differ, there has been little research on the nature of performance in these groups. We examined executive functions and memory to determine if performance varied in a manner that suggests disturbance of different neuroanatomical substrates.

Participants and Methods: Executive functioning and CVLT-C variables were examined in a consecutive sample of 100 children (50 epilepsy, 50 ADHD). IQ functioning was similar in both groups.

Results: Although there were no overall group differences in performance on memory (CVLT total; $t = .610$; $p = .54$) and attention measures (NEPSY AA; $t = .337$; $p = .74$), further analysis revealed significant findings suggesting different mechanisms. Delayed free recall was similar in the two groups ($t = -.484$; $p = .63$). However, there was a significant effect size for differences in recognition (Cohen's $d = .345$) and interference ($d = .368$), although these differences did not reach statistical significance ($p = .09$ and $.07$, respectively). Attention variables affected learning and memory differently in the two groups. Complex attention (NEPSY RS) was significantly related to delayed recall in both groups, but only affected immediate recall ($r = .534$; $p = .001$) and total recall ($r = .339$; $p = .043$) in children with epilepsy.

Conclusions: Results suggest "memory" deficits in children with ADHD are more related to retrieval failure (suggesting frontal deficits), while children with epilepsy have deficits in learning acquisition suggesting greater temporal involvement. Neuropsychological testing can lead to more detailed understanding of the cognitive deficits in both disorders, leading to more effective treatments.

Correspondence: *Christine M. Salinas, Psy.D., Walt Disney Pavilion at Florida Hospital for Children, 1685 Lee Rd., Orlando, FL 32789. E-mail: cmsalinas5@gmail.com*

X. SHENG, M. TESTA, E. RITZL, W. GAILLARD & J. BRANDT. Wada, fMRI, and Cognitive Changes after Temporal Lobe Epilepsy Surgery.

Objective: This study examines the relationship among Wada, fMRI, and change in cognitive performance after lobectomy in patients with temporal lobe epilepsy (TLE).

Participants and Methods: Six left- and 1 right- TLE patients underwent a Wada procedure, fMRI language mapping, and pre- and post-operative neuropsychological assessments. Patients completed various tasks during hemispheric anesthetization (6 patients with Amytal, 1 with Brevital). Language functions were assessed using a token test, sentence repetition, word reading and object naming. Memory consolidation was evaluated using yes/no recognition testing of words, objects, and faces. Patients also underwent fMRI while reading and listening to stories and performing semantic decision-making tasks. Cerebral activation maps from fMRI were judged for laterality by 4 raters using a 5-point likert scale (-1 all right, +1 all left). Inter-rater reliability was very acceptable. Spearman rank correlations were conducted among fMRI and Wada asymmetry scores and changes on the WAIS-III Digit Span, phonemic (FAS) and category (animals and supermarkets) fluency, and the HVLTR 10 to 70 months after preoperative neuropsychological evaluation.

Results: Better right than left hemispheric memory functions during the Wada (especially for objects) was associated with improvements in forward digit span capacity [$r_s(3) = -.98$] and letter- [$r_s(3) = -.90$] and category-cued word productivity [$r_s(3) = -.98$]. Greater left than right hemispheric activation during fMRI tasks (especially while listening to stories) was associated with improved backward digits span, $r_s(4) = .85$.

Conclusions: Language laterality during the Wada is not associated with postoperative cognitive changes. However, Wada memory and fMRI language mapping appear to provide different information regarding cognitive changes. While neither the Wada nor fMRI predicted post-operative memory changes, each was associated with changes in non-memory cognitive functioning after surgery (attention and verbal generativity). Correspondence: *Xi Sheng, George Washington University, 730 24th Street # 316, Washington, DC 20037. E-mail: sheng@gwu.edu*

D. LADOWSKI, N. SANFORD & V. SZIKLAS. Improving Neuropsychological Markers in Left Temporal Lobe Epilepsy.

Objective: Analogous verbal and nonverbal memory tests (i.e., tests that evaluate similar processes but in different modalities) can distinguish between patients with left or right temporal lobe epilepsy, respectively. Clinical diagnosis of temporal lobe epilepsy (TLE), however, remains challenging because tests available for clinical use cannot lateralize dysfunction with adequate specificity or sensitivity. Most verbal tests are comprised of concrete words, often remembered more easily than abstract words. Using high-imagery words can lead to recruitment of non-verbal strategies, possibly involving nondominant memory structures. Abstract words are less open to visualization, providing a more accurate measure of pure verbal memory and the integrity of left medial temporal structures. However, no abstract verbal memory test exists that is practical to administer. We sought to develop three equivalent forms of a verbal learning test (nVLT) by combining the assets of two measures: Rey Auditory Verbal Learning Test (RAVLT; efficient but not reliably sensitive to left TLE) and Abstract Word List (research-based instrument highly sensitive to left TLE but with impractical administration).

Participants and Methods: Seventy-five healthy subjects, aged 20-40 years, were given the nVLT, modeled on the RAVLT but comprised of abstract nouns. Three forms were constructed and matched for imagery, concreteness, and word frequency. Subjects were also given the Aggie Figures Learning Test (AFLT), which we originally showed to be sensitive to right TLE. Ten patients with TLE were subsequently given both tests as part of their clinical exam.

Results: The three forms of nVLT were shown to be equivalent. Performance on the nVLT and AFLT was comparable. There were no significant gender effects for the verbal test. The nVLT reliably predicted left dysfunction in our first series of TLE patients.

Conclusions: The nVLT, in conjunction with the AFLT, is a cost-effective and viable tool for lateralization of seizure focus in TLE.

Correspondence: *Viviane Sziklas, PhD, Neurology & Neurosurgery, McGill University, 3801 University Street, Montreal, QC H3H 1S5, Canada. E-mail: viviane.sziklas@mcgill.ca*

V.N. TUCHSCHERER, M. SEIDENBERG, J. JONES & B. HERMANN. Executive Dysfunction and Behavior Problems in Children with New Onset Epilepsy.

Objective: Executive functioning (EF) is an umbrella term for a set of cognitive skills critical to behavioral and social adjustment. Children with new onset epilepsy (NOE) have both impaired EF and problems in behavioral and social adjustment, but the potential link between them has not been examined. We report data relevant to this relationship in a sample of NOE and healthy controls (HC).

Participants and Methods: Seventy-five NOE (mean age 13.0) 62 HC (mean age 12.5) were administered the Wechsler Abbreviated Scale of Intelligence (WASI), and three subtests from the Delis-Kaplan Executive Function System; Color-Word Interference, Verbal Fluency, and Sorting which provided a composite EF score (EFC). Parents completed the Achenbach Child Behavior Checklist (CBCL). Hierarchical regression analyses were conducted with the CBCL scales and indices as dependent variables. The CEF and WASI IQ served as predictor variables, and WASI IQ entered before EFC.

Results: The CNE group performed more poorly than HC on the EFC ($p = .01$) and were also reported to have more behavioral problems. The EFC produced a significant increase (over IQ) in prediction of the Internalizing Index (R^2 change = .09; $p = .01$), and the Externalizing scale (R^2 change = .10; $p = .02$) for combined EFC and the HC groups. The EFC was also a significant predictor of several CBCL subscales for the combined groups.

Conclusions: Findings have implication for identification of epilepsy children at cognitive risk for problems in behavior and social adjustment, and may provide a framework for the development of intervention programs focused on fostering the development of EF abilities.

Correspondence: *Victoria N. Tuchscherer, M.S., Rosalind Franklin University, 3333 Green Bay RD, North Chicago, IL 60064. E-mail: vntuchscherer@gmail.com*

M. URBÁN RUIZ VÍQUEZ, D. TREJO-MARTINEZ, J. NÚÑEZ DE LA VEGA, J. CARRILLO-RUIZ, A. VELASCO-MONROY, F. VELASCO-CAMPOS & J.L. ARMONY. Emotional Memory in Temporal Lobe Epilepsy.

Objective: Temporal lobe epilepsy (TLE) is associated with a variety of cognitive and emotional deficits, including memory. However, most studies have explored this process in patients who underwent resection of medial temporal lobe structures for curative purposes. Therefore, it remains unclear to what extent these deficits are a result of the illness or the surgery. In addition, conflicting results have been observed in terms of hemispheric lateralization of the epilepsy focus and memory deficits. Thus, our main objective was to assess memory of emotional facial expressions in a large group of patients (pre- and post-surgical) suffering from TLE as a function of epileptic focus lateralization.

Participants and Methods: So far, 66 TLE patients (40 pre- and 26 post-surgery) participated in a recognition memory paradigm previously employed in healthy (Sergerie et al., 2005) and psychiatric populations (Dickie et al., 2008). During encoding, 48 faces with different expressions (fearful, happy and neutral) were presented twice. In the recognition phase, these faces were presented again (with the same expression), interleaved with a set of 48 new, similar faces. Patients were instructed to indicate whether they had seen or not each face before (old/new task). Some of the patients also underwent a neuropsychological assessment developed for a Mexican population (Ostrosky et al., 2003).

Results: Preliminary results showed a small but significantly better memory performance in pre- compared to post-surgical patients ($p < 0.05$), without significant differences in terms of lateralization of the epileptic focus. Furthermore, there was a correlation between memory accuracy and some of the subtests of the neuropsychological battery, particularly those assessing general memory recognition ($p < 0.005$) and executive function ($p < 0.005$).

Conclusions: These findings indicate an effect of surgery on memory, and are consistent with the notion that this process depends not only on temporal lobe structures but also on prefrontal cortex regions.

Correspondence: *Maricarmen Urbán Ruiz Víquez, Clínica de Epilepsia, Hospital General de México, Dr. Balmis #148, Col. Doctores, México 06726, Mexico. E-mail: maricarmen.urban@gmail.com*

R.L. COLLINS, N. WISDOM, N. SESTITO & D.K. CHEN. Use of the Health Attitude Survey (HAS) to Detect Patients Experiencing Psychogenic Non-Epileptic Events (PNEE) on a Long-Term Monitoring Unit.

Objective: The Health Attitude Survey (HAS) is a brief, 8-item screener designed to assess for somatization in general medical clinics; however, the HAS has never been evaluated in other patient populations. The purpose of this study was to calculate the diagnostic classification statistics for the HAS in patients being evaluated for seizures. It was hypothesized that the HAS would help differentiate between patients with epilepsy and patients experiencing psychogenic non-epileptic events (PNEE).

Participants and Methods: The HAS was administered to 93 inpatients (78 men; 15 women) as part of a larger neuropsychological screening. All of the patients were referred by the neurology department at a large VA hospital and were undergoing week-long observation on an epilepsy monitoring unit. Group membership (epilepsy vs PNEE) was determined by a board-certified neurologist and director of the epilepsy program. Diagnostic classification statistics were calculated for the HAS after dividing the sample into two groups. The first group only included patients diagnosed using “gold standard” video EEG (vEEG) findings following induction ($n=54$). All 93 patients were included in the second group and they were diagnosed using either vEEG, clinical observation, or self-reported semiology.

Results: Using a cut-score > 18 , The HAS demonstrated good diagnostic classification statistics in patients diagnosed using vEEG ($SE=.47$, $SP=.91$). The HAS, however, did markedly worse when patients with a more ambiguous clinical presentation were included; the cut-score had to be set at > 21 to achieve fair specificity ($SE=.23$, $SP=.88$).

Conclusions: The HAS is a promising measure of somatization that can be included as a brief screener during neuropsychological evaluations. However, it should only be used in conjunction with other well-validated instruments as the HAS has not been thoroughly vetted in the literature. Two limitations of this study are that not all patients were induced and a few patients presented with both PNEE and confirmed epilepsy.

Correspondence: *Nick Wisdom, Ph.D., Michael E. DeBakey Veterans Affairs Medical Center, 2002 Holcombe Blvd, Houston, TX 77030. E-mail: nickandjen@gmail.com*

Genetics/Genetic Disorders

C. CASNAR, L.A. KAIS, F. VAN DER FLUIT & B.P. KLEIN-TASMAN. Fine Motor Abilities in Young Children with Neurofibromatosis-1.

Objective: Neurofibromatosis-1 (NF1) is a genetic neurodevelopmental disorder affecting approximately 1 in 3,000. Research with older children and adults with NF1 has indicated significantly poorer fine motor abilities than unaffected peers. The current study sought to characterize fine motor difficulties in young children with NF1.

Participants and Methods: Participants were 51 children with NF1 ages of 3-8 years ($M = 5.10$, $SD = 1.70$). The Differential Ability Scales- Early Years Form (DAS II) was administered to assess intellectual func-

tioning (GCA). To examine fine motor abilities, the Copying subtest from the DAS II and the Imitating Hand Positions (IHP) subtest from the NEPSY II were completed. The Motor Skills domain of the Scales of Independent Behavior - Revised (SIB-R) was examined as a measure of parent reported motor functioning.

Results: A significant difference from expected normative performance was found on IHP, Copying and GCA, but not on the Motor Skills domain score of the SIB-R. When fine motor scores were examined separately, 15.7% of children fell in the “limited” to “very limited” skills range. GCA was significantly related to performance on IHP ($r = .342$, $p = .015$) and Copying ($r=.699$, $p<.001$). Copying performance and parent SIB-R scores were also significantly correlated ($r=.424$, $p<.001$).

Conclusions: Fine motor difficulties were observed for children with NF1 in comparison to the normative population, with some relations to intellectual functioning. Clinical implications and directions for future research will be discussed.

This research was supported by funds from the UWM Research Growth Initiative, University of Chicago CTSA (UL1 RR024999), NF Inc Midwest, NF Inc MidAtlantic.

Correspondence: *Christy Casnar, University of Wisconsin - Milwaukee, P.O. Box 413, Garland Hall, Rm 325, Milwaukee, WI 53201. E-mail: ccasnar@uwm.edu*

L.Z. CHISHOLM, R.E. READY & J.S. PAULSEN. Development of the Quality of Life – Huntington’s Disease Scale.

Objective: Quality of Life (QOL) measures exist for many neurodegenerative disorders but not for Huntington’s disease (HD). A measure of QOL in HD was developed that would be relevant across the disease spectrum, from at-risk and prodromal to symptomatic.

Participants and Methods: Item content derived from focus groups and individual interviews with persons affected by HD and their caregivers. Preliminary items were reviewed by these persons and healthcare professionals. Forty-seven items were piloted in a convenience sample (i.e., undergraduate students, $N = 192$) and a sample of midlife community-dwelling adults combined with persons at risk, prodromal, and symptomatic for HD ($N = 230$). Pilot testing included other conceptually-related scales.

Results: Iterative factor and item analyses resulted in an 18-item QOL-HD scale with four internally consistent lower-order subscales (i.e., Inspired, Supported, Negative Emotionality, Shame) and two higher-order scales (i.e., Positivity, Negativity). The scales demonstrated moderate convergent correlations with theoretically related constructs. No group differences in QOL emerged; however, variability in QOL-HD scales was greater in persons affected by HD than in non-HD groups. Overall test-retest reliabilities ranged from 0.64 to 0.71 over a mean interval of 18.6 days ($SD=6.2$).

Conclusions: Understanding QOL in HD will help affected persons, families, and caregivers address the challenges posed by the disorder. The QOL-HD scale promises to advance this line of research. Future studies are needed to determine predictors of QOL and whether they are different for persons at risk, prodromal, and symptomatic for HD.

Correspondence: *Lauren Z. Chisholm, M.S., Psychology, University of Massachusetts Amherst, 191 High Rock St., Needham, MA 02492. E-mail: zeranski@psych.umass.edu*

G.J. GERNER, T. HO, T.D. VANNORSALL, A.S. BUCHHOLZ, J.C. HARRIS, H.A. JINNAH & D.J. SCHRETLEN. Predictors of Self-Injurious Behavior in Lesch-Nyhan Disease: Evidence of Maladaptive Sensation-seeking?

Objective: Self-injurious behavior (SIB) is a defining feature of Lesch-Nyhan disease (LND), a rare X-linked neurodevelopmental disorder whose other features include hyperuricemia, dystonia and cognitive impairment. Self-injury in LND is often described as “compulsive,” which implies a maladaptive response to anxiety. Alternatively, it might reflect defective impulse control, maladaptive sensation-seeking behavior, or self-directed aggression. We sought to explore these alternatives with behavior ratings.

Participants and Methods: Using nonparametric and linear multiple regression methods, we examined associations between the Self-Abusive Behavior subscale of the Adaptive Behavior Scale (ABS) with Achenbach Child Behavior Checklist (CBCL) ratings of 6 adolescents with LND, 5 with a less severe variant (LNV), and 4 healthy controls. ABS and CBCL ratings that correlated significantly with the Self-Abusive Behavior ratings were then entered as predictors of Self-Abusive Behavior in a stepwise regression. We also extracted items from the ABS to define 4 new clusters of stereotyped, sensory-seeking, compulsive, and hyperactive behaviors. Finally, we used these 4 clusters to predict SIB in another stepwise regression.

Results: ABS Self-Abusive Behavior ratings correlated highly with the ABS Stereotyped and Hyperactive Behavior subscale (.91) and with CBCL ratings of Anxiety/Depression (.56), Social Problems (.55), Thought Problems (.84), Attention Problems (.66), and Aggressive Behavior (.83). Of these, Stereotyped and Hyperactive Behavior emerged as the sole predictor of Self-Abusive Behavior on multiple regression. In a second stepwise regression using the 4 specific factor scores described above, items related to sensory-seeking (e.g., playing with one's spit) emerged as the single and best predictor of SIB.

Conclusions: Self-injurious behavior in LND appears to be more closely related to maladaptive sensory-seeking and aggressive behaviors than to anxiety, depression, or impulsivity.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

T. HO, Y. TAKAYANAGI, G.J. GERNER, A.S. BUCHHOLZ, T.D. VAN-NORSALL, J.C. HARRIS, H.A. JINNAH & D.J. SCHRETLEN. Cognitive and Anatomic Brain Differences in a Female Monozygotic Twin Pair Discordant for Lesch-Nyhan Disease.

Objective: Lesch-Nyhan disease (LND) results from a single gene mutation on the X chromosome, causing an overproduction of uric acid. The disorder occurs almost exclusively in males. However, non-random inactivation of the X chromosome carrying a normal allele can allow the development of LND in females. The classic LND phenotype includes severe dystonia, intellectual disability, and compulsive self-injury. Brain imaging has shown reduced basal ganglia volume consistent with dystonic movements, as well as reductions in the caudate. The present study highlights one of the only documented case comparisons of cognitive and brain imaging data in a pair of monozygotic female twins discordant for LND.

Participants and Methods: Both twins completed cognitive testing and structural brain magnetic resonance imaging (MRI). Volumetric segmentation of MRI data was performed using FreeSurfer v.5.1.0. Regions of interest volumes were extracted and compared based on percent difference between the affected and unaffected twin.

Results: While the unaffected twin demonstrated average cognitive performance and intact adaptive functioning, her affected sister showed cognitive dysfunction on nearly every measure. The affected twin also reported moderate depressive symptoms. Comparisons of neuroanatomy revealed global volume reductions for the affected twin. The largest reductions were found in total intracranial volume (37.8%), cortical white matter (33.2%), corpus callosum (32.4%), amygdalae (32.4%), and caudate nuclei (29.7%). The difference in overall cortical thickness between them was trivial (<2%).

Conclusions: Consistent with the LND phenotype, the affected twin showed widespread deficits on tests of cognitive and adaptive functioning. In addition, her brain volume was globally smaller without signs of atrophy. This suggests that her reduced brain volume is developmental in nature. Notably, her striatal volumes were not reduced disproportionately.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

N.J. GOODRICH-HUNSAKER, L.M. WONG, Y. MCLENNAN, F. TASSONE, D. HARVEY, S.M. RIVERA & T.J. SIMON. The Effect of Age and Molecular Variables on Brain Structure in Adult Female Fragile X Premutation Carriers: A Deformation-Based Morphometry Study.

Objective: Fragile X premutation carriers (FXPCs) have a trinucleotide expansion between 55 and 200 CGG repeats in the 5' UTR of the fragile X mental retardation 1 gene (FMR1). There is growing evidence suggesting that female FXPCs have spatiotemporal impairments related to age and the dosage of the FMR1 gene, yet little is known about the neural bases of those challenges. Here we investigate whether region specific anatomical changes relate to age, molecular variables of the FMR1 gene, and cognitive impairments in adult female FXPCs.

Participants and Methods: Using deformation-based morphometry methods, we examined the pattern of anatomical changes in female FXPCs (n=30) compared to healthy controls (HCs; n=20) ages 20 to 40. We correlated the log Jacobian determinant with age, CGG repeat length, and FMR1 mRNA levels, as well as with performance on two psychomotor speed tasks: manual and oral, and two spatial attention tasks: magnitude comparison and enumeration.

Results: A group analysis comparing female FXPCs and HCs revealed no significant differences. Correlation analyses revealed localized volume loss in the frontal and parietal lobes as CGG repeat length increased within the FXPCs. We also found significant correlation differences between FXPCs and HCs in the way volume changed in the frontal and parietal lobes and cerebellum with cognitive performance.

Conclusions: These results indicate female FXPCs have an atypical relationship between brain volume of regions involved with spatiotemporal processing and dosage of the FMR1 gene.

Correspondence: *Naomi J. Goodrich-Hunsaker, PhD, University of California, Davis, 2825 50th Street, Room 1362, Sacramento, CA 95817. E-mail: naomihunsaker@me.com*

D.A. JACOBSON, M. BURSCH & R. LAJINESS-O'NEILL. Role of Cortisol in Social and Memory Impairments in Individuals with Velocardiofacial Syndrome (VCFS).

Objective: Velocardiofacial Syndrome (VCFS) is a genetic disorder characterized by numerous physiological and psychological symptoms. Little is known regarding the neuropsychological and hormonal substrates and the social functioning in individuals with VCFS. There is some evidence to suggest that the stress hormone cortisol contributes to social, cognitive, and communication deficits in related populations. This study investigated the role that cortisol has on the social and cognitive impairments observed in children with VCFS.

Participants and Methods: 11 children with confirmed VCFS and 11 age-matched controls were assessed for baseline cortisol levels and received neuropsychological testing that assessed attention, memory, language, and social functioning. Cortisol levels were compared between individuals with VCFS and Controls. Additionally, relationships between cortisol and cognitive and social functioning were assessed.

Results: Children with VCFS had significantly higher cortisol levels than control counterparts; $F(1, 20) = 5.436, p < .05$. Cortisol levels in VCFS were not related to measures of social functioning or measures of cognitive functioning. That said, a significant negative correlation was observed between the General Memory and Attention/Concentration indices of the WRAML-2 and cortisol concentrations in the control population: $r(11) = -.778, p < .05$; $r(11) = -.618, p < .05$. Additionally, the level of cortisol in control individuals was negatively correlated to the social competency scale of the CBCL; $r(11) = -.639, p < .05$.

Conclusions: These results support the role of neurohormonal substrates such as cortisol in social impairment and cognitive functioning in neurotypical children. More generally, these data provide evidence of a possible causal mechanism that underlies social impairments in other stress disorders known to involve cortisol dysregulation.

Correspondence: *Daniel A. Jacobson, M.S., Psychology, Eastern Michigan University, 520 Mark Jefferson, Eastern Michigan University, Ypsilanti, MI 48197. E-mail: gattaca2383@gmail.com*

L.A. KAIS, S.M. BERKA, B.P. KLEIN-TASMAN, S.J. HUNTER, J.H. TONGSARD & D.A. HABERMAN. Interrelations among Social Skills, Attention Problems, and Intellectual Functioning in Young Children with Neurofibromatosis-1.

Objective: Neurofibromatosis-1 (NF-1) is a genetic neurodevelopmental disorder affecting approximately 1 in 3,000 people. Research has indicated that individuals with NF-1 show significantly poorer social skills than unaffected peers, with children with NF-1 and comorbid ADHD with the poorest social skills (Barton and North, 2004). Relations between social skills, intellectual functioning and attention problems in younger children with NF-1 will be examined.

Participants and Methods: Participants were 48 children with NF-1 between the ages of 3 and 8 ($M=5.16$, $SD=1.72$). Parents completed the Social Skills Rating Scale (SSRS) and the Conners Parent Rating Scale (Conners) as measures of social ability and ADHD symptomatology, respectively. The Differential Ability Scales (DAS II) was administered to the children to assess intellectual functioning.

Results: A significant correlation was found between intellectual functioning and SSRS standard scores ($r=.362$, $p=.011$) and between age and parent scores on the SSRS ($r=.486$, $p < .001$). The number of participants falling in the delayed range (7 participants, 14.6%) on the social skills scale was higher than expected based on the normative distribution. A significant correlation between ratings on the SSRS and the Conners ADHD index was found ($r=-.337$, $p=.019$), indicating that children with greater ADHD symptomatology showed weaker social skills.

Conclusions: Some young children with NF-1 experience lower than average social functioning, and that social functioning and attention problems are related for children with NF-1. Implications will be discussed.

This research was supported by funds from the UWM Research Growth Initiative, University of Chicago CTSA (UL1 RR024999), NF Inc Midwest, NF Inc MidAtlantic.

Correspondence: *Lorri A. Kais, B.A., Psychology, University of Wisconsin-Milwaukee, 1137A E. Center St., Milwaukee, WI 53212. E-mail: lakais@uwm.edu*

S.C. MURPHY-BOWMAN, M. ANDREJCZUK, T. HO, G. GERNER, B. GORDON, H.A. JINNAH & D.J. SCHRETLEN. Personality Characteristics of Adults With Autism and Lesch-Nyhan Disease.

Objective: Autism and Lesch-Nyhan disease (LND) are neurodevelopmental disorders that share some phenotypic characteristics (e.g., cognitive impairment, stereotyped aberrant behavior, motor neurological abnormalities), but differ strikingly in terms of social/emotional impairment. This raises the question of whether their similarities and differences can be understood in terms of personality organization.

Participants and Methods: We asked a knowledgeable informant to rate the personalities of 54 adults (ages 18-55) with autism spectrum disorder (ASD; $n=13$), LND ($n=20$), or neither (NC; $n=21$) using the NEO Personality Inventory or Five Factor Index (PI-R/FFI). One patient with LND and her unaffected twin were female; all other study participants were male.

Results: A multivariate analysis of covariance, controlling for age, revealed significant ($p<0.0001$) overall effects of diagnosis on personality trait ratings. Univariate tests showed significant ($p<0.05$) pair-wise group differences on 4 of 5 factors. Patients with both ASD and LND were rated as higher in Neuroticism and lower in Openness and Conscientiousness than healthy adults. However, neither group differed from healthy adults in Agreeableness. Patients with LND were much higher in Extraversion than both the ASD and NC groups, which did not differ from each other. Finally, patients with ASD were rated as significantly lower than patients with LND in Openness (even though those with LND were already lower than NCs).

Conclusions: Patients with both ASD and LND are perceived by knowledgeable informants as much less emotionally stable, open to change or novelty, and dependable than healthy adults. They are not rated as more

disagreeable in general (Agreeableness), even if they might be so in some contexts. Finally, patients with ASD crave even greater predictability/routine than those with LND, while patients with LND are much more extraverted than patients with ASD, and even more extraverted than healthy adults.

Correspondence: *Sarah C. Murphy-Bowman, M.S., Psychology, Loyola University Maryland, 4501 N. Charles St., Baltimore, MD 21210. E-mail: bowmans@kenedykrieger.org*

C. ROMERO, K. DIAZ & F. OSTROSKY. Genetic Risk to Violent Behavior and Brain Volume.

Objective: To investigate the effect of genotype variation of Monoamine oxidase-A (MAOA) on structure of CNS.

Participants and Methods: 36 healthy males (mean age= 29.5 ± 7.6 ; mean years of education= 15.2 ± 1.7) divided into 2 groups: carriers of high expression allele of MAOA (MAOAH) and carriers of low expression allele of MAOA (MAOAL).

3D structural MRI scans were acquired, followed by optimized voxel-based morphometry (VBM) protocol.

Results: Multivariate general linear model showed that the MAOAL variant predicted limbic volume reductions in left anterior cingulate, and bilateral hippocampus, compared with the MAOAH variant.

Conclusions: The MAOAL variant has been associated with increased risk of impulsivity and violent behavior. The results suggest that differences in limbic volume of structures involved in the processing of emotion and reward in behavioral control, may be involved in the MAOA-impulsive aggression association.

Correspondence: *Cesar Romero, UNAM, primer retorno 76a, Mexico City 04480, Mexico. E-mail: cesarromerobollar@hotmail.com*

J. SNOW, E.A. WIGGS, S. WESTEN, J. BRYANT, M. PAO, W.A. GAHL & M. GUNAY-AYGUN. Neurocognitive Characteristics of Joubert Syndrome.

Objective: Joubert syndrome (JS) is a rare inherited developmental abnormality of the CNS characterized by midbrain and cerebellar malformations that form a pathognomonic "molar tooth sign" on axial brain images. Typical features include hypotonia, truncal ataxia, developmental delay, speech and oculomotor apraxia, irregular breathing, strabismus/amblyopia, and nystagmus. Ocular colobomas, congenital hepatic fibrosis, and renal fibrocystic disease are seen in some patients. JS is genetically heterogeneous; several causative genes have been identified, though not accounting for a significant proportion of patients. Cognitive function in JS has not been systematically studied. Cognitive abilities are believed to range from normal to severe intellectual disability, but few cases have been published.

Participants and Methods: As part of an ongoing NIH study (www.clinicaltrials.gov NCT00068224), we evaluated 20 individuals with JS ranging in age from 4 to 21 years. Twelve individuals were administered a Wechsler Intelligence Scale (WIS); 8 could not be administered a WIS due to severity of their cognitive and neurological deficits.

Results: Of those who were sufficiently intact to be assessed with a WIS, mean FSIQ was 68, mildly deficient. Of those 12 administered a WIS, 6 had a FSIQ in deficient range, 3 in borderline range, 2 were low average, and 1 was average. The mean Vineland-II adaptive behavior score for 3 of the 8 individuals who could not be administered a WIS was 55, moderately deficient.

Conclusions: Neurocognitive functioning in JS ranges from average to severe impairment, with distribution skewed toward severe impairment. We continue to enroll new patients into this, the largest group of JS patients assembled to date that measures cognition, in order to provide a more precise characterization of the neurocognitive phenotypes associated with clinical and genetic subtypes of the disorder. Neurocognitive study of this rare disorder can potentially shed light on mechanisms for intellectual disability and normal cognition.

Correspondence: *Joseph Snow, Ph.D., Office of the Clinical Director, NIMH, 10 Center Drive, BLDG 10 RM 3N21S, Bethesda, MD 20902. E-mail: joseph.snow@nih.gov*

M.J. SOLLMAN & J. SHI. Neuropsychological Performance of Several Siblings with Familial Idiopathic Normal Pressure Hydrocephalus.

Objective: Idiopathic normal pressure hydrocephalus (iNPH) is a reversible neurological disorder characterized by enlarged ventricles and a clinical triad of dementia, gait disorder and urinary incontinence. Most cases of iNPH occur sporadically. Only 3 familial cases have been reported in the literature, and the genetic etiology remains unknown. Shunting remains treatment of choice for familial iNPH.

We identified a large family of 5 patients with elderly onset iNPH in 2 generations. All of them had typical clinical manifestations. Three siblings (aged 70-75) underwent neuropsychological assessment by our team 5 years post shunting. Their results are described and compared to prior research on iNPH cognitive profiles.

Participants and Methods: Data are presented for the following family members: Female, aged 75, educ <12; female, age 72, educ=22; male, aged 70, educ=16. All three underwent full and comparable neuropsychological evaluations. Test data are presented in terms of both raw and demographically-corrected standard scores, given vastly discrepant educational values.

Results: The presenting symptoms and cognitive profiles of the siblings are described, illustrating that in this family of grossly varying education levels, weaknesses in attention/concentration and psychomotor processing speed prevailed. Memory and executive functions were quite consistent and thoroughly intact despite differing degrees of psychiatric disturbance. Constructional abilities were also largely intact. Of note, the male demonstrated greater visual-spatial deficits.

Conclusions: These profiles support prior research that post-shunt patients may possess both attention/concentration deficits, and intact verbal memory. They also illustrate that more favorable post-shunt outcomes may be appreciated by females despite lower education levels. In contrast with prior research, noteworthy executive deficits were not appreciated in this family.

Correspondence: *Myriam J. Sollman, PhD, Clinical Neuropsychology, Barrow Neurological Institute, 222 W Thomas Rd. Suite 315, Phoenix, AZ 85013. E-mail: myriam.sollman@gmail.com*

R. VAURIO, T.M. LEVINE, K. HOLLANDSWORTH & G.V. RAYMOND. Cognitive and Clinical Outcomes in Boys with Adrenoleukodystrophy Treated with Lorenzo's Oil.

Objective: X-Linked Adrenoleukodystrophy (ALD) is a metabolic storage disease characterized by accumulation of very long chain fatty acids (VLCFAs) and inflammatory damage of adrenal cortex and nervous tissue. Boys are most severely affected with approximately 35% of boys expected to develop the most severe cerebral forms of the disease (i.e. progressive demyelination, cognitive and neural impairment and death). Oral administration of Lorenzo's Oil (Moser et al., 2005) has been demonstrated to normalize plasma VLCFA and may prevent the onset of cerebral symptoms in asymptomatic boys with ALD (Moser et al., 2007).

Participants and Methods: The current study presents interim longitudinal cognitive and clinical data in a sample of 112 boys treated with Lorenzo's Oil (age at enrollment $\mu = 3.89$; range 1.52-8.90 years) evaluated every 6 to 12 months ($\mu = 3.73$ visits; range = 1-13). Significantly fewer boys in this sample showed cerebral progression (i.e. referred for bone marrow transplant or had died) than is expected in the general ALD population ($\chi^2 = 13.06$, $p < 0.001$). Moreover, boys in the sample did not differ significantly from age-based normative samples on a battery of neuropsychological measures including measures of attention/executive functioning and visual-spatial ability, which are often sensitive to early signs of disease progression.

Results: Significantly fewer boys in this sample showed cerebral progression (i.e. referred for bone marrow transplant or had died) than is expected in the general ALD population ($\chi^2 = 13.06$, $p < 0.001$). Mean performance on a neuropsychological battery did not differ significantly from age-based normative samples including measures of attention/executive functioning and visual-spatial ability, which are often sensitive to early signs of disease progression.

Conclusions: The results suggest Lorenzo's Oil is an effective in preventing onset of cerebral ALD with implications for the importance of early detection and the role of neuropsychological monitoring.

Correspondence: *Rebecca Vaurio, Ph.D., Kennedy-Krieger Institute, 1750 E. Fairmount Ave., Baltimore, MD 21231. E-mail: vaurio@kennedykrieger.org*

R.A. YEO, S.W. GANGESTAD, J. POMMY, J. LIU, R.J. THOMA, S. SCHULTZ, S. EHRlich, E.M. MORROW, B. HO, S.R. SPONHEIM, T.H. WASSINK & V.D. CALHOUN. Rare Copy Number Genetic Deletions and Complex Human Phenotypes: General Cognitive Ability, Schizophrenia, and Brain Volume.

Objective: To evaluate the significance of the total burden of rare (occurring in less than 1% of the population) deletions of genetic material for three complex, correlated human phenotypes.

Participants and Methods: Healthy controls (N = 130) and individuals with schizophrenia (N = 117) were recruited from four different sites around the country through the Mind Clinical Imaging Consortium. Genotyping was performed using the Illumina HumanOmin1-quadruplet chip. Copy number variations (CNVs) were identified by both a hidden Markov algorithm and a circular binary segmentation algorithm. General cognitive ability was assessed by determining the first principal component of a large battery of neuropsychological tests. Total brain volume was estimated from structural T1 MRI scans using Freesurfer.

Results: A multivariate regression using SPSS GLM examined the three phenotypes as dependent variables, with sex and race as fixed factors, and age, the total number of rare deletions, and the interaction of this variable with age as covariates. Both the rare deletion burden and the interaction were significant in the overall model ($p = .009$ and $p = .001$, resp.). More rare deletions predicted lower general ability, smaller brain volume, and greater risk for schizophrenia.

Conclusions: As the specific rare deletions comprising the total burden measure are virtually unique across individuals, these results draw attention to the impact of "genomic disruption" rather than locus-specific genetic effects. Variations in rare deletion burden may help account for the "missing heritability" commonly noted in comparing the results of genome-wide association studies of complex human phenotypes to those utilizing behavior genetic analyses.

Correspondence: *Ronald A. Yeo, Ph.D., Psychology, University of New Mexico, Logan Hall, Albuquerque, NM 87131. E-mail: ryeo@unm.edu*

T. BRUNELLE, R. PORTER, D. RUBINSTEIN, M.S. BROWN, R.E. BENNETT & J. GRIGSBY. The Relationship Between Cerebellar Volume and Executive Functioning in Fragile X-Associated Tremor/Ataxia Syndrome.

Objective: Fragile X-Associated Tremor/Ataxia Syndrome (FXTAS) is a neurodegenerative movement disorder. Male carriers of the premutation often develop FXTAS in their 50s or 60s. FXTAS manifests neurologic signs associated with cerebellar disorders, including gait ataxia, action tremor, and impaired executive function (EF). We explored the relationship between EF and cerebellar volumes (CV) in males with FXTAS and normal controls. We predicted that among individuals with FXTAS, but not controls, CV would be associated with performance on tests of EF and related abilities.

Participants and Methods: Our sample consisted of 38 men, ages 53-85, with definite or probable FXTAS, and 36 male controls, ages 41-89 years, with a normal FMR1 allele. Participants were administered the Wechsler Adult Intelligence Scale-III (WAIS-III), and from it we analyzed Verbal IQ and Performance IQ (VIQ and PIQ), Symbol Search, Digit Span Backwards, Letter-Number Sequencing, and Working Memory Index (WMI). Other tests included Symbol Digit Modalities (SDMT); Stroop; Controlled Oral Word Association (COWAT); Rey Auditory Verbal Learning (RAVLT); and Behavioral Dyscontrol Scale (BDS). Structural MR images were acquired using either a 1.5 or 3.0T magnet. Images were segmented using a semi-automated approach.

Results: Controlling for age, education, and whole brain volume, FXTAS patients had smaller CV than controls. In regression models con-

trolling for the same covariates for each group separately, relationships between total CV and all cognitive tests were not significant for FXTAS subjects. For controls, however, CV was associated with processing speed (1/4 measures), EF (1/2 measures), and working memory (2/4 measures) (all $p < 0.05$).

Conclusions: Despite finding that FXTAS patients had smaller CV than controls, cerebellar volume was not a significant predictor of EF and related abilities for the FXTAS group. In this context, a significant relationship for controls was unexpected.

Correspondence: *Jim Grigsby, PhD, Psychology, University of Colorado Denver, 1200 Larimer Street, Campus Box 173, Denver, CO 80217-3364. E-mail: jim.grigsby@ucdenver.edu*

J. GRIGSBY, M.S. BROWN, M. RAY, K. ONDERKO, A. ROYSTON, R.E. BENNETT & C.M. FILLEY. Preliminary Magnetic Resonance Spectroscopy Findings Among Carriers of the Fragile X Premutation.

Objective: Fragile X tremor/ataxia syndrome (FXTAS) is a neurodegenerative movement disorder in which impaired executive function (EF) is the most prominent cognitive sign. Proton magnetic resonance spectroscopy (1H-MRS) was performed in a pilot study of carriers of the fragile X (FX) premutation. The purpose was to assess spectroscopic signs of FXTAS in asymptomatic carriers of an expanded FMR1 allele, who may develop the disorder.

Participants and Methods: The sample included six males who had CGG trinucleotide repeat expansions (the premutation, which involves expansions of 55 to 200 CGG repeats), but no clinical signs of FXTAS. They were compared with three male controls who had a normal FX allele. Among MRS neurometabolites measured were n-acetyl aspartate (NAA), a marker of neuronal integrity, and choline (Ch), which is associated with demyelination and/or inflammation. The region of interest was the middle cerebellar peduncle (MCP), a white matter tract that is commonly abnormal on MRI of FXTAS patients. The MCP is a node in frontal-subcortical networks that subserves EF. Participants were administered measures of EF, working memory, processing speed, and verbal learning/memory. Tests included Behavioral Dyscontrol Scale (BDS); Controlled Oral Word Association (COWAT); Logical Memory (LM, both learning trials and delayed recall); Letter-Number Sequencing; and Symbol Digit Modalities (SDMT).

Results: Compared with controls, carriers showed elevated concentrations of Ch in the MCP. In addition, lower values of NAA in the MCP (suggesting neurodegeneration) were associated with lower EF performance (both $p \leq 0.05$).

Conclusions: We conclude that MRS may disclose neurometabolite changes in MCP among premutation carriers, and that microstructural damage to this tract may compromise EF. Despite the limitations of this study, especially the small sample, the findings provide support for the use of MRS in studying the nature and trajectory of FXTAS, and for monitoring the neuroradiologic status of asymptomatic carriers.

Correspondence: *Jim Grigsby, PhD, Psychology, University of Colorado Denver, 1200 Larimer Street, Campus Box 173, Denver, CO 80217-3364. E-mail: jim.grigsby@ucdenver.edu*

**Medical/Neurological Disorders/Other
(Adult)**

L. BOLLWERK, A. GINLEY, R.F. HAMMAN, J. BAXTER & J. GRIGSBY. Low Diastolic Blood Pressure is Associated with Impaired Executive Functioning among Older Persons in the San Luis Valley Health and Aging Study (SLVHAS).

Objective: Previous research has found a link between hypertension and impaired cognitive functioning, but abnormally low blood pressure also may affect cognition via ischemic white matter disease (IWMD). We assessed the relationship between blood pressure (BP) and executive cognitive functioning (EF) among participants in the San Luis Valley Health and Aging Study (SLVHAS), a longitudinal study of chronic illness and disability affecting older (age > 59) Hispanic and non-Hispanic White (NHW) persons in two counties in rural southern Colorado.

Participants and Methods: The sample ($n=994$) consisted of 399 men and 545 women who were examined at the second timepoint of the SLVHAS. Mean age was 72.8; there were 514 Hispanic and 430 NHW subjects. Blood pressure was taken three times, with the subject at rest, and the value used was the mean of the second and third systolic and diastolic readings. The Behavioral Dyscontrol Scale (BDS), a reliable and valid measure of the capacity for behavioral self-regulation, was used as a measure of EF. Data were analyzed using unadjusted and adjusted models using linear regression. Covariates controlled for age, sex, education, ethnicity, and mood (Center for Epidemiologic Studies Depression Scale, or CES-D).

Results: In unadjusted models, systolic blood pressure (SBP) was negatively correlated with EF, and diastolic BP (DBP) was ($p < 0.00001$) There was a moderate negative relationship between Systolic Blood Pressure (SBP) and EF ($p < .05$). However, there was a strong positive relationship between Diastolic Blood Pressure (DBP) and ECF ($p < .0001$). Suspecting an inverted U curve, we calculated a quadratic model, and β for DBP2 was significant ($p = 0.004$). R^2 for the linear model = 0.286, and for the quadratic model 0.296.

Conclusions: The relationship between BP and EF is complex, with increased SBP predicting a decrease in ECF, and increased DBP predicting an increase in EF. The relationship between DBP and EF was curvilinear, with both low and high DBP predicting EF deficits.

Correspondence: *Jim Grigsby, PhD, Psychology, University of Colorado Denver, 1200 Larimer Street, Campus Box 173, Denver, CO 80217-3364. E-mail: jim.grigsby@ucdenver.edu*

R. BALDWIN, R.F. KAPLAN, W.B. WHITE & L. WOLFSON. Stage 1 Hypertension as a Risk Factor for Cognitive Slowing on Measures of Executive Functioning.

Objective: Recent work has shown that 24-hour average blood pressure (BP) is a more sensitive index of predicting white matter hyperintensities (WMH) than clinically derived BP. The American Heart Association (AHA) has categorized Stage 1 hypertension as a systolic BP between 140 and 159 mm Hg. Hypertension has been associated with decreased performances on processing speed and executive function tasks. We investigated differences in cognitive performance in groups of normal elderly with and without hypertension based on AHA guidelines.

Participants and Methods: Seventy-three adults, ages 77 to 91 ($M = 83.8$, $SD = 3.9$) were monitored for 24 hour BP and completed a neuropsychological battery including the RBANS, Trail Making Test (TMT), Stroop Test, and the CalCAP, a continuous performance test. Seventeen had 24 hour average systolic BP exceeding 140. None had average systolic BP over 159 and none had diastolic BP below 80, the AHA cutoff for hypotension.

Results: The hypertensive group (Average BP >140) performed more slowly on the RBANS coding task ($t(71) = 2.14$, $p < .05$) and on the TMT part B ($t(70) = -2.12$, $p < .05$). There were no group differences on any other RBANS subtest, the Stroop, TMT Part A or the CalCAP.

Conclusions: Otherwise healthy elderly individuals with systolic BP over 140 perform more slowly on some cognitive measures particularly those requiring executive functioning. These data suggest the AHA guidelines for hypertension may also be useful indicator of vulnerability to slower performances on executive function tests.

Correspondence: *Richard F. Kaplan, PhD, Psychiatry, UConn Health Center, 263 Farmington Av, Farmington, CT 06030. E-mail: rkaplan@uchc.edu*

L. BRENNAN, M. SCHULTHEIS, P. MOBERG, H. HURTIG, D. WEINTRAUB, J. DUDA, J. KARLAWISH, C. CLARK & A. SIDEROWF. Assessment of Activities of Daily Living in Parkinson's Disease: Examination of Physical and Cognitive Task Demands.

Objective: The Alzheimer's Disease Cooperative Study Activities of Daily Living Inventory (ADCS-ADL), designed to assess everyday functioning in Alzheimer's patients via caregiver report, is also often used in patients with Parkinson's disease (PD). The present study examined the relationship between cognition and ADLs in PD through unique classification of ADCS-ADL items into those requiring a primarily physical (PADL) or cognitive (CADL) load.

Participants and Methods: Neuropsychological functioning of PD patients aged 60 or greater (n=181) was assessed utilizing the Dementia Rating Scale-2 (DRS-2). Caregivers completed the ADCS-ADL, consisting of 23 items and yielding a maximum score of 78, with higher scores indicating better functioning. Each item was carefully reviewed to determine if each ADL required greater physical or cognitive resources. Newly classified PADL and CADL subscales yielded maximum total scores of 38 and 40, respectively.

Results: Partial correlation coefficients, adjusting for age, education, gender and motor disability were analyzed to explore the relationship between DRS-2 cognitive domains and calculated PADL and CADL scores. The DRS-2 subscale assessing visuo-spatial construction was significantly correlated with the PADL ($r=.20$, $p=.01$) and CADL subscales ($r=.20$, $p<.01$). The DRS-2 subscale assessing aspects of executive functioning was significantly correlated with the CADL subscale ($r=.20$, $p=.01$), and approached significance with the PADL subscale ($r=.17$, $p=.03$). Memory, attention, and conceptualization were not associated with either subscale.

Conclusions: Results suggest that while visuo-spatial and executive functions are both related to everyday functioning in PD, executive functioning may better inform the role of cognition, and visuo-spatial functioning may better inform the interplay between motor and cognitive decline. The findings highlight the need for development of a questionnaire exploring everyday functioning specific to PD.

Correspondence: *Laura Brennan, M.S., Psychology, Drexel University, 1505 Race Street, Philadelphia, PA 19102. E-mail: laura.brennan29@gmail.com*

L.C. BUTTERFIELD, W. SONG, C. JACOBSON, M. OKUN & D. BOWERS. Cognitive predictors of quality of life in Parkinson's disease.

Objective: It is widely known that Parkinson's disease (PD) patients often experience compromised quality of life (QoL). Cognitive changes associated with PD have been related to reduced QoL, independent of motor functioning. This study seeks to investigate the cognitive contributors (as indexed by DRS subscales) to QoL (as indexed by PDQ -39 scores).

Participants and Methods: The participants in this study included 213 PD patients (71% male, 29% female) in the mild to moderate disease stage. Correlational analyses were used to examine the relationship between cognitive performance and QoL. Standard regression was used to investigate the unique contribution of each cognitive domain (Attention, Initiation/Perseveration, Construction, Conceptualization, Memory) on QoL.

Results: Correlational analyses revealed significant associations between overall QoL and Initiation/Perseveration ($r = -.187$, $p<.01$) and Construction ($r = -.198$, $p<.01$) DRS subscales. Standard regression analyses demonstrated that both Initiation/Perseveration and Construction significantly and uniquely predicted overall QoL as well as activities of daily living (ADL). Investigation into the unique contributions of DRS domains on specific areas of well-being (as indexed by PDQ-39 subscales) revealed that DRS Initiation/Perseveration alone significantly predicted well-being in PDQ Mobility, Cognition, and Communication domains. In addition, DRS Construction alone significantly predicted emotional well-being of PD patients.

Conclusions: Integrity of cognitive executive functioning and visuoconstructional ability appear to be important in predicting QoL and ADL in PD.

Correspondence: *London C. Butterfield, MA, Psychology, University of South Florida, 4202 E. Fowler Ave., PCD 4118G, Tampa, FL 33620. E-mail: londonbutterfield@hotmail.com*

S.R. EARL, K.M. OBTERA, D.M. SCHIEHSER, S.L. LESSIG, D.D. SONG, D.P. SALMON & J. FILOTEO. Neuropsychological, Psychological and Functional Correlates of Tremor vs. Postural Instability/Gait Symptoms in Patients with Parkinson's Disease.

Objective: Recent studies suggest that postural instability and gait symptoms (PIG-S) are more likely to be associated with neuropsychological functioning than tremor symptoms (TS) in patients with Parkinson's disease (PD). The present study further addressed this issue by examining cognitive, psychiatric, functional, and life quality correlates of axial symptoms and tremor symptoms in PD.

Participants and Methods: 86 mild to moderate, nondemented PD patients participated in this study. The Unified Parkinson's Disease Rating Scale was used to derive summary scores of PIG-S and TS using previously published methods. These scores were then correlated with patients' scores on tests of cognition, psychiatric/psychological functioning, performance-based activities of daily living, and life quality.

Results: Only total scores on a measure of global cognitive functioning were associated with PIG-S symptoms, and TS symptoms were not associated with any neuropsychological measure. In contrast, PIG-S scores were associated with symptoms of depression, apathy, and anxiety as well as fatigue and life quality, which was not the case for TS scores. Neither PIG-S nor TS scores were associated with performance-based activities of daily living skills.

Conclusions: In contrast to previous studies, postural instability and gait symptoms were not strongly associated with cognition, although these symptoms were associated with psychiatric symptoms, fatigue, and life quality. Consistent with previous studies, tremor symptoms were not strongly associated with any of these factors. Results suggest that there is some utility in quantifying specific motor symptoms in PD to predict other aspects of the disease.

Correspondence: *J. Vincent Filoteo, VA San Diego Healthcare System, 3350 La Jolla Village Dr., San Diego, CA 92161. E-mail: vfiloteo@ucsd.edu*

K.M. OBTERA, S.R. EARL, D.M. SCHIEHSER, S.L. LESSIG, D.D. SONG, D.P. SALMON & J. FILOTEO. Using the Mattis Dementia Rating Scale to Identify Mild Neuropsychological Deficits in Nondemented Parkinson's Disease Patients.

Objective: Recently Villeneuve et al. (2011) proposed a cut-off score of 138/144 on the Mattis Dementia Rating Scale (MDRS) to identify "possible" mild cognitive impairment (MCI) in nondemented patients with Parkinson's disease (PD). The present study examined whether this cut-off score corresponded with an alternative method to classifying patients based on impairment on at least one of the five MDRS subscales.

Participants and Methods: 126 PD patients participated in this study and were classified as MCI using a cutoff of 138 on the MDRS. Patients were next classified as having mild neuropsychological deficits (MND) if they obtained a scaled score of < 6 on at least one of the five MDRS subscales.

Results: Results indicated that 47% were classified as MCI, whereas 31% were classified as MND. Only 76% of the sample was classified similarly using the two methods (i.e., "impaired" or "normal" using both methods), with the greatest source of error occurring in patients who scored below the 138 cut-off but were not impaired on any of the MDRS subscales.

Conclusions: The MDRS can be a useful tool to identify mild neuropsychological deficits in PD; however, the best method to using this measure has yet to be determined. The present study does not provide evidence that one approach is better than the other, but the 31% identified as MND in the present study is closer to the 20-30% prevalence rate of MCI reported in previous PD studies, suggesting that an MDRS score of 138 may not be optimal.

Correspondence: *J. Vincent Filoteo, VA San Diego Healthcare System, 3350 La Jolla Village Dr., San Diego, CA 92161. E-mail: vfiloteo@ucsd.edu*

S. FOSTER, J. SPRAY & B.J. SCHROCK. Making a Difference to Outcome: A Qualitative Look at the Various Roles of Neuropsychology in an Acute Inpatient Rehabilitation Setting.

Objective: Recently, there has been debate about whether there is a role for neuropsychology in an acute rehabilitation setting. We will present 3 case studies that highlight the diverse roles of neuropsychology in this setting.

Participants and Methods: Participants include 3 individuals who were acute inpatients in a rehabilitation hospital between Mar and Aug 2011. Specifically, (A) an 82-year old, Caucasian woman with an ad-

mitting diagnosis of spinal tumor, (B) an 81-year old, Caucasian man with an admitting diagnosis of below knee amputation, and (C) a 33-year old, Caucasian man with an admitting diagnosis of CVA related to atrial myxoma. A qualitative look at the case histories, neuropsychological evaluation processes, and recommendations for these 3 patients will highlight the unique roles of neuropsychology in this setting from admission to discharge.

Results: For patient A, we will present information highlighting our role in diagnosing an unexpected change in the patient's behaviors across her stay in rehabilitation. For patient B, we will present information that displays the strong impact that we can have on discharge planning; helping the patient, family, and team develop realistic expectations in light of previously undiagnosed cognitive difficulties. Information presented for patient C will highlight the dramatic impact we can have by recognizing neurological syndromes that explain problematic behaviors and using this information to guide treatment goals and strategies. These 3 cases are exemplars of how we as individuals who specialize in brain-behavior relationships can benefit outcome directly.

Conclusions: Although an atmosphere of reimbursement issues has cornered neuropsychology into a primarily diagnostic role, our discipline has much more to offer, particularly in an acute rehabilitation setting where our input can change the trajectory of a patient's recovery.

Correspondence: *Shannon Foster, Ph.D., Sharp Healthcare/Advanced Neurobehavioral Health Consortium, 4087 Carmel Springs Way, San Diego, CA 92130. E-mail: shannon.foster@sharp.com*

R. CALIOTO, M. SPITZNAGEL, G. STRAIN, M. DEVLIN, R. COHEN, R. PAUL, R. CROSBY, J. MITCHELL & J. GUNSTAD. Sleep Problems and Cognitive Function in Morbidly Obese Individuals.

Objective: Sleep problems are associated with cognitive impairment across multiple domains including attention, memory, executive and motor function (Durmer & Dinges, 2005). To date, no study has examined the effects of reported sleep problems on cognition in a morbidly obese sample.

Participants and Methods: A total of 206 morbidly obese individuals completed a computerized battery of cognitive tests (Integneuro) including executive, memory, language, and attention. Patients self-reported sleep difficulties, including 41 with sleep apnea, 40 with insomnia, and 13 with both insomnia and sleep apnea.

Results: The four groups (sleep apnea, insomnia, both, neither) were similar in BMI ($F(3, 194) = .420, p > .05$), hypertension ($\chi^2(6) = 15.0, p > .05$) and diabetes ($\chi^2(6) = 3.76, p > .05$). MANCOVA for z scores for each cognitive domain found no differences memory function (Wilks' $\lambda = .921, F(12, 447.42) = .299, p > .05$), attention (Wilks' $\lambda = .956, F(12, 428.903) = .617, p > .05$), executive function (Wilks' $\lambda = .934, F(12, 447.42) = .977, p > .05$) or language (Wilks' $\lambda = .989, F(6, 344.00) = .316, p > .05$).

Conclusions: Our results found that reported sleep problems were not associated with cognitive deficits in this sample. Further work is needed to clarify these findings, including studies involving a detailed sleep assessment to determine whether different sleep disorders have different cognitive effects, the role of treatment in minimizing impairment, and prospective studies in older adults.

Correspondence: *Rachel Galimoto, Psychology, Kent State University, 1846 Hampton Knoll Dr, Akron, OH 44313. E-mail: rmgalimoto@gmail.com*

S.L. GARCIA, M. SPITZNAGEL, R. COHEN, N. RAZ, L. SWEET, L. COLBERT, R. JOSEPHSON, J. HUGHES, J. ROSNECK & J. GUNSTAD. Association Between Sleep Quality and Cognitive Function in Heart Failure Patients.

Objective: Heart failure (HF) patients frequently exhibit cognitive impairment, with deficits often emerging in attention and memory. HF patients also frequently suffer from sleep problems, although the relationship between sleep quality and cognitive functioning in HF is unclear. The current study examines the relationship among reported sleep, cognitive function, and transcranial doppler (TCD).

Participants and Methods: Older adults with HF ($N=159; 68.53 \pm 9.30$ years; 36.2% female) completed a neuropsychological test battery and self-reported sleep quality on the Pittsburgh Sleep Quality Index (PSQI). Within two weeks of assessment a TCD was conducted to measure mean velocity of cerebral blood flow.

Results: Forty-five percent of participants received a significantly disturbed sleep score, while less than one percent endorsed having no sleep problems. Linear regressions were conducted between global PSQI scores and composite t scores for neuropsychological domains, adjusting for hypertension, cardiac fitness, and type 2 diabetes. Regressions were significant for global cognitive function ($\Delta R^2 < .005, p < .001$), frontal cognition ($\Delta R^2 = .03, p < .001$), language ($\Delta R^2 = .04, p < .001$), and motor function ($\Delta R^2 = .001, p < .001$). In each case, poorer reported sleep was associated with poorer cognitive test performance. No association emerged between PSQI and TCD indices.

Conclusions: Findings show a relationship between sleep quality and cognitive dysfunction in HF, but not with TCD indices. Future research is needed to clarify the mechanisms by which sleep influences cognitive functioning in this population.

Correspondence: *Sarah L. Garcia, Kent State University, 3814 Whip-poorwill Lane, Youngstown, OH 44511. E-mail: sarahlucillegarcia@gmail.com*

S. GELB, M.A. LANGILL, G.L. IVERSON & A.J. STOESSL. Factors Associated with Low WMS-IV Brief Cognitive Status Exam Scores in Parkinson's Disease.

Objective: The Wechsler Memory Scale – Fourth Edition (WMS-IV) Brief Cognitive Status Exam (BCSE) is a relatively new cognitive screening test. To our knowledge, there are no published studies examining the utility of the BCSE in a neurological population or, more specifically, amongst individuals with Parkinson's disease (PD). This study was designed to characterize demographic and clinical factors associated with low BCSE scores in patients with PD.

Participants and Methods: Participants were 34 outpatients with clinically probable or definite PD. The sample was 59% male and their mean age and education was 62.9 ($SD=10.8$) and 14.4 ($SD=2.8$) years, respectively. Average time since PD diagnosis was 7.6 ($SD=5.5$) years. Mean Unified Parkinson's Disease Rating Scale motor scores (part III; on-medication) and Modified Hoehn and Yahr Scale scores were 19.1 ($SD=12.4$) and 2.2 ($SD=0.8$), respectively. Participants were administered the BCSE, the Montreal Cognitive Assessment (MoCA), and various self- and informant-report measures (e.g., BRIEF-Working Memory Scale) while following their normal medication regimen.

Results: One third of the sample had below average scores on the BCSE. These patients were more likely to have lower MoCA scores ($p < .01$; Cohen's $d=1.22$) and family members rated them as having greater cognitive problems (BRIEF-WM; $p < .02$; $d=0.61$). For these patients, trends were seen for older age and self-reported cognitive problems. The groups did not significantly differ on other demographic or clinical characteristics.

Conclusions: The BCSE was well tolerated, identified 33% of the sample as below average, and performance was associated with performance on the MoCA and informant-reported cognitive problems.

Correspondence: *Shannon Gelb, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T2A1, Canada. E-mail: slund@sfu.ca*

M.A. LANGILL, G.L. IVERSON, S. GELB & A.J. STOESSL. Comparing Computerized Cognitive Screening to the MoCA in Parkinson's Disease.

Objective: The purpose of this study was to compare two cognitive screening measures in patients with Parkinson's disease (PD).

Participants and Methods: Participants were 80 outpatients with clinically probable or definite PD. The sample was 67% male and their mean age and education were 63.4 ($SD=9.8$) and 15.0 ($SD= 3.2$) years, respectively. Average time with PD diagnosis was 8.1 ($SD= 5.6$) years.

Mean Unified Parkinson's Disease Rating Scale (UPDRS) motor scores (part III; on-medication) and Modified Hoehn and Yahr Scale (MHYS) scores were 18.4 (SD= 10.4) and 2.3 (SD= 0.6), respectively. Participants were administered the CNS Vital Signs (CNS-VS) computerized neurocognitive battery, Montreal Cognitive Assessment (MoCA; M=24.9, SD= 3.1), and self-report measures.

Results: Using a cutoff for possible cognitive impairment, the tests classified 45% (CNS-VS; 2/5 domains <16th percentile), and 52% (MoCA; total score < 26) of the patients as impaired. Using a cutoff for probable impairment, the tests classified 31% (CNS-VS; 2/5 domains ≤5th percentile), and 28% (MoCA; total score ≤ 23) of the patients as impaired. Agreement was moderate between the MoCA and CNS-VS using possible ($\kappa=.403$; $p<.001$) and probable ($\kappa=.429$; $p<.001$) impairment cutoffs. Medium correlations were found (all p 's < 0.05) between the cognitive screening measures and demographic variables, clinical characteristics, and self- and collateral-reported cognitive problems.

Conclusions: The cognitive screening tests identified 28-50% of the sample as impaired and were in moderate agreement regarding those classifications. Performances were correlated with clinical characteristics and self-reported cognitive decline.

Correspondence: *Shannon Gelb, Ph.D., Psychiatry, University of British Columbia, 2255 Wesbrook Mall, Vancouver, BC V6T2A1, Canada. E-mail: slund@sfu.ca*

M. GONZALES, T. TARUMI, D.E. EAGAN, H. TANAKA & A.P. HALEY. Frontal White Matter Perfusion and Memory Performance in Type 2 Diabetes.

Objective: Type 2 diabetes mellitus is associated with vascular abnormalities such as arterial narrowing and sclerosis, which may induce cerebral hypoperfusion and disrupt networks critical for cognitive functioning. The aim of the current study was to investigate cerebral perfusion and its implications for cognition in early diabetes.

Participants and Methods: Fourteen middle-aged adults with type 2 diabetes and thirty-seven age-matched controls completed a fasting blood draw, neuropsychological testing, and cerebral perfusion assessment as measured by flow alternating inversion recovery arterial spin labeling. Average cerebral perfusion was calculated for six bilateral a priori regions of interest selected for their documented susceptibility for cerebrovascular disease.

Results: There were no significant differences in global cognitive function, age, education, or blood pressure between groups. In comparison to controls, individuals in the diabetes group displayed significantly lower frontal white matter perfusion ($F(1,50) = 5.91$, $p < 0.05$). Within the diabetes group, lower frontal white matter perfusion was associated with poorer cognitive performance within the memory domain ($r=0.59$, $p < 0.05$).

Conclusions: Small penetrating arteries in the frontal white matter may be particularly vulnerable to hypoperfusion in diabetes, potentially affecting frontal-subcortical circuits important for cognitive functioning. Non-invasive perfusion imaging is a potential source of important clinical information about the cerebral consequences of type 2 diabetes early in the disease process.

Correspondence: *Mitzi Gonzales, MA, Psychology, University of Texas - Austin, 1 University Station A8000, Austin, TX 78712. E-mail: mitzi.m.gonzales@gmail.com*

A. JAYWANT, C.K. TONER & A. CRONIN-GOLOMB. The Effects of Normal Aging and Parkinson's Disease on Design Fluency.

Objective: Parkinson's disease (PD) results in dysfunction of the basal ganglia and associated frontostriatal circuitry, which leads to impairments in executive function beyond those related to normal aging. Though verbally-based executive processes including initiation, self-monitoring, and response inhibition have been examined in PD, few studies have investigated how normal aging and PD differentially affect nonverbal executive processes. The present study investigated performance on the Ruff Figural Fluency Test (RFFT), a nonverbal analog to tests of verbal fluency.

Participants and Methods: Ten non-demented patients with mild-moderate PD, 17 age-matched normal control adults (NC), and 12 young control (YC) participants completed the RFFT. In each trial of the RFFT, participants have 60 seconds to generate as many unique designs as possible by connecting arrays of dots while avoiding repetitions.

Results: The results are examined in regard to response initiation (number of unique designs) and self-monitoring and response inhibition (limited production of perseverative responses). Compared to the YC group, NC participants produced significantly fewer unique designs, though there was no difference in the number of perseverative errors or in the ratio of errors to unique designs. Compared to the NC group, PD participants had a significantly higher ratio of perseverative errors to unique designs, but did not differ in the number of unique designs.

Conclusions: These findings suggest that on a task of nonverbal design fluency, normal aging is associated with a decline in response initiation while PD leads to additional deficits in self-monitoring and response inhibition beyond the effects of aging.

Correspondence: *Abhishek Jaywant, M.A., Boston University, 648 Beacon St, Boston, MA 02215. E-mail: ajaywant@bu.edu*

J. JONES, B. SKOBLAR, L. KIRSCH DARROW, M. OKUN & D. BOWERS. Contribution of Apathy and Depression to Global Cognitive Status in 209 Non-Demented Parkinson Patients.

Objective: Apathy is a primary neuropsychiatric feature of Parkinson's disease (PD) that is distinct from depression and has been associated with frontal-executive function. Yet some have argued that apathy has no meaningful impact on cognition or real world activities. The purpose of the present study was to learn whether apathy and depression exerted differential influence on a relatively simple, widely-used dementia screening measure.

Participants and Methods: We administered the Dementia Rating Scale-2 (DRS-2) as part of a large neuropsychological battery to 209 non-demented idiopathic PD patients and examined the contribution of cognitive (executive/memory/spatial) and mood measures to overall DRS-2 total score. Mood measures included: Apathy Scale (AS), Beck Depression Inventory-II (BDI-II) and State-Trait Anxiety Inventory (STAI).

Results: Parkinson patients were well-educated, 60% male, had an average disease duration of 10.5 years, with a mean DRS-2 score of 136.8. Exploratory regression analysis determined the best set of neuropsychological predictors of the DRS-2 were the Stroop, Animal fluency, HVLT, JOLO, and FRT, which together accounted for 32% of the variance. To examine influence of mood on DRS-2, we performed a hierarchical regression holding the neuropsychological predictors constant. Results revealed that apathy was the only mood/motivation variable that made a significant contribution beyond the cognitive model.

Conclusions: These results add to the literature by showing in a large cohort of PD patients that apathy, more so than depression or anxiety, contributes to general cognitive status in nondemented Parkinson patients. The basis for this relationship is unclear, but may reflect recent views that apathy is a barometer of disease progression.

Correspondence: *Jacob Jones, BA, CHP, University of Florida, 3901 SW 20th ave apt 206, Gainesville, FL 32607. E-mail: jacob.jones126@ufl.edu*

J. JONES, I. MALATY, M. OKUN & D. BOWERS. Health Comorbidities, Cognition and Quality of Life in Parkinson Disease : Results from the National Parkinson Foundation Quality Initiative with 1935 Patients.

Objective: Health comorbidities, particularly cardiovascular risk factors, are well known to pose risks for cognitive decline in older adults. To date, little attention has focused on Parkinson disease (PD), a dopaminergic depletion disorder affecting frontal-subcortical systems. This study examined the contribution of different health comorbidities on cognitive status and quality of life in Parkinson patients, above and beyond the effects of PD subtype, disease severity, and other factors.

Participants and Methods: Data on 1,935 PD patients were obtained from the National Parkinson Foundation Quality Initiative database and included two cognitive measures (Animal Fluency, delayed 5-word memory recall) and a PD-specific quality of life measure (QOL, PDQ-39). Available comorbidity data included cardiac disease, diabetes, arthritis, cancer, respiratory, and other neurologic disease, which clinicians rated for severity (1-5 scale). Data were analyzed (multiple hierarchical regression) controlling for demographic, PD disease variables, and medication types.

Results: Overall sample characteristics: 60% male, 72% tremors, disease duration 9.2 years, Hoehn-Yahr stage 2.9, age 66.6 years. Prevalence of comorbidities ranged from 9% (diabetes) to 47% (arthritis). For cognitive variables, severity of cardiac disease significantly contributed to memory recall, whereas diabetes contributed to animal fluency at trend. Different combinations of comorbidities influenced domain-specific QOL.

Conclusions: This study with a large cohort of PD patients provides evidence for detrimental influence of health comorbidities, particularly cardiac disease and diabetes, on simple indices of cognitive status. These observations are in line with those in normal elderly. Findings will be discussed in terms of the relationship between health comorbidities and MCI subtypes in PD.

Correspondence: *Jacob Jones, BA, CHP, University of Florida, 3901 SW 20th ave apt 206, Gainesville, FL 32607. E-mail: jacob.jones126@ufl.edu*

N.A. KIEWEL, R. SIMPSON, W. ONDO & A.M. STRUTT. Neurobehavioral Effects of Deep Brain Stimulation in a Case of Essential Tremor and Tourette's Syndrome.

Objective: Deep brain stimulation (DBS) targeting the ventralis intermediate nucleus (VIM) of the thalamus has been used as a neurosurgical intervention for essential tremor. However, the benefit of VIM DBS for the treatment of Tourette's syndrome (TS) is unknown. Research findings on the neurocognitive effects of VIM DBS have been variable, but stable improvements in quality of life (QOL) have been found. The aim of the present study was to evaluate the effect of VIM DBS on the cognitive and behavioral functioning in a patient with ET and TS, who experienced significant motor and tic amelioration post-surgically. Based on previous findings, post-operative declines in verbal fluency and improvements in mood and QOL were hypothesized.

Participants and Methods: A 64-year old, right-handed, Caucasian male with a history of ET, TS, multiple head trauma, and two pituitary tumor resections, who underwent VIM DBS for the treatment of ET and TS was administered a pre-operative and 6-month post-operative neuropsychological evaluation.

Results: Using a 95% RCI criterion, post-operative improvements were found on measures of learning efficiency of prose and non-verbal information, semantic verbal fluency, and on a measure of information processing. Declines were noted for learning efficiency and immediate recall on a list-learning task. Fewer symptoms associated with executive dysfunction were reported, along with decreases in obsessive-compulsive behaviors and anxiety, and improved QOL.

Conclusions: Several post-DBS improvements were noted, including QOL. Declines were found on a demanding list-learning task.

Correspondence: *Nicole A. Kiewel, MS, Psychology, University of Houston, 126 Heyne Building, University of Houston, Houston, TX 77204-5022. E-mail: nicole.kiewel@gmail.com*

K. KNECHT, M. SPITZNAGEL, R. COHEN, N. RAZ, L. SWEET, L. COLBERT, R. JOSEPHSON, J. HUGHES, J. ROSNECK & J. GUNSTAD. Additive Effects of Heart Failure and Obstructive Sleep Apnea on Cognitive Functioning.

Objective: Prior research indicates heart failure (HF) patients exhibit significant cognitive deficits relative to controls. Few studies have examined whether the presence of comorbid medical conditions exacerbates these cognitive deficits. Research demonstrates that obstructive sleep apnea (OSA) is associated with both HF and reduced cognitive function, but the combined impact of these conditions on cognition is unknown.

Participants and Methods: One hundred and eighty participants (138 HF patients, $M = 68.5$ years of age; 42 patients with HF+OSA, $M = 66.9$ years of age) completed a battery of cognitive tests measuring attention, executive functioning, and memory.

Results: Participants' test scores were standardized using normative data. We used separate MANCOVAs to compare HF and HF+OSA groups on measures of attention, executive function, and memory, while using education, hypertension, and diabetes as covariates. Results indicate that in comparison to patients with HF alone, HF+OSA patients performed worse on measures of attention [$\lambda = .919$, $F(3, 170) = 4.977$, $p < .01$] and executive functioning [$\lambda = .954$, $F(3, 166) = 2.668$, $p < .05$], but not on memory tests [$\lambda = .981$, $F(4, 171) = .836$, $p = .504$].

Conclusions: Cognitive impairment is exacerbated in patients who have both HF and OSA when compared to those who have HF alone. Future studies are needed to clarify underlying mechanisms, particularly those involving neuroimaging.

Correspondence: *Krysten Knecht, Psychology, Kent State University, 3943 Lake Run Blvd., Stow, OH 44224. E-mail: kknknecht1@kent.edu*

E. KOZORA, J. ZELL, J. SWIGRIS, E. DUGGAN & B. MAKE. Sleep Abnormalities and Cognitive Dysfunction in Systemic Lupus Erythematosus (SLE).

Objective: This pilot study aimed to describe sleep abnormalities in SLE patients with no history of overt neuropsychiatric disorders and to evaluate cognitive dysfunction in those identified as high risk (HR) for obstructive sleep apnea (OSA).

Participants and Methods: The Berlin Questionnaire (BQ), Pittsburg Sleep Quality Index (PSQI) and ACR-SLE neuropsychological battery were acquired in 14 SLE patients. They were on average 40.9 ($SD=10.6$) years old, had 14.6 ($SD=2.3$) years of education, 93% female, 71% Caucasian, with mean SLE duration of 125.3 months ($SD=71.2$), mean SLEADI score of 2.93 ($SD=2.8$) and 64% take prednisone (mean=5.1mg, $SD=0.5$).

Results: Poor sleep quality was reported on the PSQI in 50% of the group including delayed onset (28.6%), limited duration (28.6%), disturbance (35%) and sleep medication use (21.4%). HR for OSA was found in 57.1% of the group using the BQ with no demographic or SLE disease differences between HR and low risk (LR) OSA groups. The HR group had significantly higher body mass index (BMI) compared to the LR group ($p < 0.001$). Overall 4/14 (28.6%) had global cognitive impairment and 4/8 (50.0%) HR patients had cognitive impairment. The HR group had mild to moderate impairment in nonverbal learning (62.5%) nonverbal memory (50%), visuospatial speed (37.5%) and visuospatial construction (25%) and below average performance in complex attention (37.5%), fine motor coordination (37.5%) and information processing (25%).

Conclusions: Results suggest that some SLE patients with higher BMI may have undiagnosed sleep abnormalities and unknown HR for OSA. HR OSA patients appear to have global cognitive difficulties and specific difficulties in visual memory, visuospatial speed/construction and complex attention/information processing. Further research is needed to determine if self report measures under/over diagnose OSA, if SLE patients have undiagnosed—and therefore untreated—OSA or sleep abnormalities affecting behavioral functioning, and to discern the relationship between sleep and cognitive dysfunction.

Correspondence: *Elizabeth Kozora, Ph.D., Medicine, National Jewish Health, 1400 Jackson Street, Denver, CO 80206. E-mail: Kozorae@njhealth.org*

K.F. HOTH, K.A. MESCHEDE, J. LAGGART, E. DUGGAN, B. MAKE, C. EMERY & E. KOZORA. The Clock Drawing Test is Limited as a Screening Measure in Emphysema.

Objective: The Clock Drawing Test (CDT) is used as a screen for dementia in geriatric medicine. Drawing impairment has been suggested as a predictor of mortality and cognitive deficits in emphysema. There are limited data regarding the CDT in emphysema. Our aims were to examine two scoring systems for the CDT comparing emphysema patients to healthy controls, and to determine whether the CDT was associated with neuropsychological test performance.

Participants and Methods: Ninety-nine emphysema patients and 25 healthy controls completed the CDT (scored using Mendez and Rouleau criteria) and comprehensive neuropsychological testing. Neuropsychological measures were grouped into 5 domain scores (Memory, Language, Processing Speed, Attention, and Executive Functioning). We compared CDT scores between emphysema patients and healthy controls using *t*-tests. Among emphysema patients we also examined the association between CDT scores and performance on the 5 neuropsychological domains using MANOVA.

Results: The two groups did not differ on age, education, or gender. Emphysema patients' neuropsychological test scores were average overall, but worse than controls on processing speed ($t=2.69$, $p<.01$) and executive functioning ($t=2.83$, $p<.01$). Emphysema patients did not differ from controls on the CDT using either scoring approach (Mendez $t=1.53$, $p>.05$; Rouleau $t=.55$, $p>.05$). CDT scores were not significantly associated with neuropsychological performance using either the Mendez or Rouleau approach ($F=1.10$, $p>.05$; $F=.73$, $p>.05$, respectively).

Conclusions: Performance on the CDT did not differ between patients with emphysema and healthy controls using either the Mendez or Rouleau scoring method. The CDT was not significantly associated with neuropsychological test performance among emphysema patients. These data are consistent with previous literature in geriatric populations suggesting that the CDT alone is insufficient to screen for mild cognitive impairment.

Correspondence: *Karin F. Hoth, Ph.D., Medicine, National Jewish Health, 1400 Jackson St., Denver, CO 80207. E-mail: hothk@njhealth.org*

Z. MELIKYAN, Y. MIKADZE & A. POTAPOV. Memory and Executive Functions in Mild and Moderate TBI 3 and 6 Months Post-Injury.

Objective: Mild and moderate TBI - prevalent types of brain trauma - often lead to long-lasting cognitive deficits. Memory and executive functions - crucial for daily functioning - are most frequently disturbed in TBI. In the current study we combined quantitative and A.R. Lurian qualitative approach in an attempt to better characterize the structure of cognitive impairments in mild and moderate TBI.

Participants and Methods: 40 adults (25 male, 15 female), 19-62 years old with mild (21 patients) and moderate (19 patients) TBI were tested within 1, 3 and 6 months after trauma. Testing included visual and verbal memory tests from scored A.R. Lurian neuropsychological battery and Trails A&B, Letter-Number Sequencing, Digit and Spatial Span. Changes between 1 - 3 and 3-6 months post-injury were analyzed. ANOVA was performed. Only statistically significant results ($p<=0.05$) are reported.

Results: Changes were more pronounced between 1 and 3 then 3 and 6 months post-injury. During the first 3 months post TBI both speed and accuracy in Trails A&B improve, immediate and delayed recall in visual memory increase, number of errors decrease, in verbal memory only delayed recall increases. Between 3 and 6 months post TBI spatial span increases and there's insignificant increase in visual memory immediate and delayed recall and errors repetition rate in visual and verbal memory.

Conclusions: Cognitive changes in executive functions and memory are more pronounced in the first 3 months after TBI. Visual memory demonstrates significant improvement within first 3 months of trauma as compared to verbal memory.

Correspondence: *Zara Melikyan, PhD, MSU, 11-5 Mokhovaya str., Moscow 125009, Russian Federation. E-mail: zmelikyan@yahoo.com*

L.A. MILLER, M. SPITZNAGEL, M.L. ALOSCO, R.A. COHEN, N. RAZ, L.H. SWEET, L. COLBERT, R. JOSEPHSON, J. HUGHES, J. ROSNECK & J. GUNSTAD. Cognitive Profiles in Heart Failure: A Cluster Analytic Approach.

Objective: Cognitive impairment is common among individuals with heart failure (HF), with decline often found in multiple domains. However, the exact nature of these impairments remains unclear. Using a cluster analytic approach, we examined whether there are distinct cognitive profiles among subgroups of persons with HF and how these subgroups differ on demographic and clinical variables.

Participants and Methods: Older adults with HF (N=140; mean age = 68.94 ± 9.31 years; 36% female) completed a comprehensive neuropsychological battery and measures of cardiac function and cardiovascular fitness (2-minute step test). Neuropsychological tests included NAART, 3MS, CVLT, Animal Naming, BNT, TMT, FAB, LNS, and SCWT.

Results: Hierarchical cluster analysis indicated three clusters and K-mean cluster analysis was used to determine the final cluster solution. Results yielded Intact (N=53), Memory Impaired (N=67), and Globally Impaired (N=20) groups. MANOVA [$\lambda = .46$, $F(16,260) = 7.71$, $p < .001$] and chi-square analyses indicated differences on several demographic and clinical variables. Specifically, clusters differed in age, gender, global cognitive function, estimated premorbid IQ, education, systolic blood pressure, cardiovascular fitness, and history of sleep apnea.

Conclusions: A substantial amount of variance in cognitive performance was found within this sample of older adults with HF. Given the risk for adverse outcomes associated with cognitive decline in HF, determining precise cognitive profiles has important implications for treatment recommendations. Treatment strategies targeting particular cognitive strengths and weaknesses may increase treatment compliance among this population and reduce the associated clinical and economic burdens.

Correspondence: *Lindsay A. Miller, Psychology, Kent State University, 238 Kent Hall, Kent, OH 44242. E-mail: lmlille92@kent.edu*

L.A. MILLER, R.D. CROSBY, G. STRAIN, M.J. DEVLIN, R. WING, R.A. COHEN, R.H. PAUL, J.E. MITCHELL & J. GUNSTAD. Cognitive Effects of Bariatric Surgery at 12 Month Follow-up.

Objective: Cognitive impairment is prevalent among obese individuals. Bariatric surgery is an effective intervention for obesity and our recent work showed improved memory function 12 weeks post-operatively relative to controls. However, no study has examined the effects of bariatric surgery on cognitive function at 12 month follow-up.

Participants and Methods: 137 participants were included in the current study (95 bariatric surgery patients, mean age=43.23; 42 obese controls, mean age=39.93). All bariatric surgery patients were part of the Longitudinal Assessment of Bariatric Surgery parent project. Bariatric surgery participants completed self-report measurements and a computerized cognitive test battery prior to surgery and then 12 weeks and 12 months after surgery; obese controls completed these measures at equivalent time points. Cognitive function over time was examined by repeated measures MANOVA and mixed modeling was used to examine potential mechanisms of change among bariatric surgery patients.

Results: Group comparisons of cognitive performance indicated no differences between bariatric surgery patients and controls. However, an interactive effect emerged for memory indices [$\lambda = .37$, $F(8, 128) = 2.34$, $p = .02$, $\eta^2 = .13$], with bariatric surgery patients demonstrating better performance post-operatively. Mixed modeling indicated that change was largely unrelated to the presence of hypertension, sleep apnea, and diabetes or to BMI among bariatric surgery patients. However, these conditions influenced some cognitive test performances.

Conclusions: The current findings demonstrate that cognitive function continues to change at more distant follow-up intervals after bariatric surgery. However, the mechanisms of change remain unclear and future work involving neuroimaging and biomarkers is needed to clarify the underlying mechanisms.

Correspondence: *Lindsay A. Miller, Psychology, Kent State University, 238 Kent Hall, Kent, OH 44242. E-mail: lmlille92@kent.edu*

J. MINGER, A. SIDEROWF & A.R. DARIN. Identifying Symptoms of Parkinson's Disease That Influence Caregiver Burden.

Objective: Parkinson's disease (PD) is a progressive neurodegenerative disorder. Predominately known as a movement disorder, PD may also accelerate cognitive degeneration, as well as increase levels of depression and anxiety for patients. As patients worsen, caregiver burden

levels tend to increase. However, it is yet to be determined specifically which types of PD symptom progression influence caregiver burden. In evaluating a sample of 154 PD patients, we found that the combination of both physical and cognitive symptom progression is the best predictor of caregiver burden.

Participants and Methods: The participants of this study were a sample of 154 PD patients of various symptom progression that were enrolled in a longitudinal quality of life study. The study's test battery included the Unified Parkinson's Disease Rating Scale part-III (UPDRS) to evaluate motor impairment, the Mattis Dementia Rating Scale (DRS) to evaluate cognitive impairment, as well as the Geriatric Depression Scale (GDS) to evaluate patient's level of depression and anxiety. Each patient's caregiver was then required to fill out the Burden Interview (BI) to reflect levels of burden that may be associated with caring for a PD patient.

Results: Motor ($r = 0.2583$) and cognitive impairment ($r = 0.3090$) were both strongly correlated with caregiver burden. Participant's mood was weakly related to increased caregiver burden ($r = .1578$). Sub-scales of the DRS that were particularly correlated with caregiver burden were initiation/perseveration ($r = 0.1783$) and construction ($r = 0.2112$).

Conclusions: Motor and cognitive impairment significantly affect increased levels of caregiver burden. We found that participant's level of depression and anxiety insignificantly affect caregiver burden. Furthermore, caregiver burden correlated with participants that were more impaired on the initiation/perseveration, and construction DRS sub-scales. Correspondence: James Minger, Neurology, University of Pennsylvania, 735 Melon Terrace, Apt C, Philadelphia, PA 19123. E-mail: jmsminger@gmail.com

T.S. PATERSON, S.E. YEUNG, R.J. SHAPIRO & W. THORNTON. Examination of the Relationships Between Transplant Effects Questionnaire Measured Worry, and General Symptoms of Anxiety and Depression in Renal Transplant Patients.

Objective: Transplant recipients endorse moderate levels of worry concerning their transplant. However, little research has examined relationships between worry specifically pertaining to one's transplant and other psychosocial factors that impact everyday function. We examined the relationship between general feelings of anxiety and depression, and transplant-specific worry in renal transplant recipients to determine whether transplant-related worry may act as a marker of more general anxiety and/or depression symptomatology.

Participants and Methods: Renal transplant recipients ($N = 106$) completed the Centre of Epidemiologic Studies Depression (CES-D) scale, Multidimensional Anxiety Questionnaire (MAQ), and Transplant Effects Questionnaire (TxEQ), which assesses behavioral/emotional responses following transplantation. Using regression analyses, we examined whether transplant-specific worry predicted symptoms of depression and/or anxiety.

Results: Increased overall symptoms of anxiety ($\beta = .40, p < .01$) and depression ($\beta = .23, p < .05$) were predicted by increased transplant-specific worry beyond the effects of age, gender, and education. Separate regression analysis of factor scores revealed significant relationships between the TxEQ worry subscale and all four MAQ factors (physiological-panic, negative affectivity, social phobia, and worry-fears) as well as depressive-affect and somatic factors of the CES-D.

Conclusions: Given these relationships, transplant-related worry can be considered as a marker, or warning sign, that an individual may be experiencing more generalized symptoms of anxiety and/or depression. This relationship between self-reported anxiety and depression symptoms and transplant-related worry indicates that the Worry TxEQ subscale has the capacity to inform physicians of potentially more debilitating psychosocial difficulties patients may be facing. Our findings further highlight the importance of monitoring and treating anxiety and depression in transplant recipients.

Correspondence: Theone S. Paterson, M.A., Psychology, Simon Fraser University, RCB5246, 8888 University Dr., Burnaby, BC V5A 1S6, Canada. E-mail: theonep@sfu.ca

P. RUPPERT, E.C. EDMONDS, M. BROOK, S. MUSIL & S. HAN. Longitudinal Neuropsychological Assessment in a Case of Adult-Onset Hemophagocytic Lymphohistocytosis (HLH).

Objective: We present a case of an individual diagnosed with hemophagocytic lymphohistocytosis (HLH), an extremely rare and potentially fatal disorder characterized by rapid dysregulation of immune system processes. Typical age of onset is in childhood, with adult-onset occurring less frequently. The pathophysiology of this condition is characterized by a hyperinflammatory response with infiltration of visceral organs, lymph nodes, bone marrow, and the central nervous system. The clinical presentation, along with neurological symptoms, has been documented in the extant medical literature. However, there are no published reports of neuropsychological functioning in HLH patients. To the best of our knowledge, this is the first study to present comprehensive neuropsychological data for an adult diagnosed with HLH.

Participants and Methods: The patient was a 28-year-old woman with 16 years of education and unremarkable psychiatric history who developed HLH subsequent to systemic lupus erythematosus flare-up. She was initially comatose for 3 weeks. Acute MRI reported multiple subcortical abnormalities, including brainstem. The patient underwent chemotherapy, immunosuppressant, and steroid treatments. She had neuropsychological evaluation at 3 and 7 months post initial presentation.

Results: Initial neuropsychological evaluation found impairments in motor and aspects of executive functions. Subsequent evaluation showed improved executive function but continued impairment on motor tests.

Conclusions: To our knowledge, this is the first study to report neuropsychological functioning in HLH. Results of longitudinal neuropsychological assessment were notable for impairments in motor function but relative sparing of higher-order cognitive abilities, despite the patient's poor acute presentation. Implications of these findings are discussed.

Correspondence: Phillip Ruppert, Ph.D., Duke University Medical Center, 2106 University Drive, Durham, NC 27707. E-mail: phillipruppert@gmail.com

A.A. RUSSO, R. FROST, S. CHURCHILL, K. DERU & L.K. WEAVER. Hyperbaric Oxygen in Chronic Stable Brain Injury (HYBOBI): Effects on Processing Speed and Working Memory.

Objective: Individuals with chronic sequelae of brain injury were exposed to hyperbaric oxygen (HBO2) in a feasibility study. Neuropsychological outcomes (NPT) were evaluated; specifically, working memory and processing speed are addressed here.

Participants and Methods: NPT evaluations were completed at baseline, after 60 daily HBO2 sessions and 9 months post-enrollment. Processing speed in this population was evaluated with the Ruff 2/7 Total Speed Score and Working Memory indicated by the average word total of trials one and b of the California Verbal Learning Test-II.

Results: Subjects included 45 individuals diagnosed with TBI (10), stroke (17), and anoxia (18). Mean pre-exposure Ruff 2/7 total speed t-score was 35.62, mean six-month post exposure t-score was 37.96. Mean pre-exposure word recall composite score was 4.28, mean six-month post exposure score was 4.74.

A GLM repeated measures model was used to evaluate whether processing speed and working memory increased after HBO2 exposure. Sex and injury type (TBI, stroke, anoxia) were added as between-subject variables. Within-subjects results indicate a statistically significant change in processing speed ($F: 4.808, p = .034$) and working memory ($F: 6.213, p = .017$) between pre-exposure and six months post-exposure. Between-subjects analysis indicates that TBI, stroke, and anoxia groups changed differently over time compared to one another for both processing speed ($F: 338.83, p = .000$) and working memory ($F: 296.71, p = .000$).

Conclusions: While caution in interpretation is necessary given limited power and lack of concurrent controls, both processing speed and working memory showed statistical improvement from pre- to post-exposure with HBO2. Unfortunately, patients remained within the deficit range in these areas, which leaves the clinical significance of the increase in cognitive abilities in doubt. As such, HBO2 exposure in those with chronic TBI, stroke, or anoxia may provide little benefit.

Correspondence: *Antonietta A. Russo, Ph.D., Outpatient NeuroRehabilitation, Intermountain Health Care, 5770 South 250 East, Ste. G-50, Murray, UT 84107. E-mail: antonietta.russo@imail.org*

N. SINGH, J.C. KEILP, K.M. CORBERA & B.A. FALLON. Subjective Cognitive Complaints in Post-Lyme Disease Syndrome: Effects of Mood Disturbance and Actual Performance Decline.

Objective: Post-Lyme Disease syndrome (PLDS) is associated with subjective complaints regarding cognition, but, on average, moderate deficits in actual cognitive performance. Cognitive complaints are often found to be contaminated by mood disturbance, rather than reflecting actual deterioration in performance. In this study, subjective cognitive complaints were compared to ratings of depressed mood, as well as performance on the Wechsler Intelligence and Memory Scales in a PLDS sample.

Participants and Methods: Thirty-four individuals meeting strict criteria for PLDS (documented infection with IV antibiotic treatment and later reemergence of symptoms; current positive IgG Western Blot) were screened for inclusion in a re-treatment study. Participants were administered the Cognitive Failures Questionnaire (CFQ) to assess subjective cognitive complaints, the revised Beck Depression Scale (BDI-II), and the WAIS-III and WMS-III.

Results: CFQ scores were elevated in patient subjects (60.1 ± 18.7). CFQ scores correlated most strongly with BDI-II ($r=.63, p<.001$), and with WAIS-III Processing Speed ($r=-.40, p=.03$), Vocabulary ($r=+.34, p=.06$), Digit Span ($r=-.42, p=.02$), and Digit Symbol ($r=-.48, p=.006$), but no scores from the WMS-III. Stepwise regression revealed that a combination of BDI-II (Beta=.59), WAIS-III Vocabulary (Beta=.24), Digit Symbol (Beta=-.43), and Picture Arrangement (Beta=.34) predicted 71.4% of the variance in CFQ (Multiple $R=.85, p<.001$).

Conclusions: Cognitive complaints in PLDS were associated with both mood disturbance, as expected, but also, independently, with declining processing speed relative to intelligence level. In terms of actual performance, subjective cognitive complaints were not related to attention, working memory, or memory scores. Subjective cognitive complaints are clearly affected by mood factors, but also declining psychomotor performance.

Correspondence: *Nanya Singh, MA, Ferkauf Graduate School, Albert Einstein College of Medicine, Yeshiva University, 1165 Morris Park Avenue, Bronx, NY 10461. E-mail: navyachanna@gmail.com*

L. STROBER, J. LENGENFELDER, N. MOORE, J. DELUCA & N. CHIARAVALLI. The Perceived Deficits Questionnaire (PDQ): Perception, deficit, or distress?

Objective: The Perceived Deficit Questionnaire (PDQ) was designed specifically for use in multiple sclerosis (MS) as a self-report measure of cognitive dysfunction. Previous reports, however, suggest that patients' self-report on the PDQ lack a relationship with objective neuropsychological performance. The goal of the present investigation was to explore the relationships of the PDQ with objective neuropsychological performance as well as a host of psychosocial variables such as depression, anxiety, fatigue, self-efficacy, and pain.

Participants and Methods: Eighty-two individuals with MS enrolled in a memory retraining study were administered a brief, comprehensive neuropsychological battery and completed various self-report measures including the PDQ, Chicago Multiscale Depression Inventory, Modified Fatigue Impact Scale, State Trait Anxiety Inventory, Multiple Sclerosis Self-Efficacy Scale, and the MOS Pain Effects Scale.

Results: With the exception of attention, none of the remaining domains of the PDQ (retrospective memory, planning/organization) correlated with objective neuropsychological performance. However, all domains of the PDQ were significantly correlated with reports of depression (mood and vegetative symptoms), anxiety, fatigue, pain, and feelings of control on the MS Self-Efficacy Scale.

Conclusions: The PDQ is reported to have good face validity and is recommended for use as part of the Multiple Sclerosis Quality of Life In-

ventory (MSQLI). However, given these and previous findings, caution should be taken in interpreting patients' self-reported cognitive complaints as they appear to be more related to overall psychological distress and one's self-efficacy than impairment, per se. Such findings highlight the importance of neuropsychological evaluations to validate patients' complaints as well as the importance of questioning patients about other psychosocial issues that may be influencing their cognitive complaints.

Correspondence: *Lauren Strober, Ph.D., Kessler Foundation Research Center, 300 Executive Drive, Suite 70, West Orange, NJ 07052. E-mail: lstrober@kesslerfoundation.org*

K. SULLWOLD, M.A. MATTHEWS, C.R. BUTSON, B.C. HINER, K. BLINDAUER, B. KOPELL & J.A. BOBHOLZ. Relationship between neuropsychological and behavioral manifestations of executive dysfunction following deep brain stimulation in Parkinson's disease.

Objective: Decrements in performance on objective measures of executive functioning following deep brain stimulation (DBS) of the subthalamic nucleus in individuals with Parkinson's disease have been consistently reported in the literature; however, behavioral changes associated with frontal lobe functioning after DBS surgery are less well documented. The current study longitudinally examined the relationship between behavioral executive dysfunction and performance on objective tests of executive functioning in patients with Parkinson's disease following DBS.

Participants and Methods: Patients ($n = 24$) underwent pre- and post-DBS neuropsychological assessments and completed the Frontal Systems Behavior Scale (FrSBe) at each evaluation.

Results: Patients had a significant increase in scores on the Apathy and Executive Dysfunction subscales on the FrSBe and their performance declined on several neuropsychological measures of executive functioning. There was a trend for a positive correlation between change in Total FrSBe score and change in performance on a measure of auditory working memory; however, there were no significant relationships between change in FrSBe scores and performance on other objective executive functioning measures or mood.

Conclusions: The findings demonstrate differential longitudinal change in self-reported behavioral executive dysfunction and performance on neuropsychological measures of executive functioning and support the inclusion of both forms of measurement in pre- and post-DBS neuropsychological evaluations.

Correspondence: *Kristin Sullwold, PhD, Medical College of Wisconsin, 9200 W Wisconsin Ave, Milwaukee, WI 53226. E-mail: ksullwold@mcw.edu*

L.G. UMFLEET, J. JONES, C. PRICE, R.M. BAUER, M.S. OKUN & D. BOWERS. Neuropsychological Test Performance: Effects of Age of Onset in a Non-demented Parkinson's Disease Patient Population.

Objective: Cognitive deficits can be present in non-demented PD patients at any stage of the disease. Previous research indicated that individuals with later-onset PD are more likely to be diagnosed with dementia earlier and experience more severe symptoms. Reid et al. found that individuals with earlier onset PD, relative to later-onset, experience modest declines on cognitive testing 10 years after diagnosis, and are more likely to not be diagnosed with dementia until much later in the disease course. The purpose of the present study was to examine cognitive status in a non-demented PD cohort comprised of persons with early (<50 years) and later onset PD who were matched for duration of illness.

Participants and Methods: Participants ($N = 237$) were patients with idiopathic PD who underwent a comprehensive neuropsychological evaluation as part of standard referral from the UF Movement Disorders Clinic. Participants met several exclusion/inclusion criteria (e.g., no history of DBS, DRS-2 scores \leq 5th %ile). Participants were divided into

three age of onset groups (<50, 50-59, 60-75), and all groups were matched on total years of PD symptoms. Standard scores on Neuropsychological measures such as Stroop, Trailmaking, COWA, WCST, WMS-III, FRT, HVLT-R, BNT, and WAIS-III DS-Coding were compared among age groups.

Results: ANOVA results revealed significant group differences on Animal Fluency and the FRT, with lower mean scores in the 60-75 group compared to the <50 group. In contrast, mean differences approached significance on the HVLT-R, with lower scores in the <50 group compared to the 60-75 group. No differences emerged for other measures.

Conclusions: When controlling for duration of illness, the present results did not point to a strong "age of onset" effect vis a vis cognitive changes in Parkinson disease. These findings will be discussed in terms of recent conceptualizations of mild cognitive impairment (MCI) in PD. Correspondence: *Laura G. Umfleet, M.S., Roosevelt University; 3800 SW 34th Street, Apt Q-146, Gainesville, FL 32608. E-mail: lglass@mail.roosevelt.edu*

J. WARD, L. BURRELL & M. NAQUIBUDDIN. Predictors of Work Status in Systemic Lupus Erythematosus.

Objective: The presence of cognitive deficits in systemic lupus erythematosus (SLE) is well established. However, the relationship of specific cognitive abilities to work status remains unclear.

Participants and Methods: In the current study, we assessed cognitive functioning in individuals with SLE who are disabled (DSLE; N=24) and participants with SLE who are still able to work (WSLE; N=41). Study participants underwent assessment of cognitive functioning and completed a brief mood measure.

Results: Groups did not differ with regards to age, disease duration, or disease severity. However, DSLE participants were found to have significantly fewer (i.e., 12.94) years of education than WSLE (i.e., 15.3 years) participants and a higher degree of self-reported depressive symptoms. Stepwise logistic regression analyses were then undertaken to determine the relationship between occupational status (i.e., working versus disabled) and years of education, disease status/duration, self-reported mood rating, and cognition. A stepwise model that retained three variables (i.e., years of education and measures of processing speed and complex problem solving) accurately classified 97.6% of WSLE participants. However, prediction of occupational status among DSLE participants was much weaker (i.e., 62.5%) using this model. The stepwise logistic regression model that best classified the occupational status of both groups also retained years of education, as well as measures of complex problem solving and verbal learning of new information. Classification accuracy using this latter model was 92.7% for WSLE and 70.8% for DSLE participants.

Conclusions: The current findings clearly indicate the importance of preserved problem solving skills, speeded mental processing, and new learning for maintaining the ability to work in SLE. Additionally, years of education may represent a proxy for cognitive reserve, which may play a role in the ability to continue working in SLE.

Correspondence: *Julianna Ward, Ph.D., Psychiatry & Behavioral Sciences, Johns Hopkins University/Hospital, Meyer 218, Div. of Med. Psychology, 600 N. Wolfe Street, Baltimore, MD 21218. E-mail: jward24@jhmi.edu*

H.A. WISHART, J.C. FORD, J.S. RANDOLPH, S. CRONENWETT, E. REILLY, B.J. OLIVER, A.J. SAYKIN, B.C. MCDONALD, E. LALLANA, C. FADUL & L. KASPER. Longitudinal Change in Cognition-Related Brain Activity in Multiple Sclerosis.

Objective: The aim of this study was to examine change in cognition-related brain activity over a one-year period in patients with multiple sclerosis (MS) compared to healthy controls, and to assess the potential usefulness of fMRI for longitudinal pharmacologic studies in MS.

Participants and Methods: Patients with relapsing-remitting or secondary progressive MS (n=9) and healthy demographically matched controls (n=11) underwent scanning and neuropsychological testing

at baseline and again one year later. Patients were evaluated at baseline prior to starting disease-modifying medication (glatiramer acetate; GA), and remained on treatment thereafter. Scans were acquired on a Philips 3.0T magnet using an auditory-verbal N-back task. After detrending, images were realigned, normalized and smoothed using SPM5. Contrasts for 3-back>rest were entered into second-level analyses.

Results: Groups did not differ on baseline neuropsychological testing, but there was a trend for lower 3-back accuracy in the patients (p=0.08). Both groups activated expected working memory circuitry. At baseline, patients showed less activity than controls in left temporal cortex (cluster-level p = 0.005). There was no significant change in controls' activity from baseline to one-year follow-up. In contrast, patients showed an increase in activity in two large left lateral prefrontal cortex regions (cluster-level p=0.001 and 0.01). Across groups, 3-back accuracy improved over time (p=0.05) and there was a trend for increased left prefrontal activity to correlate with extent of improvement (p=0.03). There were no regions in which either group showed decreased activation over time. Neuropsychological test performance remained stable over time in both groups.

Conclusions: This study shows that fMRI is sensitive to changes in cognition-related brain activity over a 12-month period in MS patients treated with disease-modifying medication. These findings suggest the potential usefulness of cognitive fMRI for evaluating effects of treatment on cognition in MS.

Correspondence: *Heather A. Wishart, PhD, Psychiatry, Dartmouth Medical School, One Medical Center Dr., Lebanon, NH 03756-0001. E-mail: wishart@dartmouth.edu*

J.C. WERTHEIMER, D. YEH, W. TANG, J. FITZGERALD SMITH, C. WALTON & M. TUCHMAN. Fatigue and Apathy in Individuals with Parkinson's Disease with and without Deep Brain Stimulation: Implications for Neuropsychologists.

Objective: Non-motor symptoms of Parkinson's disease (PD) greatly affect daily functions and quality of life for persons with Parkinson's disease (PWP) and their care providers. Two poorly understood but common non-motor symptoms in PWP are fatigue and apathy. In addition to increasing the understanding of fatigue and apathy in PD, the impact of Deep Brain Stimulation (DBS) on these symptoms warrants more attention. Study objectives include: 1. To examine prevalence and characteristics of fatigue and apathy in PWP who have undergone DBS (DBS group) and those without DBS (Non-DBS group). 2. To understand how fatigue and apathy manifest in Early PD versus Advanced PD. 3. To examine the relationship between other non-motor symptoms, such as sleep, depression and anxiety, and fatigue and apathy.

Participants and Methods: Using survey-based methodology, the DBS group (N = 205) and the Non-DBS group (N = 311) completed the Parkinson Disease Fatigue Scale, the Apathy Scale, and a questionnaire inquiring about other non-motor symptoms such as sleep, anxiety, and depression.

Results: Both DBS (66%) and Non-DBS groups (58%) revealed clinically elevated levels of fatigue, with no significant difference between groups. Both DBS (62%) and Non-DBS (47%) groups experienced elevated apathy, with significant differences between groups. For all participants, 44% were clinically elevated for both fatigue and apathy. Even after controlling for age, a greater number of PWP with advanced PD (vs. Early PD) experienced fatigue and apathy. Although elevated levels of depression, anxiety, and sleep disturbance significantly correlated with fatigue and apathy for both groups, fatigue and apathy were also found to be independent symptoms for individuals with PD.

Conclusions: Both fatigue and apathy are prevalent in PD, and DBS appears to have a differential impact on apathy, which may be a direct and/or indirect outcome of this therapy. Practical implications and recommendations are discussed.

Correspondence: *Jeffrey C. Wertheimer, PhD, Physical Medicine and Rehabilitation, Cedars-Sinai Medical Center, 8700 Beverly Blvd, Ste 7215, Los Angeles, CA 90048. E-mail: Jeffreywertheimer@yahoo.com*

D. YEH, D. CARR, A.M. MEIER, M.E. GOMEZ, D.A. MARTINEZ, J. KIM, K.J. MILLER & G.W. SMALL. Insomnia and Attentional Decline in Cognitively Intact Older Adults.

Objective: To identify if insomniacs exhibit greater longitudinal decline on cognition in a sample of cognitively intact older adults. Researchers indicate short-term sleep deprivation is associated with declines in cognition (i.e., attention, working memory, processing speed, short-term memory; Lim & Dinges, 2010). However, the impact of insomnia on longitudinal cognitive abilities is less clear. The current study examined if insomnia results in greater longitudinal decline on measures of attention, processing speed, and short-term memory.

Participants and Methods: With 54 participants (23 insomniacs, 31 non-insomniacs) the mean age was 62.65 (SD = 11.51). No significant differences between groups on gender, education, or gross cognitive functioning. Attention (WAIS-III Digit Span), processing speed (WAIS-III Digit Symbol; Trails A), and short-term memory (WMS-III: Logical Memory I; Verbal Pairs I) were measured.

Results: Insomnia was significantly correlated with advanced age (age 60+; $r = .30$) and depression severity ($r = .28$). Using MANOVA with covariates of advanced age and depression severity, there was a negative statistically significant interaction effect between attention and insomnia over time (Pillai's Trace = 0.087, $F(1, 50) = 4.75$, $p = .03$). Interestingly, all participants, including insomniacs, improved over time for psychomotor speed (Pillai's Trace = 0.75, $F(2, 49) = 72.31$, $p < .001$) and short-term memory (Pillai's Trace = 0.211, $F(2, 49) = 6.57$, $p = .003$).

Conclusions: Results indicated that insomnia is associated with advanced age and depression, and a decline in attention over time.

Correspondence: *Dow-ann Yeh, MA, UCLA Longevity Center, UCLA Semel Institute for Neuroscience and Human Behavior, Peter V. Ueberroth Building Suite 3119, 10945 Le Conte Ave., Los Angeles, CA 90095-6980. E-mail: yeh.d.ann@gmail.com*

Medical/Neurological Disorders/Other (Child)

T.R. CUNNINGHAM, J. PANINE PISCIONE, D. IGOE, M. ORFUS, E. BOUFFETT, U. BARTELS, S. LEUGHLIN, U. TABORI & D. MABBOTT. Preliminary results from an exercise program targeted at neuro-recovery in pediatric brain tumor survivors treated with cranial radiation therapy.

Objective: Cranial radiation is frequently required for effective tumor control for pediatric brain tumors, but is associated with significant neuro-toxicity, including white matter damage and cognitive morbidity. The potential value of exercise for supporting brain recovery has been documented in animal models and in adult humans. Our feasibility study evaluated a structured exercise program to determine whether increases in cardio-respiratory fitness results in improved neuro-cognitive and physical/motor outcomes in paediatric brain tumor patients treated with cranial radiation.

Participants and Methods: Five patients treated with cranial-spinal radiation participated in the program. A Pre-intervention-post testing model was used to evaluate change scores in cardio-respiratory fitness (VO₂ max), neuro-cognitive function (processing speed, working memory, and declarative memory) and physical /motor outcome (bilateral coordination, balance, running speed and agility, and strength). The intervention was run over 12 consecutive weeks, 3 times a week for an 1.5 hours each session and consisted of aerobic games/activities designed to increase patients' heart rate.

Results: All patients showed a pattern of either stable or improved performance in speed and accuracy scores across neuro-cognitive measures. Participants also showed stable or improved performance in bilateral coordination and strength.

Conclusions: Paediatric brain tumor survivors treated with cranial radiation typically display declines in neuro-cognitive scores over time. Within this context, it is notable that we observed a trend of stable/im-

proved performance in both neuro-cognitive and motor outcomes following an exercise program. Our findings may reflect practice effects. Hence, we are currently gathering longitudinal data from a sample of patients who did not participate in an exercise program to evaluate the determine whether patients who participated in the exercise program show different outcomes than those not participating in such a program. Correspondence: *Todd R. Cunningham, Ph.D., Psychology, The Hospital for Sick Children, 555 UNIVERSITY AVE, Toronto, ON M5G 1X8, Canada. E-mail: todd.cunningham@sickkids.ca*

M. GERSTLE & D.D. SCHWARTZ. Neuropsychological Functioning in Sickle Cell Anemia Following Peripheral Blood Stem Cell Transplantation: A Pediatric Case Study.

Objective: Sickle cell anemia (SCA) is the most common and most severe genotype of sickle cell disease, an inherited disorder affecting the body's production of hemoglobin. Individuals with SCA are at risk for a number of cognitive and academic deficits, including impairments in general intellectual functioning, attention, processing speed, memory, and language. Currently, the only known curative option for SCA is stem cell transplantation, such as peripheral blood stem cell transplantation (PBSCT), which carries its own increased risk of neurological complication potentially impacting cognitive functioning. This case study describes the neuropsychological functioning of a school-aged child with SCA following PBSCT with ensuing neurological complications compared to pre-transplant functioning.

Participants and Methods: Comprehensive neuropsychological testing was conducted on a right-handed female at age 5 years (18 months prior to PBSCT) and at age 7 years (7 months post-PBSCT).

Results: Variable intellectual functioning was noted and likely due to considerable changes in the level of arousal observed across testing sessions. Compared to pre-morbid functioning (i.e., prior to PBSCT), continued difficulties with attention were evident. Decreased processing speed and motor dexterity as well as impairments in planning and problem solving were also found. Parent ratings indicated no clinically significant difficulties with behavioral, emotional, or executive functioning, but parent report suggested concerns regarding depression.

Conclusions: Continued impairments in attention and decreased executive functioning and motor dexterity were evident following PBSCT. However, inconsistencies in cognitive performance were also noted. The variability in the neuropsychological profile may indicate ongoing recovery of cognitive functioning, persistent fluctuations in cognition, or a true cognitive decline, thereby stressing the importance of close monitoring and reassessment post-PBSCT.

Correspondence: *Melissa Gerstle, Ph.D., Department of Pediatrics-Psychology, Baylor College of Medicine/Texas Children's Hospital, 6701 Fannin St., Ste. 1630, Houston, TX 77030. E-mail: mxgerstl@texaschildrens.org*

L.E. HAMPTON, N. CRUZ & L. CHAPIESKI. Cognitive and Academic Outcomes of Pediatric Rasmussen's Encephalitis Patients With Hemispherectomies.

Objective: Rasmussen's Encephalitis (RE) is a rare neurological characterized by unilateral inflammation of the hemisphere and intractable seizures. The treatment for most patients is a hemispherectomy. In this case presentation we highlight cognitive changes due to natural progression and hemispherectomy in three previously normal, school-aged patients who had hemispherectomies.

Participants and Methods: The pre and postoperative cognitive performances of two RE female patients with left hemispherectomies were compared to one RE female patient with a right hemispherectomy. Tests of intelligence, academic skills, language, memory, visual-spatial and visual-motor were administered. Testing was completed at least once pre- and post-surgery. Age at seizure onset ranged from 4 to 8 and age at surgery ranged from 9 to 12 years

Results: The right hemispherectomy patient exhibited a mild decline over the course of the disease with little additional decline following

surgery. Declines were most evident on spatial tasks, working memory, processing speed and math calculations. Declines in the left hemispherectomy patients were more dramatic and more global, affecting both language and less verbally mediated tasks. All academic skills were severely impaired. All three patients acquired hemiparesis and visual-field deficits and the right hemisphere patient developed a left neglect.

Conclusions: Patients who undergo left hemisphere deterioration and hemispherectomy appear to be at risk for more global and significant functional decline that affects the entire spectrum of academic skill. Effects of right hemispherectomy are most evident on spatial tasks and math calculations.

Correspondence: *Lyla E. Hampton, M.A., Psychology, University of Houston, 1 Hermann Museum Circle, Apt 3060, Houston, TX 77004. E-mail: lelmessi@gmail.com*

K.K. HARDY, K. WALSH, B.T. HAREL, S.A. HOSTETTER, R. PACKER & M. ACOSTA. Computerized Cognitive Training for Children with Neurofibromatosis Type 1 (NF1): A Pilot Study.

Objective: Children with NF1 have a high incidence of executive dysfunction, but few interventions have been empirically evaluated. We aim to assess the feasibility and preliminary efficacy of a home-based, computerized cognitive training program for children with NF1 and working memory deficits. Changes in functional connectivity by resting-state functional magnetic resonance imaging (R-fMRI) following completion of CT are also assessed.

Participants and Methods: This prospective, single-arm, repeated measures trial (target $n = 20$) includes pre- and post-intervention neuropsychological assessment, including parent questionnaires, and R-fMRI. Children meeting eligibility criteria (i.e., those who show attention/working memory impairment) complete training with Cogmed®, a web-based working memory training program completed at home that includes phone-based coaching support over 9 weeks (25 sessions). Primary outcomes include change in attention and working memory function, evaluated with both traditional and computerized measures.

Results: Nine children (44% male; Mean age = 10.9, Range = 8-15) have been enrolled since June 2011. Treatment compliance is high with all participants completing at least 92% of training sessions with no adverse events. Training improvement in our sample is consistent with standards based on previous samples of children with working memory deficits and with Attention Deficit/Hyperactivity Disorder (ADHD). At follow-up, two-thirds of the sample evidenced clinically meaningful improvement (defined as at least +0.5 SD) on computerized and traditional measures of sustained attention and executive functioning.

Conclusions: Additional inferential analysis of neurocognitive and R-fMRI outcomes on the full sample will be presented. Preliminary data suggests that home-based computerized training is feasible for children with NF1, and that many of those completing the program show meaningful gains on tasks of attention and executive functioning. Further study using a larger, randomized design is warranted.

Correspondence: *Kristina K. Hardy, PhD, Children's National Medical Center, 111 Michigan Ave, NW, Washington, DC 20010. E-mail: kkhardy@childrensnational.org*

E.J. HELDER, B. ELZINGA & T. LARSEN. Cognitive, behavioral, and emotional outcomes in older international adoptees.

Objective: Children adopted internationally are at increased risk for cognitive difficulties (Behen, 2008), behavioral problems (Gunnar, 2007), and emotional difficulties (Colvert, 2008). Often the frequency and/or degree of these difficulties are positively correlated with age at adoption (Behen, et al., 2008). However, longitudinal studies examining outcomes in older adoptees are lacking. The current study evaluated cognitive, behavioral, and emotional functioning in children who were adopted at age four and older across two time points.

Participants and Methods: Twenty-two internationally adopted children were included in the study (9 males, mean age at time 1=109+35 months, mean age at adoption=91+36 months). They had been in their adoptive home an average of 17+11 months and were assessed utilizing a comprehensive neuropsychological battery and parent report of behavioral and emotional adjustment at time 1 and again one year later.

Results: At year 1, participants displayed deficits in verbal reasoning (64%), receptive and expressive language (55%), and inhibition (61%). Additionally, parent reported externalizing problems and impulsivity were common. Performance on neuropsychological tests and emotional and behavioral ratings scales were all significantly correlated from time 1 to time 2. Academic functioning was the only cognitive area that demonstrated significant improvement over time ($p < .01$). Also, parent reported internalizing problems increased ($p < .05$).

Conclusions: The findings suggest that cognitive deficits observed in older adoptees are similar to those reported in studies with younger samples, however, they may also be slower to recover as little improvement was noted and emotional difficulties increased across time points. Future research will follow these older adoptees over additional time points.

Correspondence: *Emily J. Helder, PhD, Psychology, Calvin College, 3201 Burton St SE, Grand Rapids, MI 49546. E-mail: emily.helder@calvin.edu*

E. GARCÍA, R. MARTÍN, S. HERNÁNDEZ, J. JIMENEZ, L. DÍAZ-FLORES & D. GONZÁLEZ. Neuropsychological Assessment of Executive Function in a Case of Dandy-Walker Syndrome.

Objective: Dandy-Walker Syndrome (DWS) refers to a congenital brain malformation involving the cerebellum and the fluid filled spaces around it. DWS has variable effect on neuropsychological development where some children have normal cognition and others never achieve normal intellectual development. **Objective.** To assess executive functioning (EF) of an adolescent with DWS.

Participants and Methods: RA is a 16-year-old girl diagnosed with dyslexia when she was 11. RA was diagnosed with DWS while taking part in a neuroimaging experiment about dyslexia. The images showed dilated temporal horns and frontal horns without periventricular edema and a dilatation of the third and fourth ventricles. Sagittal images showed an artefact signal (on the Aqueduct of Sylvius) indicative of the increase of flow, an extensive connection between third and fourth ventricles, a cystic retro-cerebellar structure and hypoplasia of cerebellar vermis. **Method.** The EF assessed were: verbal and spatial working memory, planning, cognitive flexibility, inhibition and verbal fluency. The neuropsychological protocol was formed by: Sentences Working Memory Test; Spatial Span (CANTAB); verbal fluency test (COWAT), Stroop test; Wisconsin Card Sorting Test and Stockings of Cambridge (CANTAB).

Results: Comparing the results obtained by RA with normative data, they showed that the patient has adequate performance on all EF assessed.

Conclusions: The neuropsychological profile for EF of RA is compatible with normal development and correct functioning of the prefrontal cortex. Factors such as brain reorganization and cerebral plasticity might have contributed to the normal functional development in RA.

Correspondence: *Sergio H. Expósito, Doctor, Psychobiology and Methodology, University of La Laguna, Faculty of Psychology, Campus of Guajara, La Laguna 38207, Spain. E-mail: sexposito@ull.es*

M. HUDEPOHL & D. ILARDI. Neuropsychological Patterns in Children with Acquired Cerebellar Lesions.

Objective: Research has demonstrated the cerebellum's role in non-motor functions due to bidirectional circuits with higher-order brain areas. Cerebellar Cognitive Affective Syndrome (CCAS) describes a deficit pattern in adults after cerebellar lesion, characterized by executive, visuospatial, and language deficits, and personality changes (Schmahmann & Sherman, 1998). Studies have tried to link lesion location with

deficit patterns. No specific pattern has been identified but limited evidence shows that right cerebellar lesions may result in language deficits whereas left lesions often result in executive and visuospatial deficits. Few studies have assessed neuropsychological outcomes in pediatric populations. The purpose of this case study was to explore patterns in neuropsychological outcomes after pediatric cerebellar lesion and attempt to make anatomical-functional correlations.

Participants and Methods: This case series reviewed neuropsychological results for 20 children with cerebellar lesions (7-left; 6-right; 7-bilateral). Each patient was administered a flexible battery. Impairment was defined as below 1 standard deviation from the mean; qualitative aspects of executive dysfunction were also considered.

Results: Analysis of data revealed patterns consistent with CCAS apart from personality changes, which were rare. Patients with bilateral and left cerebellar lesions were more likely to demonstrate impairment across executive, visuospatial, and language domains. Patients with right lesions consistently exhibited executive deficits but less language and visuospatial impairment.

Conclusions: Results from this pediatric sample support the CCAS characterization. Lesion lateralization revealed executive dysfunction across locations; however, patients with left and bilateral lesions exhibited greater impairment across domains. Although future research should be done with a larger sample, this study suggests that lesion location can impact neuropsychological profiles, an important finding for treatment and remediation.

Correspondence: *Margaret Hudepohl, M.A., Division of Neuropsychology and Behavioral Health, Emory University School of Medicine, 300 Martin Luther King Jr. Dr., Apt. 350, Atlanta, GA 30312. E-mail: margaret.hudepohl@gmail.com*

M. IAMPIETRO, T. GIOVANNETTI, D.G. DRABICK & R.A. TARAZI. A Person-Centered Approach to Understanding Preschool Children with Sickle Cell Disease.

Objective: Sickle cell disease (SCD) negatively influences academic achievement and IQ. However, more work is needed to understand whether/how the considerable heterogeneity of disease severity and socioeconomic status (SES) among children with SCD affects cognitive outcomes. We used the person-centered approach of latent class analysis (LCA) to empirically define groups of preschool-aged children with SCD based on disease severity and SES variables and then compared these groups on cognitive measures.

Participants and Methods: Measures of disease severity (SCD genotype, hemoglobin) and SES (maternal education, hrs per wk in daycare) were obtained from 41 children with SCD ($M_{age} = 4.30 \pm .73$, 39% female). LCA models were run with these variables. A one-class model was tested first, followed by the exploration of additional models with more classes. Cognitive variables (WPPSI, Differential Abilities Scales; DAS) were compared across the classes of the best-fitting model.

Results: Statistical indicators, including the Bayesian Information Criteria (BIC; 658.83), adjusted BIC (611.88), and Bootstrap Likelihood Ratio Test ($p < .001$), indicated that a two-class model provided the best fit to the variables. Class 1 ($n=23$) included children with lower hemoglobin and more children with genotypes associated with greater disease severity (HgbSS). SES variables did not differ between classes, and sex and age did not alter class membership. Follow-up analyses revealed no significant differences between the classes on WPPSI-III full-scale, verbal, or performance IQ, or DAS Recognition of Pictures or Verbal Comprehension subtests.

Conclusions: Measures of SCD disease severity, but not measures of SES, distinguish children at preschool-age. However, these relatively homogenous groups of more versus less severe SCD children do not differ on cognitive outcomes. Additional research is essential to identify possible factors (i.e., cognitive reserve) that might mitigate the effect of disease severity on cognition.

Correspondence: *Tania Giovannetti, Psychology, Temple University, Weiss Hall, 1701 N 13th St., Philadelphia, PA 19122. E-mail: tgio@temple.edu*

A.L. JANOS, D.K. GRANGE, R.D. STEINER & D.A. WHITE. Processing Speed and Executive Abilities in Children with Phenylketonuria.

Objective: Phenylketonuria (PKU) is a hereditary metabolic disorder that results in neuropsychological impairment even in individuals treated early and continuously. We examined the relationship between processing speed and executive abilities in children with PKU.

Participants and Methods: The early-treated PKU group comprised 42 children (23 girls, 19 boys) aged 7-18 years ($M = 11.8$, $SD = 3.5$). The control group comprised 81 typically-developing children (42 girls, 39 boys) aged 7-18 years ($M = 12.3$, $SD = 3.2$). No child had a major medical disorder, neurologic compromise, or learning disorder unrelated to PKU. Children completed three reaction time (RT) tasks (simple RT, go/no-go, stimulus-response compatibility) and seven executive tasks examining working memory, inhibitory control, and strategic processing.

Results: Separate linear regression analyses were conducted for executive tasks, with variables entered in the following order: age, composite z-score for RT mean or SD, group, interaction between age and composite z-score for RT mean or SD, interaction between age and group, interaction between composite z-score for RT mean or SD and group, and interaction between age, composite z-score for RT mean or SD, and group. Performance improved with age for both groups across all executive tasks ($p < .02$). Processing speed (RT mean) and variability in processing speed (RT SD) contributed to performance on most executive tasks. After controlling for processing speed and variability, executive impairments were still identified in working memory ($p < .05$) and inhibitory control ($p < .04$).

Conclusions: Processing speed and variability contributed to some, but not all, impairments in executive abilities in children with PKU.

Correspondence: *Alicia L. Janos, M.A., Psychology, Washington University in St. Louis, 4400 Lindell Blvd, 15L, St. Louis, MO 63108. E-mail: alicia.janos@gmail.com*

A. KHATCHADOURIAN, M. MCCABE, V. RAMOS & L. JACOBSON. Neuropsychological Functioning in Opsoclonus Myoclonus Syndrome: A Case Series.

Objective: Opsoclonus Myoclonus syndrome (OMS) is a rare paraneoplastic syndrome often associated with neuroblastoma. Hallmark symptoms include ataxia, myoclonus, language difficulties/regression, and opsoclonus. Evidence suggests that the cerebellum is particularly affected by this syndrome as well as the brain stem and limbic system. Research suggests a chronic or relapsing disease course in the majority of cases, with persisting motor, speech, behavioral, and cognitive problems. Despite these neurological symptoms, research on development and neuropsychological functioning in these patients is limited. In order to contribute to the existing literature, this study examined the neurocognitive effects of OMS in a pediatric population.

Participants and Methods: We present a series of four clinically-referred patients (two female) with OMS between ages four and six years at the time of evaluation. Presenting symptoms included ataxia, tremor, involuntary eye movements, and language regression; onset ranged from 17 to 36 months. Neuroblastoma was identified in each patient; treatment for each included surgical resection, chemotherapy, and intravenous immunoglobulin (IVIG).

Results: Results from clinical neuropsychological evaluations suggest notable variability in intelligence, adaptive skills, emotional and behavioral functioning, and academic skill development. Motor and attention impairments were consistent findings across these patients. With regard to both cognitive and behavioral functioning, males (mean $IQ=77.5$) appeared to fare worse than females (mean $IQ=94$).

Conclusions: These results contribute to the small literature on neurocognitive functioning in patients with OMS and suggest that neuropsychological evaluation is an important aspect of care given the variability in outcomes as well as the early age of onset and potential impact on patients' developmental trajectories.

Correspondence: *Annie Khatchadourian, M.A., Neuropsychology, Kennedy Krieger Institute, 1750 E. Fairmount Ave., Baltimore, MD 21231. E-mail: khatchadourian@kennedykrieger.org*

L.S. KRIVITZKY, K.S. WALSH, M.M. BERL, E.L. FISHER & N. BARNETT. Executive Functioning across Pediatric Medical Disorders: A BRIEF profile analysis.

Objective: Deficits in executive functioning are known sequelae of many childhood medical conditions or their treatments. Differences in the patterns of executive strengths and weaknesses across disorders are understudied. We compare executive functioning profiles in pediatric medical conditions and examine the relationship to age and disease onset.

Participants and Methods: Five groups of children (ages 3-18, FSIQ>70) included Partial Epilepsy (n=97), Neurofibromatosis-Type 1 (n=55), Brain Tumors (n=83), Leukemia (n=62), and Urea Cycle Disorders (n=49). All children underwent neuropsychological assessment including parent report BRIEF. Group differences were examined in a profile analysis via a mixed model MANOVA.

Results: A group effect for medical diagnosis ($F=1.510, p=.042$) revealed higher levels of executive dysfunction in the NF-1 and UCD groups. Working memory and planning/organization were consistently rated as the most elevated subscales (peaks in the profiles) across diagnoses (mean T scores 57-62 and 53-60, respectively), although not reaching clinically significant levels ($T \geq 65$). A trend for younger age at diagnosis/symptom onset (birth/infancy) to have more executive dysfunction relative to children with later disease onset (over 7; $F=1.566, p=.081$) was found. However, this finding is confounded, as the NF-1 and UCD groups both have a high percentage of early onset subjects (under 2).

Conclusions: Results from this study suggest that children with medical conditions that impact the CNS have similar executive profiles with mild elevations for aspects of metacognitive skills. A risk factor for greater executive dysfunction may include the medical condition and/or earlier age of symptom onset/treatment.

Correspondence: *Lauren S. Krivitzky, Children's National Medical Center, 2548 Ayr Court, Crofton, MD 21114. E-mail: lauren.krivitzky@gmail.com*

K.A. MCNALLY, V. ANDERSON, W. LO, M. MACKAY & K.O. YEATES. Understanding of Ironic Criticism and Empathic Praise in Children with Arterial Ischemic Stroke.

Objective: The effects of childhood brain insults on social development are largely unknown. This study aims to determine whether children with a history of arterial ischemic stroke (AIS) demonstrate impairments in social-affective cognition, specifically the understanding of ironic criticism and empathic praise.

Participants and Methods: Participants were 6 to 16 year old children with neonatal or childhood AIS (unilateral stroke, $N = 24$; bilateral stroke $N = 6$) and a comparison group of children with asthma ($N = 15$). They were administered the Irony and Empathy Task (Dennis, Purvis, Barnes, Wilkinson & Winner, 2001) to assess their understanding of literal praise and criticism, ironic criticism, and empathic praise. Multiple regression analyses determined the relationships of age, sex, WASI IQ, socioeconomic status (SES), and group membership to performance on scenarios involving literal praise/criticism, ironic criticism, and empathic praise.

Results: As expected, performance on all types of scenarios improved with age. IQ was related to understanding of empathic praise, but not to understanding of literal praise/criticism or ironic criticism. Even after controlling for age, sex, SES and IQ, children with bilateral AIS performed more poorly than those with unilateral AIS or controls in their understanding of literal praise/criticism, ironic criticism, and empathic praise.

Conclusions: Children with a history of AIS, particularly those with bilateral lesions, perform more poorly on measures of social-affective cognition.

Correspondence: *Kelly A. McNally, Ph.D., Psychology, Nationwide Children's Hospital, 700 Children's Drive, Columbus, OH 43205. E-mail: kelly.mcnally@gmail.com*

C. MRAKOTSKY, K. MALETSKY, R. GRAND & D. WABER. Long-term Effects of Steroids on Memory and Behavior in Children with Crohn's Disease.

Objective: Corticosteroids can disrupt hippocampal and frontal integrity. We previously established the acute effects of steroids on memory and behavior control in pediatric Crohn's disease (CD), a remitting-relapsing autoimmune illness with chronic intestinal and systemic inflammation. We here investigate the long-term effects of steroids in an on-off repeated measures design.

Participants and Methods: Behavioral data is presented on $n=74$ (of 110) children age 8-16 years who completed baseline and 6-month retest in this ongoing study. CD patients on steroids ($n=36$) were compared to inflammation- and steroid-free abdominal pain ($n=26$) and healthy controls ($n=12$) on measures of memory, executive functions, IQ, behavior, and disease variables.

Results: During treatment steroid patients had poorer spatial and verbal memory and reported more emotional and cognitive complaints than controls. Repeated measures analyses in the steroid group demonstrated improvements in spatial learning ($p < .01$) and word list learning ($p < .05$) on-off steroids, while word list and spatial recall remained unchanged. When compared to controls, time x group interactions were found for spatial learning ($p < .05$). Post-treatment CD patients improved more than controls in spatial learning, whereas all groups improved on list learning. Robust improvements were found for reported behavior/emotion regulation problems, less so for cognitive complaints, for the steroid group. Behavior in control groups remained unchanged.

Conclusions: Results confirm earlier findings of differential impact of steroids on learning, recall and behavior. Steroid effects on prefrontally mediated functions (behavioral control, working memory/learning) may be transient, whereas effects on functions mediated by hippocampus (memory) may persist post-treatment. Behavioral results will be described in context of a larger ongoing study involving biomarkers and neuroimaging. Supported by NIH K23HD58466.

Correspondence: *Christine Mrakotsky, Ph.D., Children's Hospital Boston, 300 Longwood Avenue, Boston, MA 02115. E-mail: christine.mrakotsky@childrens.harvard.edu*

C. NOGGLE & J.C. THOMPSON. The Neuropsychology of de Morsier Syndrome: A Case Report.

Objective: The study evaluated the neuropsychological performance of a 17-year old with de Morsier Syndrome, also known as Septo-Optic Dysplasia.

Participants and Methods: Neuropsychological assessment was performed secondary to concerns of inattention. Visual limitations were previously documented via single field analysis. Absence of the septum pellucidum was reported in infancy. de Morsier Syndrome was never diagnosed previously; however, requested MRI confirmed absence of the septum pellucidum and optic nerve hypoplasia suggesting diagnosis.

Results: VIQ was high average. PIQ was average. Prominent deficits were noted across all trials of the CTMT and first two trials of the Stroop. Outcomes on the CVLT-II were 1.5 SDs below the mean across initial learning trials 1-4; 0.5 SDs below on trial 5. Short-delay free recall, long-delay free recall, and long-delay cued recall were all 1 SD below the mean. Recognition was average. Outcomes on the CPT-II and WCST were normal. Language was unimpaired. Visuoconstructional skills were variable. Beyond vision, sensory and motor functioning was average.

Conclusions: Findings demonstrate both the variability of neurocognitive performance in de Morsier Syndrome and the impact that developmental abnormalities of the optic nerve and septum pellucidum can produce. This patient performed relatively well across tasks involving

frontal domains without significant processing speed or visual processing requirements. Moreover, there was evidence of personal and normative strength regarding crystallized verbal intelligence and verbal reasoning. However, clear evidence of visual processing speed deficits were noted as was mild single trial learning difficulties. Not surprisingly, the patient also demonstrated evidence of weakness on tasks of visuomotor integration and visual attention.

Correspondence: *Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu*

S.K. POWELL, J.M. HEMME-PHILLIPS, F.T. MANGANO, S.K. HOLLAND, B.V. JONES, M. ALTAYE, R.C. MCKINSTRY, D.D. LIMBRICK & W. YUAN. Young Children with Congenital Hydrocephalus Demonstrate Early Developmental Deficits with Improvement Post Surgery.

Objective: Congenital hydrocephalus (CH) is a pathological condition in which excessive accumulation of cerebrospinal fluid (CSF) results in increased intracranial pressure and abnormal neurologic symptoms. To effectively relieve symptoms, surgical intervention is often necessary to divert CSF. Several studies have examined the cognitive functioning of school-age children with hydrocephalus, though typically when associated with other neurological conditions (spina bifida, brain tumors). We present initial findings from a longitudinal DTI study investigating the developmental trajectory of children with primary CH post initial surgical intervention (NIH R01# NS 066932).

Participants and Methods: Children were recruited for the study at the time of diagnosis and referral to neurosurgery. Initial data were analyzed looking at a young child sample from the larger study (N=27; ages 0- to 5-years). Developmental testing was conducted prior to surgery and again 3-months and 12-months post-surgery. Measures included the Bayley Infant Scales of Development, Third Edition (Bayley-III) and Adaptive Behavior Assessment System, Second Edition (ABAS-II).

Results: Results indicate that children with CH demonstrate deficits compared to a healthy control sample at an early age (pre-surgery Bayley-III Language $p=.037$; 3-months post-surgery Bayley-III Cognitive $p=.023$, Motor $p=.041$). Interestingly, preliminary data suggest an improvement in language skills noted at 3-months post surgery and cognitive skills noted at 12-months post surgery. Results from parent questionnaires were variable; while parents do not endorse substantial concerns prior to surgery or even 3-months post surgery, they do endorse problems in motor and practical skills at 12-months post-surgery (ABAS-II Motor $p=.016$, Practical $p=.012$).

Conclusions: Young children with congenital hydrocephalus demonstrate developmental deficits early on, some of which normalize following successful surgical intervention while others persist.

Correspondence: *Stephanie K. Powell, Ph.D., Psychology / Neurology, St. Louis Children's Hospital / Washington University School of Medicine, One Children's Place, Department of Psychology, Suite 3-South 32, St. Louis, MO 63130. E-mail: skp6143@bjc.org*

R.W. SCHROEDER, L.E. BAADE & R.J. HEINRICH. A Case Study of an Adolescent with Progressive Neurocognitive Decline Following a Period of Normal Development.

Objective: We present a case of an adolescent male who had normal development until the age of 8. At that time, the patient began having "rages" which lasted anywhere from 5 minutes to 1 hour. At the age of 13, the patient's cognitive abilities began to decline. He was diagnosed and treated for epileptic seizures, which stopped his "rages," however, his cognition continued to decline.

Participants and Methods: At the age of 13, the patient was referred for neuropsychological testing. Since then, neuropsychological evaluations have been conducted on an annual basis. Recent EEG, MRI, and MRA studies have been conducted.

Results: Based on scholastic records, it is likely that the patient's pre-morbid cognitive abilities were average to above average. Currently,

the patient's WISC-IV FSIQ score is 58. Examination of scores across neuropsychological evaluations shows a steady decline in mental processing speed, verbal intellectual ability, verbal memory, and verbally mediated executive tasks. Visuospatial intellectual, memory, and executive abilities initially declined, but leveled off, and now remain stable. Although some of the patient's declining scores might be related to a lack of age-appropriate cognitive progression this is not the case for all scores, as many raw scores have also steadily declined. The patient's recent EEG results (off medications) continue to show epileptic discharges, primarily of the bifrontal areas. MRI and MRA were negative.

Conclusions: Neuropsychological testing shows a progressive neurocognitive decline. Although the patient has a seizure disorder, it is treated and not expected to cause this level of decline. Full neurological underpinnings are not currently known.

Correspondence: *Ryan W. Schroeder, PsyD, Psychiatry and Behavioral Sciences, University of Kansas School of Medicine - Wichita, 7829 E. Rockhill, Suite 105, Wichita, KS 67206. E-mail: Ryan.W.Schroeder.PsyD@hotmail.com*

A. SPURGIN, P. GLASIER, M. MORRIS & P. STAVINOH. Neuropsychological Impact of Bilateral Cerebral Abscesses in an Adolescent.

Objective: Existing literature on neuropsychological outcomes of cerebral abscesses is extremely limited. Through presentation of comprehensive neuropsychological and imaging data, this case of pediatric cerebral abscesses demonstrates the anatomical and neuropsychological impact of right frontal and left thalamic *Streptococcus intermedius* infection. The potential contribution of congenital heart disease (CHD), a known risk factor for cerebral abscesses, is discussed.

Participants and Methods: This 15-year-old, right-handed male with a history of complex CHD presented with a 24-hour history of low-grade fever, left-sided weakness, and fatigue. Imaging revealed left-to-right midline shift and bilateral abscesses in the left ventral thalamus and right superior frontal gyrus, affecting subcortical white matter. Pathology detected *Streptococcus intermedius*. Treatment consisted of burr hole drainage, antibiotics, and steroids. Neuropsychological evaluation was conducted six months post-treatment due to problems with memory, processing speed, sleep, and mood.

Results: Background information suggested average to above average pre-morbid functioning. Testing revealed deficits in nonverbal reasoning (SS=71) but average verbal reasoning (SS=98). Impaired bilateral fine motor coordination likely contributed to motor-based processing speed deficits. Impairments in immediate and delayed visual and verbal memory were evident. Executive functioning skills were generally below to far below average. Language, motor-free processing speed, visual-spatial processing, and sustained attention were intact.

Conclusions: Neuropsychological findings correspond with both existing and emerging knowledge regarding functions of the thalamus, frontal lobe, cerebral hemispheres, and subcortical white matter. Findings are discussed in terms of relevance to functional neuroanatomy, with consideration given to the potential impact of CHD. Recommendations for testing in cases of cerebral abscesses associated with CHD are provided. Correspondence: *Alice Ann Spurgin, B.A., University of Texas Southwestern Medical Center, 6300 Harry Hines Blvd., 9th Floor, Dallas, TX 75235. E-mail: AliceAnn.Spurgin@utsouthwestern.edu*

K. STANEK SELBOM, Z. FETTERMAN, S.M. GRIEVE, A.M. BRICKMAN, M.S. KORGAONKAR, R. GALIOTO & J. GUNSTAD. Associations Between Brain Structure and Body Mass Index in Children and Adolescents.

Objective: Obesity is associated with cognitive dysfunction in children and adolescents, though the mechanisms underlying these deficits remain unclear. The current study explored the associations between body mass index (BMI) and indices of regional grey matter volume and white matter integrity in a sample of healthy individuals ranging from 6 to 18 years of age.

Participants and Methods: A total of 120 participants from the Brain Resource International Database without medical or psychiatric disorder underwent magnetic resonance and diffusion tensor imaging. BMI was demographically standardized according to Center for Disease Control guidelines; the sample was approximately 3% underweight (BMI < 5th percentile), 67% normal weight (BMI = 5th–84th percentile), 12% overweight (BMI = 85th–95th percentile), and 17% obese (BMI > 95th percentile).

Results: Partial correlation analyses controlling for relevant demographic characteristics revealed statistically significant ($p < .05$) associations between standardized BMI values and grey matter volume of frontal ($r = -.19$), limbic ($r = -.20$), cingulate ($r = -.20$), and lingual ($r = -.27$) brain regions, as well as fractional anisotropy in the superior longitudinal fasciculus ($r = -.19$). Hierarchical linear regression analyses indicated that the relationship between structural brain changes and standardized BMI did not vary with age.

Conclusions: Results suggest that obesity in children and adolescents is associated with decreased volume of frontal, limbic, and cingulate brain regions. In addition, higher BMI was associated with reduced integrity of key white matter tracts, suggesting reduced connectivity between brain regions. The pattern of effect sizes demonstrated in this exploratory study suggest a great need for further research in this area to better elucidate possible neuromorphological and/or developmental mechanisms for cognitive dysfunction in obesity.

Correspondence: *Kelly Stanek Sellbom, PhD, Psychology, University of Alabama, 348 Gordon Palmer Hall, University of Alabama, Tuscaloosa, AL 35487-0348. E-mail: kmstanek@as.ua.edu*

K.L. WIJK, K.E. KING & R.S. ZIEGLER. Longitudinal Neuropsychological Functioning of Two Female Siblings with 4H Syndrome.

Objective: 4H syndrome is a recently identified rare form of leukoencephalopathy associated with hypomyelination, hypogonadotropic hypogonadism, and hypodontia. Little is known about its etiology or natural history. Limited neuroradiological findings have documented widespread hypomyelination, thinning of the corpus callosum, and cerebellar hypoplasia/atrophy. Functional impairments observed include progressive ataxia, dysarthria, and below average to impaired cognitive skills. However, longitudinal neuropsychological data has yet to be published.

Participants and Methods: This study considers neuropsychological data collected over more than 3 years for two females (16 and 23 years) who are among the first identified 4H syndrome sibling pairs. Findings are interpreted in the context of previous school evaluations.

Results: The older sibling appears more affected and has declined from average intellectual skills in early elementary school to below average in early adulthood. The younger sibling's performance on intellectual measures across evaluations has generally remained in the broad average to mildly below average ranges. Both siblings exhibit academic and social difficulties, nonverbal memory weaknesses, and notable, mildly progressive impairments in fine motor, visual perceptual, and visuomotor skills. Difficulties with attention, executive functioning, and adaptive skills have been documented for both patients, although more severely in the older sibling.

Conclusions: Consistent with its leukoencephalopathic nature, longitudinal neuropsychological data suggests 4H syndrome impacts a range of neural systems underlying motor skills, visual processing, executive functioning, and learning. The rate and severity of functional deterioration appears variable and has yet to be documented over the lifespan.

Correspondence: *Kristen Wik, University of Minnesota, MMC Box 486, 420 Delaware St. SE, Minneapolis, MN 55455. E-mail: wik0002@umn.edu*

Executive Functions/Frontal Lobes

D.M. EASON, M. FRANZEN & V. SEKUNDA. The Influence Of Common Medical Illnesses On Executive Functioning And Treatment.

Objective: Information is limited regarding the role of common medical illnesses in the disruption of frontal circuitry. This study sought to address this dearth in the literature by examining the effects of pharmacotherapy on executive function in an outpatient sample.

Participants and Methods: Archival data from thirty-six adults with medical and psychiatric conditions were reviewed. This sample excluded those with conditions correlated with executive dysfunction (e.g., traumatic brain injury, cerebrovascular incidents, dementia, ADHD, and intellectual disability). Outpatients were identified based diagnoses with DSM-IV-TR and ICD-9 criteria and the number of medications prescribed to treat Axis III conditions at the time of intake.

Results: No significant differences were observed on most measures of executive functioning when the number of medications was the independent variable. A larger number of medications was associated with fewer perseverative errors and responses on a computer task of response-contingent feedback. Conversely, outpatients taking more medications demonstrated significantly weaker scores on a task of bilateral complex coordination utilizing goal-directed movements and planning.

Conclusions: Some weaknesses were observed among executive measures employing complex coordination; however, a majority of the data does not suggest a difference among outpatients treated for common medical illnesses and those with no Axis III diagnosis. Effectively treating common medical illnesses may mitigate executive dysfunction in this population. Other literature has demonstrated the negative impact of medical illness on executive impairment. Primary care physicians must be aware of executive dysfunction and its significant effect on functioning, including compliance with medication regimens and ability to perform general activities of daily living. Routine executive functioning screening should take place in the primary care setting to optimize patient care and improve functional outcome.

Correspondence: *Danielle M. Eason, M.A., Psychiatry, Allegheny General Hospital, 6707 1/2 McPherson Boulevard, Pittsburgh, PA 15208. E-mail: Danielle.Eason@gmail.com*

Cognitive Intervention/Rehabilitation

K. NASH, S. STEVENS, R. GREENBAUM, G. KOREN & J. ROVET. Self Regulation Therapy Alters Frontal-Striatal BOLD Response in Children with Fetal Alcohol Spectrum Disorders.

Objective: The chronic and severe executive functioning (EF) and self regulation deficits experienced by children with fetal alcohol spectrum disorders (FASD) are well documented. However, studies have not thoroughly examined treatment approaches aimed at improving EF and self regulation in this population. While one study has shown promising results following an EF and self regulation treatment program, this study did not measure the impact treatment may have on the developing brain. Therefore, we used a go-no/go fMRI paradigm as a neural marker of treatment outcome and used fMRI to differentiate treatment responders from non-responders.

Participants and Methods: Twenty-five children with an FASD participated in this study. Using a wait-list control design children received fMRI at baseline and upon completing therapy, or 12–14 weeks after baseline testing. Following treatment, children in the TXT group only were classified into treatment 'responders' and 'non-responders' based on parent questionnaire at follow-up, and fMRI results were compared between these two groups.

Results: Treatment effects reflecting greater BOLD response in the right prefrontal cortex and left caudate in the TXT, but not DTC group, were found. Treatment effects were also reflected in improved task performance in treated children only. When treatment responders were compared to non-responders, a pattern of increased BOLD response was found bilaterally in the PFC and left caudate.

Conclusions: Following treatment children with FASD recruited a pattern of neural activation similar to that documented in typically developing children. Furthermore, our finding that fMRI was able to classify treatment 'responders' from 'non-responders' suggests that fMRI may be an important predictor of treatment outcome, which has important implications for designing appropriate treatment plans for children with FASD.

Correspondence: *Kelly Nash, The Hospital for Sick Children, 555 University Ave, Toronto, ON M5G 1X5, Canada. E-mail: 2kellynash@gmail.com*

D. HOOFIEN. Comparisons of the Long Term Effects of Three Comprehensive Neuropsychological Rehabilitation Programs among Patients with Acquired Brain Injuries.

Objective: In a previous study (Hoofien et al., 2011) we reported the immediate post-treatment effects of three neuropsychological rehabilitation (NPR) programs: Comprehensive Interdisciplinary Day Center (CDC); Prevocational Rehabilitation (VR) and Standard Neuropsychological Treatment (SNT). Here we extend the report to include new follow-up data of the same patients, one year post conclusion of their rehabilitation program.

Participants and Methods: Ninety five patients participated in the study. CDC (24 patients) followed the common procedure of comprehensive NPR milieu programs. VR (28 patients) included intensive participation in prevocational workshops. SNT (43 patients) was delivered on an hourly basis (1-4 h/w). An extensive battery of interviews and questionnaires was used to measure the pre-post treatment and one-year post treatment effects (Repeated measures ANOVAs). The battery was delivered to the patients in a double-blind method and included measures of quality of life, mood, community integration, occupation, behavior and family burden.

Results: Participants in all three programs improved in rates of employment and work-stability. These gains were maintained at follow-up. A significant treatment by programs interaction effect revealed that CDC patients improved and maintained improvement in community integration. Improvement in quality of life has been also maintained by CDC and SNT patients but not so by VR patients, who, by and large, showed the least improvement in most measures.

Conclusions: In all of this study's measures post-treatment improvements in functioning have been either maintained or even further extended at follow-up. None of the measures manifested regression to baseline. CDC was found to be more efficient than VR and STN.

Correspondence: *Dan Hoofien, Ph.D, Psychology, Hebrew University of Jerusalem, Mount Scopus, Jerusalem 91905, Israel. E-mail: mshoofi@mscc.huji.ac.il*

Dementia (Alzheimers)

K. POLLARD, S. VICK, K. FUCHS & C. MANNING. Predicting Degree of Cognitive Decline In Older Adults Using An Index of Cognitive Reserve.

Objective: Cognitive reserve is hypothesized to be protective against cognitive decline and to potentially moderate the effects of pathology related to aging. Prior research suggests that higher education and pre-morbid IQ are associated with cognitive reserve. The purpose of this study is to examine whether cognitive reserve can predict degree of cognitive decline in older adults diagnosed with Mild Cognitive Impairment (MCI) or Alzheimer's disease (AD).

Participants and Methods: Participants (N=140) included 75 females and 65 males, of whom 131 were Caucasian and 9 were African American. 82 participants diagnosed with MCI and 58 with probable or possible AD. The average education was 15 years and the average age was 75. The Mattis Dementia Rating Scale-2 (DRS-2) total score was used to measure degree of cognitive decline. The American National Adult Reading Test (AMNART) was used to estimate participant IQ.

Results: Regression analysis revealed that cognitive reserve as measured by education and estimated IQ significantly predicted global cognitive decline accounting for 20% of the variance in cognitive impairment. Estimated IQ had greater predictability of cognitive impairment than education. In post-hoc analysis, diagnosis alone accounted for 37% of the variance in cognitive impairment.

Conclusions: These results suggest that a cognitive reserve index based on education and IQ, is related to the degree of cognitive decline in older adults. Although diagnosis accounted for a significant degree of impairment, education and estimated IQ significantly improved prediction of global cognition. This is consistent with the hypothesis that cognitive reserve serves as a protective factor.

Correspondence: *Karen Pollard, Psy.D., University of Virginia, 500 Ray. C. Hunt Dr., Charlottesville, VA 22908. E-mail: kdp6c@virginia.edu*

Invited Address: Fronto-Parietal Interactions in Working Memory: Monitoring versus Manipulation

Speaker: Michael Petrides

3:45–4:45 p.m.

M. PETRIDES. Fronto-Parietal Interactions in Working Memory: Monitoring versus Manipulation.

The mid-dorsolateral prefrontal cortex (areas 46 and 9/46) constitutes a distinct functional component of the prefrontal cortex. Examination of working memory after selective damage to the mid-dorsolateral prefrontal cortex in macaque monkeys and patients with excisions that include the mid-dorsolateral prefrontal cortex shows that the maintenance of information in memory per se is unaffected, but the capacity to track information in working memory (i.e. to monitor information) is severely impaired. Subsequent functional neuroimaging studies showed increased activity in the mid-dorsolateral prefrontal cortex whenever there are increased demands of monitoring and manipulation of information in working memory (e.g., Petrides, 2005, *Phil. Trans. R. Soc. B* 360, 781–795). Concomitant increase in activity within the mid-dorsolateral prefrontal cortex and the posterior parietal cortex is often observed in many functional neuroimaging studies of working memory. In event-related functional magnetic resonance imaging experiments, we were able to show that the cortex in the posterior parietal cortex is involved in the manipulation (operationally defined as the mental rearrangement) of information in working memory, whereas the mid-dorsolateral prefrontal cortex monitors the information that is being manipulated (e.g., Champod and Petrides, 2007, *PNAS*, 104, 14837–14842). Thus, the mid-dorsolateral prefrontal cortex is the critical region for the monitoring of information in working memory and interacts with the posterior parietal cortex during the manipulation of that information.

Correspondence: *Michael Petrides, Montreal Neurological Institute, McGill University, 3801 University Street, Montreal, QC H3A2B4, Canada. E-mail: michael.petrides@mcgill.ca*

Symposium 6: Binge Drinking and Neurocognition in Youth: Evidence from Cross-sectional and Prospective Neuroimaging Studies

Chair: Krista Medina

Discussant: Susan Tapert

3:45–5:15 p.m.

K.L. MEDINA, J. PRICE, T. MCQUEENY, S. SHOLLENBARGER & C. PADULA. Maximum Binge Drinking Dose Predicts Smaller Left Hippocampal Volumes in Male Emerging Adults.

Approximately 40% of emerging adults report recent binge drinking (Johnston et al., 2009). Adolescents with alcohol use disorders have

shown smaller hippocampal volumes compared to controls (Medina et al., 2007); however, few studies have examined the effects of binge drinking on hippocampal (HC) volumes in youth. This study examined left and right HC volumes in emerging adults with a wide range of binge drinking exposure.

Participants included thirty-five emerging adults (aged 18-25) who met criteria for binge drinkers ($n=17$; 9 female) or light drinkers ($n=18$; 7 female). Exclusions included history of a psychiatric or neurologic disorder other alcohol use disorders. MRI scans occurred after at least 7 days of abstinence from alcohol or drugs. Left and right HC volumes were hand-drawn (left ICC=.95; right ICC=.96) on high-resolution magnetic resonance images.

Groups were matched on age, ethnicity, gender, verbal IQ, reading ability, depressive symptoms, and education, although the bingers used marijuana significantly more often. Ordinary least square regressions were run to examine whether maximum drinks per binge, frequency of binges per month, and frequency of binge drinks in past year uniquely predicted HC volumes after controlling for gender, age, intracranial volume and past year marijuana use. Results indicated that gender interacted with maximum drinks per binge to predict left HC volumes ($t=2.10$, $p<.05$) in that males demonstrated a significant negative relationship between increased max binge drinks and smaller left HC volumes.

Consistent with animal literature a, more intense binge drinking was linked to smaller left hippocampal volumes in males, the majority of whom did not meet criteria for an alcohol use disorder. This study suggests a possible risk of negative consequences for emerging adults consuming high doses of alcohol. Longitudinal research is needed to see if HC volumes worsen with protracted drinking and recover with abstinence.

Correspondence: *Krista L. Medina, University of Wisconsin-Milwaukee, 2441 East Hartford Ave, Milwaukee, WI 53211. E-mail: krista.medina@gmail.com*

T. MCQUEENY, K. BOHACHE, Z. GRAHAM, A. REEDY & K.L. MEDINA. Abnormal Cortical Architecture in Binge Drinkers: Unique Gender Effects.

Peak binge-drinking rates are observed in young adults ages 18-25. Important neural developments are still underway during this period, especially in higher-order brain regions like the prefrontal cortex (PFC). Volume reductions and poorer white matter microstructure in the PFC are consistently linked to chronic alcohol use, but it is unknown whether heavy drinking is related to microstructural changes of cortical gray matter. To assess this, we examined the relationship between PFC cortical thickness and binge drinking. Participants were 46 binge drinkers (23 female, ages 18-25) who reported drinking 4+ (for females) or 5+ (males) standard alcoholic beverages in one sitting at least once in the past year. Freesurfer's surface-based processing stream computed cortical thickness across both cerebral hemispheres. After controlling for intracranial volume, nicotine and marijuana, multiple regression showed gender differences in the relationship between maximum drinks per binge and cortical thickness ($ps < .05$, corrected). Specifically, male binge drinkers exhibited cortical thinning while females showed thicker cortices with greater drinks per binge in bilateral posterior cingulate, right insula and left inferior frontal lobe. This provides preliminary evidence for altered cortical microstructure in association with heavy drinking during emerging adult years. These results are consistent with previous literature that document gross volumetric decrements as well as compromised white matter integrity. Prospective studies are needed to replicate these findings and to determine if altered cortical architecture stems from premorbid risks or alcohol-induced changes. Supported by NIDA R03 DA27457 to KLM.

Correspondence: *Tim McQueeny, University of Cincinnati, 6154 Edwards Building One, Cincinnati, OH 45221. E-mail: tmcqueeny@gmail.com*

J. JACOBUS, S. BAVA, R.E. THAYER & S.F. TAPERT. Longitudinal Changes in White Matter Integrity Among Adolescent Substance Users. Adolescent cannabis and alcohol users have shown aberrancies in white matter projection and association fiber tracts. Yet few prospective stud-

ies have investigated the influence of frequent substance use over time on adolescent neurodevelopment. The aims of this study were to identify longitudinal changes in fiber tract integrity associated with alcohol and marijuana use severity over the course of 1.5 years. Control teens ($n = 51$) and teens with extensive marijuana and alcohol use histories by mid adolescence ($n = 41$) received diffusion tensor imaging at baseline (ages 16-19) and a follow-up visit 1.5 years later. Substance users showed poorer white matter integrity than controls at follow-up in seven brain regions: (1) right superior longitudinal fasciculus, (2) left superior longitudinal fasciculus, (3) right posterior thalamic radiations, (4) right prefrontal thalamic fibers, (5) right superior temporal gyrus white matter, (6) right inferior longitudinal fasciculus, and (7) left posterior corona radiata ($ps < .01$). Alcohol use severity over the interscan interval and externalizing behaviors at each time point significantly predicted white matter integrity above and beyond age, months between sessions, and baseline white matter integrity ($ps < .05$). Findings are consistent with previous cross sectional investigations identifying white matter differences in adolescents with substance use histories. Alcohol use and engagement in a variety of risk taking behaviors may lead to, or identify teens at high risk for, structural brain changes during adolescent neurodevelopment that can have functional and clinical consequences in young adulthood.

Correspondence: *Joanna Jacobus, UCSD, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: jjacobus@ucsd.edu*

R.R. WETHERILL, L. SQUEGLIA & S.F. TAPERT. Neuroimaging of Inhibitory Processing Across Adolescence: Effects of Heavy Drinking.

Alcohol use is common during adolescence, which is concerning given the neuromaturational changes that occur during this time. Adolescent heavy has been associated with cognitive deficits; however, functional consequences of exposure to the neurotoxic effects of alcohol in the midst of neurodevelopment remain unknown. In the current study, longitudinal functional magnetic resonance imaging (fMRI) was used to prospectively examine blood oxygen level-dependent (BOLD) response during inhibition in substance-naïve youth ($N = 38$, ages 12-16) and to assess the impact of initiating heavy alcohol use during adolescence. Baseline neuroimaging, neuropsychological, and substance use data were collected from 38 substance-naïve youth, who were assessed again ~3 years later after 19 had transitioned into heavy drinking. Heavy drinkers were matched to non-using controls on baseline alcohol risk and developmental factors. Whole-brain analyses revealed a significant group x time interaction in a large cluster spanning the medial frontal cortex and anterior cingulate bilaterally ($3,159 \mu L$, $p=.004$; $\eta^2=.21$). Independent samples t-tests indicated that adolescents who transitioned into heavy drinking showed less BOLD response contrast during inhibitory control than controls at baseline ($p < .02$); however, heavy drinkers had greater activation to the task than controls at follow-up ($p < .01$). These findings may suggest that neural abnormalities in the medial frontal cortex are both a precursor to alcohol initiation and a consequence of heavy drinking. Given that the medial frontal cortex is a brain region subserving response conflict and inhibitory control, functional brain abnormalities in this region may heighten the risk for initiating heavy alcohol use and developing alcohol use disorder.

Correspondence: *Reagan R. Wetherill, UCSD, 3350 La Jolla Village Drive, San Diego, CA 92161. E-mail: rwetherill@gmail.com*

K.L. MEDINA & S.F. TAPERT. Binge Drinking and Neurocognition in Youth: Evidence from Cross-sectional and Prospective Neuroimaging Studies.

Symposium Description: Teens and emerging adults engage in alarming rates of binge drinking (4 alcohol drinks per occasion in females and 5 for males; Johnston et al., 2009; 2010). This drinking pattern has induced neuronal damage and long-lasting behavioral deficits in adolescent animals (see Spear, 2010). Despite this, there are relatively few human studies that examine the effects of binge or heavy drinking in otherwise healthy teens and young adults without psychiatric comorbidities.

This symposium comprises four cross-sectional and longitudinal studies that report the impact of binge and heavy episodic drinking on brain structure and function in youth. The first two presentations describe findings from structural magnetic resonance imaging (MRI) studies that examine how heavy binge drinking impacted hippocampal structure and prefrontal cortical architecture in healthy emerging adults. The final two talks describe findings from novel prospective studies that examined how the initiation of heavy drinking alters adolescent neurodevelopment. The first prospective study demonstrated changes in white matter fiber tract integrity after the initiation of alcohol and marijuana use during adolescence. The final presentation describes findings from a longitudinal functional MRI study that prospectively examined how BOLD response to an inhibitory processing task both predicted the initiation of heavy alcohol use and differentiated heavy drinkers from controls after a three-year follow-up period.

Results across the studies suggest that prefrontal cortex and limbic areas, brain regions underlying affective processing, memory and inhibitory control, appear to both increase risk for initiating alcohol use and are vulnerable to binge drinking associated structural and functional damage. Discussion following the symposium will include future directions and the impact of these findings on prevention and treatment campaigns.

Correspondence: *Krista L. Medina, Ph.D., University of Wisconsin-Milwaukee, 2441 East Hartford Ave, Milwaukee, WI 53211. E-mail: krista.medina@gmail.com*

Birch Lecture: Memory: Looking Back and Looking Forward

Speaker: Brenda Milner

5:15–6:15 p.m.

B. MILNER. Memory: Looking Back and Looking Forward.

In the early 1950's, the psychological study of a few neurosurgical patients (including H.M.), who all exhibited a profound anterograde amnesia following bilateral damage to the medial structures of the temporal lobes, revealed the importance of the hippocampal region for autobiographical memory. In the ensuing search for a learning task that H.M. could master, a breakthrough came with the demonstration of spared motor learning, thus providing early evidence for the existence of multiple memory systems in the brain.

In contrast to the effects of bilateral lesions, unilateral temporal lobectomy causes material-specific memory deficits, verbal from the left side and non-verbal from the right, but in the 1960's the unexpected finding of impaired delayed-recall of dually encodable material (drawings of objects) after either left or right anterior temporal lobectomy pointed to an important role for hemispheric interaction in memory processes. Support for this view comes also from patients tested after commissurotomy, and from functional-imaging in healthy subjects. The scope and nature of this interaction remain to be explored.

Correspondence: *Brenda Milner, Montreal Neurological Institute, Dorothy J. Killam Professor of Cognitive Neuroscience, Professor, Department of Neurology and Neurosurgery, McGill University, Montreal, QC H3A 2K6, Canada. E-mail: brenda.milner@mcgill.ca*

FRIDAY MORNING, FEBRUARY 17, 2012

Invited Address:

Social Cognition and the Frontal Lobes: Amazing What Patients Can Teach You if You Just Listen, Observe, Think and Measure

Speaker: Donald Stuss

9:00–10:00 a.m.

D.T. STUSS. Social Cognition and the Frontal Lobes: Amazing What Patients Can Teach You if You Just Listen, Observe, Think and Measure.

Following the theme of "Back to the Future", this presentation is a personal history of how studying patients – without the benefit of fMRI – provided landmarks on a journey in understanding personality changes, social behaviour, and levels of self- and other-awareness. Early lessons were learned from research and observation in patients who had undergone frontal lobotomies 25 years earlier. Discovery of a patient with an "atypical" psychiatric disorder labelled the Capgras Syndrome led to the hypothesis of a neurological base for this disorder. Continued review emphasized the multi-determinant nature of social behaviour, and led to the evolution of a hierarchical model of awareness.

The second phase of research also was focused in patients on the assumption that lesion research is foundational for determining the necessary relations between brain and behaviour. This phase can be characterized by two goals: refinement of the processes underlying social cognition; relating these processes more directly to distinct brain regions. This research was conducted in patients with focal frontal lesions, and in general can be seen as based on the early studies: reaction to humorous stimuli and social situations; theory of mind; and the understanding of risk-taking and impulsivity.

The learning objectives of this session are: 1) to identify several determinants underlying the expression of social behaviour, based on refinement of operational definitions of behavior; 2) to cite anatomic structures involved in different processes related to social cognition, and their interactions; and 3) to describe a hierarchical model of awareness, and the relationship of the model to different expressions of disturbed awareness, as well as to psychiatric disorders.

Correspondence: *Donald T. Stuss, Ph.D., Ontario Brain Institute, 101 College St., Box 21, Toronto, ON M5G 1L7, Canada. E-mail: dstuss@braininstitute.ca*

Paper Session 4: Cognitive Aging

Moderator: Adam M Brickman

9:00–10:30 a.m.

A. SOLDAN & M. SPEER. ERP correlates of cognitive reserve in healthy older adults.

Objective: Epidemiological studies have provided evidence for the concept of cognitive reserve (CR) to explain individual differences in the effects of brain damage on clinical outcome. Neuroimaging studies suggests that higher levels of CR are associated with brain networks that are more efficient and have a greater capacity for information processing. To our knowledge the relationship between CR and event-related potential (ERP) measures of neural activity has not been examined. However, the excellent temporal resolution of

ERPs is particularly well suited for examining neural efficiency and speed of information processing as a function of CR. The goal of this study was to see whether CR modulates ERPs associated with performance of a verbal recognition memory task in healthy older adults.

Participants and Methods: Twenty older adults participated in a delayed item recognition task for visually presented letters (set size 1, 4, or 7 letters). A composite score based on the NART, WAIS verbal sub-scale, years of education, and engagement in leisure activities was used as an index of CR.

Results: As expected, the behavioral results showed that as task demand increased, accuracy decreased whereas reaction time increased. The neural data showed that as subjects moved from the low to high demand condition during the probe presentation phase, the amplitude of the P3 over parietal scalp from 400 to 1000 ms decreased and the degree of this neural change correlated negatively with CR across subjects. Specifically, individuals with higher CR showed less change in neural activation as they moved from the low to high demand condition, providing evidence for neural efficiency. In addition, higher CR was associated with faster P3 onset latencies for the high load condition (set size 7), indicating faster neural processing.

Conclusions: This shows that greater CR reflects greater efficiency and faster processing while performing a challenging task, which may underlie reserve against pathological and age-related brain changes.

Correspondence: *Anja Soldan, Ph.D., Neurology, Johns Hopkins University, 600 N. Wolfe Street, Reed Hall, Rm. 2240, Baltimore, MD 21287. E-mail: asoldan@gmail.com*

P.E. MAY, J.L. WOODARD, S.M. JAZWINSKI, A. DAVEY, J. ARNOLD, L.S. MILLER, S. KIM & L.W. POON. Longevity Assurance Gene 1's (LASS1) Association with Cognitive and Physical Functioning, Functional Capacity, and Inflammation in Centenarians.

Objective: Longevity Assurance Gene 1 (LASS1) is a candidate longevity gene in humans. Frequencies of five LASS1 allelic combinations were examined in a population-based sample of centenarians and younger controls. We investigated the effect of these allelic combinations on cognitive and physical functioning, functional capacity, and inflammation in the centenarian sample. Simple effects of these combinations on outcome variables were tested in centenarian subgroups classified by sex and genetically-determined ethnicity (i.e., African and European Origin).

Participants and Methods: Participants were centenarians ($n = 244$) aged 98 years and older and younger controls ($n = 401$) aged 20-59 years old. Blood samples were collected to obtain genetic data from both age groups, and to collect inflammatory biomarker data from centenarians. Centenarian participants completed the Mini-Mental State Examination, Severe Impairment Battery, Fuld Object Memory Evaluation, Behavioral Dyscontrol Scale, Direct Assessment of Functional Status, and motor tests.

Results: There were no significant differences in frequencies of allelic combinations between young controls and centenarians. LASS1 allelic combination type had a significant main effect on global cognitive functioning, memory, IADLs, and physical strength in the centenarian sample. Stratification by sex revealed several allelic combination differences, principally for women. Stratification by ethnicity revealed no allelic combination differences. Allelic combination types associated with healthier functioning varied across outcome measures. However, CG/AG was reliably associated with lower cognitive, physical and functional performance.

Conclusions: The CG/AG allelic combination may have a deleterious effect on centenarian functioning. Results indicate that LASS1 may influence centenarian physical and cognitive functioning, at least for one allelic combination.

Correspondence: *Pamela E. May, M.A., Wayne State University, 5057 Woodward Ave., 7th Floor, Detroit, MI 48202. E-mail: pamela.e.may@gmail.com*

E.C. EDMONDS, S. HAN, D.A. FLEISCHMAN, K. ARFANAKIS, R.S. WILSON & D.A. BENNETT. Late Life Cognitive Activity is Associated with Greater Functional Connectivity of the Default Mode Network in Non-Demented Older Adults.

Objective: Previous studies have shown that engagement in mentally stimulating activity is associated with protection against cognitive decline in old age and a reduced risk of Alzheimer's disease. Other research using resting-state fMRI has shown that non-demented older adults demonstrate greater functional connectivity to the posterior cingulate cortex (PCC), a region of the Default Mode Network (DMN), in comparison to patients with Alzheimer's disease and mild cognitive impairment. We investigated whether non-demented older adults' participation in cognitively stimulating activities was related to resting-state functional connectivity to the PCC.

Participants and Methods: One hundred and fifty-one older adults without cognitive impairment (mean age=81.54; 75% female; mean MMSE=28.85) from the Rush Memory and Aging Project underwent resting-state fMRI and rated their current frequency of participation in mentally stimulating activities (e.g., reading books, playing games). Ratings were combined to yield a composite cognitive activity score. For functional connectivity analyses, a spherical seed region of interest was prescribed in the PCC.

Results: After controlling for age, gender, education, and total gray matter, voxel-wise comparisons ($p < 0.001$) revealed that more frequent cognitive activity was associated with greater functional connectivity between the PCC and several regions of the DMN, including the left and right hippocampus, and the orbital, middle, and inferior gyri of the frontal lobe.

Conclusions: Participation in cognitively stimulating activities in late life was associated with greater functional connectivity in specific regions of the DMN in a sample of non-demented older adults, including regions critical for episodic memory. Frequent mental stimulation may protect against cognitive decline in old age by maintaining or increasing functional connectivity in these pathways.

Correspondence: *Emily C. Edmonds, Ph.D., Behavioral Sciences, Rush University Medical Center, 1645 W. Jackson Blvd., Suite 400, Chicago, IL 60607. E-mail: emilycedmonds@gmail.com*

B. BETTCHER, C. WATSON, R. GREEN, J. MILLER, C. RACINE, R. WILHEIM, B.L. MILLER & J.H. KRAMER. Inflammation is Related to White Matter Integrity and Executive Functions in Healthy Older Adults.

Objective: Research suggests a central role for inflammatory mechanisms in cognitive decline that occurs prior to evidence of neurodegeneration. A proposed mechanism for inflammation-mediated cognitive change is altered vascular permeability and microvascular structure. We hypothesized that blood levels of C-reactive protein (CRP), an inflammatory marker, would be associated with worse executive functions (EF) and reduced volume and fractional anisotropy (FA) of the corpus callosum (CC).

Participants and Methods: We evaluated 62 normal older adults (mean age=70.7; CRP-) with undetectable CRP and 69 (mean age=71.44; CRP+) with detectable CRP. Participants were administered several measures of EF (Verbal/Visual Fluency; Stroop Inhibition; Trails) and a single score was generated using factor analysis. In addition, all participants underwent 3T MRI, and a subsection had diffusion tensor imaging available ($n=29$). CC volume was measured using FreeSurfer, and FA was calculated using tract-based spatial statistics.

Results: Age, intracranial volume, and vascular risk (i.e. history of hypertension, body mass index) were controlled for in general linear model analyses when appropriate. The CRP+group evidenced worse EF than the CRP-group, even after controlling for processing speed (marginal mean = -.14 vs. .21; $p=.01$). MRI analysis showed that the CRP+group had smaller CC volumes ($p=.03$) and reduced FA, specifically in the genu ($p=.01$) and splenium of the CC ($p=.02$).

Conclusions: Detectable levels of CRP were associated with worse executive functions, and smaller volume and reduced FA of the CC. Findings could not be attributed to processing speed or vascular risk factors, suggesting that inflammation is independently and deleteriously associated with cognitive aging.

Correspondence: *Brianne Bettcher, PhD, Neurology, Memory and Aging Center, University of California, San Francisco, 350 Parnassus Ave, Suite 905, San Francisco, CA 94143. E-mail: bbettcher@memory.ucsf.edu*

R. PAUL, T. CONTURO, D. LAIDLAW, E. LANE, J. HEAPS, R. CABEEN, J. MILES & L. BAKER. Quantitative Diffusion Tractography Reveals Reduced Frontal White Matter Fiber Lengths in Older Adults.

Objective: Previous studies have demonstrated reductions in frontal white matter volume associated with advanced age. Additionally, research has revealed reductions in microstructural integrity utilizing scalar metrics of diffusion tensor imaging (DTI). In the present study we examined novel metrics of white matter integrity associated with advanced age with quantitative diffusion tractography.

Participants and Methods: A total of 77 healthy adults were enrolled in a study of cognitive aging. Inclusion criteria included age at least 50 years of age and absence of neurological, psychiatric, or medical conditions that could impact cognitive status. Recruitment was stratified by age into three groups (50-59, 60-69, and 70+) with 29, 30 and 19 individuals in each group respectively. All individuals completed a 3T DTI acquisition following informed consent. White matter tracks were extracted from the tensor field and segmented into frontal, temporal, parietal and occipital lobes.

Results: Correlation analyses revealed significant relationships between age and white matter length in the frontal ($r = -.30$) and temporal ($r = -.32$) regions but not the parietal or occipital regions. Multivariate analyses revealed that the white matter fiber lengths were significantly reduced among the two older groups relative to the 50-59 age group in the frontal region only. No other regions differed significantly between the three groups.

Conclusions: The present study is the first to report in vivo reductions in white matter fiber length among nonclinical older adults. These results are consistent with postmortem studies reporting reductions in frontal white matter length associated with age. Findings from this study reveal for the first time that these age-associated effects in the frontal white matter fibers are evident among individuals 60 and over. Additional studies are needed to determine the relationships between these neuroimaging findings and both cognitive and functional status.

Correspondence: *Rob Paul, Ph.D., University of Missouri, St. Louis, 1 University Blvd, St. Louis, MO 63124. E-mail: paulro@umsl.edu*

**Poster Session 6:
Behavioral Neurology/Forensic
Neuropsychology/Adult and Child TBI**

9:15–10:45 a.m.

Behavioral Neurology

J.D. CLAUNCH, A. FALCHOOK, J.B. WILLIAMSON, I. FISCHLER, E.M. JONES, J.B. BAUM & K.M. HEILMAN. Remembered Spaces and Famous Faces Influence Vertical Line Bisections.

Objective: The ventral visual processing stream mediates facial and object recognition while the dorsal visual processing stream mediates recognition of spatial relations. The purpose of this study is to test the hypothesis that activation of the ventral stream will induce an upward bias and activation of the dorsal stream a downward bias.

Participants and Methods: Twelve healthy right handed individuals performed 92 vertical line bisections. During some trials there were pictures of famous faces or dots in different spatial locations above and below the line and participants were asked to recognize and remember the faces or locations of dots while they performed the bisections. In other trials they were not asked to attend to these visual stimuli.

Results: An upward bias was observed in all conditions. The upward bias was greatest for line bisections performed during the facial memory recognition task and line bisections with no surrounding visual stimuli. There was a lesser upward bias for bisections performed during the spatial memory recognition task and bisections performed while pictures of dots in boxes above and below the lines were present. The upward bias was least for the bisections performed with no instructions to attend to or remember the pictures of faces above and below the lines.

Conclusions: Activation of the ventral stream with facial recognition and memory produced an upward bias of greater magnitude than that produced by activation of the dorsal stream. When the visual stimuli were present but not explicitly attended to and remembered, these effects were not present.

Correspondence: *Joshua D. Claunch, Florida State University College of Medicine, 232 Lakeridge Dr, Panama city, FL 32405. E-mail: jdc10@med.fsu.edu*

J.D. CLAUNCH, A. FALCHOOK, J.B. WILLIAMSON, I. FISCHLER, E.M. JONES, J.B. BAUM & K.M. HEILMAN. The Highs and Lows of Attentional Disengagement during Vertical Line Bisection.

Objective: Vertical asymmetries in the spatial allocation of attention may relate to altitudinal organization of the visual attentional fields and/or the type of information processed by the ventral (facial and object recognition) and dorsal (spatial relations) visual streams (networks). The purpose of this study is to test the hypothesis that either cognitive or spatial attentional engagement and/or disengagement of the dorsal and ventral streams influences performance on vertical line bisections.

Participants and Methods: Twelve healthy right handed individuals each performed 94 vertical line bisections. Above and below some lines were famous faces or boxes with dots in different spatial locations. During some tasks, subjects were directed to name the face or spatial location of the dot above or below the line before performing the line bisection while on other trials they were not asked to attend to these visual stimuli.

Results: An upward bias was seen for line bisections performed in all conditions. Compared to regular vertical line bisections, bisections preceded by identification of faces or spatial locations of dots above the line were significantly higher, and bisections preceded by identification of either type of stimulus below the line were significantly lower. The magnitude of this effect was greater in the lower condition.

Conclusions: Temporary processing of facial identity or dot location before line bisection did not alter vertical attention bias. In contrast, subjects could not disengage their up-down spatially allocated attention before bisecting lines and this effect was greater for disengagement from the bottom of the line.

Correspondence: *Joshua D. Claunch, Florida State University College of Medicine, 232 Lakeridge Dr, Panama city, FL 32405. E-mail: jdc10@med.fsu.edu*

A.D. FALCHOOK, D.M. MOSQUERA, G.R. FINNEY, J.B. WILLIAMSON & K.M. HEILMAN. Conceptual Apraxia in Alzheimer Disease: Impaired Mechanical Knowledge with Preserved Tool Selection Associative Knowledge.

Objective: Conceptual apraxia (CA), a feature of Alzheimer disease (AD), can be assessed by asking participants to identify the correct tool to act on an object based on learned associations (a tool selection test) or mechanical properties of the tool and object (an alternative tool selection test). The purpose of this study was to determine if CA is present in patients with amnesic Mild Cognitive Impairment (aMCI) and if knowledge of taxonomical semantic relations (intrinsic properties common between items) correlates with performance on tests for conceptual apraxia.

Participants and Methods: We tested participants with AD (10), aMCI (12), and healthy older adults (18) for conceptual apraxia with an alternative tool selection test and a tool selection test, and with a test of taxonomical relations.

Results: The aMCI group did not differ from the control group on the CA tests. The AD group was impaired on all tests except the tool selection test. In the AD group, performance on the alternative tool selection test significantly correlated with performance on the taxonomical relations test.

Conclusions: We did not find CA to be present in aMCI. CA in AD may be associated with (but not necessarily caused by) loss of knowledge for other types of semantic relationships. Patients with AD may be able to select tools on the basis of previously learned associations without full understanding of the mechanical advantages the tools afford.

Correspondence: *Adam D. Falchook, MD, Neurology, University of Florida, UF Health Science Center, Box 100236, Gainesville, FL 32610-0236. E-mail: Adam.Falchook@neurology.ufl.edu*

E. KEIFER & M.W. HAUT. Motor Perseverations in Patients with Neurological or Psychiatric Disease.

Objective: Perseveration is associated with brain dysfunction in patients with neurological and psychiatric diseases, but it is unclear if the frequency and degree of perseveration differs in these populations.

Participants and Methods: We compared patients with neurological (n=54) and psychiatric (n=56) disease on two graphomotor tasks (loops and ramparts). Files from consecutive neuropsychological evaluations were retrospectively scored for the frequency of occurrence and number of perseverations. Inter-rater reliability for the scoring procedure was high ($r_s > .98$). Patients were assigned to a psychiatric or neurological group based on criteria.

Results: Neurological patients were significantly older than psychiatric patients. Controlling for age, there was no significant difference between the groups on the number of perseverative responses for both tasks [$F(1,107) = .16, p = .69$]. Frequency analysis revealed that significantly more patients in the neurological (51%) vs. the psychiatric (28%) group made at least one perseverative error on the loops [$X^2(1, N=111) = 5.79, p = .016$]. Older neurological patients had a higher frequency of perseveration occurrence compared to younger neurological patients [$X^2(1, N=55) = 15.320, p < .001$], suggesting that increased occurrence of perseverations in the neurological group is partially explained by older patients with dementia. Matching the psychiatric and neurological patients on age revealed no difference between groups in the number and occurrence of perseverations.

Conclusions: Overall, motor perseverations occur in both neurological and psychiatric patients. While motor perseverations were more frequently observed in older patients with neurological disease, this may be an effect of age and/or diagnosis. Future research should investigate the effect of age and diagnosis on motor perseverations in psychiatric and neurological patients.

Correspondence: *Ekaterina Keifer, PhD, Behavioral Medicine and Psychiatry, West Virginia University, 930 Chestnut Rudge Road, Morgantown, WV 26505. E-mail: ekeifer@hsc.wvu.edu*

D. LIEBERMANN, F. OSTENDORF, U.A. KOPP, A. KRAFT, G. BOHNER, N. KATHMANN & C.J. PLONER. Subjective Cognitive-Affective Status Following Thalamic Stroke.

Objective: Thalamic stroke is associated with neurological and cognitive deficits which are related to damage of distinct thalamic nuclei. However, in the postacute phase, many patients with selective thalamic stroke show only minor pathological findings during clinical examination. Since it is currently unclear whether and how thalamic stroke yields persistent subjective impairments, our objective was to assess subjective cognitive and emotional consequences of focal thalamic stroke.

Participants and Methods: Sixty-eight patients were examined by using established clinical questionnaires assessing memory, attention, executive functions, emotional status and health-related quality of life. To differentiate effects of thalamic damage from unspecific factors related to cerebrovascular disease, performance was compared to an age-matched group of 34 patients with a history of transient ischemic attack. Thalamic lesions were co-registered to an atlas of the human thalamus and grouped according to major vascular thalamic territories. Established methods were used for lesion overlap/ subtraction analyses.

Results: When both patient groups were compared, no significant differences were found for either questionnaire, suggesting subjective cognitive-affective status following thalamic stroke may be mainly determined by vascular risk factors and the experience of a cerebrovascular event per se. However, when subgroups were compared, patients with infarctions involving the pulvinar showed elevated anxiety levels compared to patients with lesions sparing the posterior thalamus.

Conclusions: We suggest that affective deficits with posterior thalamic lesions reflect damage to connections with regions involved in affective processing such as amygdala and other limbic areas. Affective disturbances must be taken into account during rehabilitation and health care of patients with thalamic stroke.

Correspondence: *Daniela Liebermann, MSc, Dept. of Neurology, Charité - Universitätsmedizin Berlin, Charitéplatz 1, Berlin 10117, Germany. E-mail: daniela.liebermann@charite.de*

M. ODAGIRI, K. UEDA, T. MURAI, Y. OHIGASHI & S. FUNAHASHI. The Visual Search Strategy Associated with Action Organization/Disorganization: Are There Any Particular Fixation Patterns Attributable to Errors in General?

Objective: We reported significant correlations between error types of naturalistic actions and fixation patterns at the 2010 INS Mid-Year Meeting. Here, the results of further investigations are shown regarding the relationship between fixation patterns and the mechanisms of sequential actions.

Participants and Methods: The subject was a 68-year-old, right-handed man with spinocerebellar degeneration. While showing mild ataxia of the extremities, he could perform pointing, smooth pursuit, and saccade. He completed standard neuropsychological examinations and praxis tests. During sequential actions, look-ahead (LAF, Pelz and Canosa, 2001) and next fixations, which would help future and next actions, respectively, were recorded. Action errors were classified in reference to proposal in previous report by Schwartz et al. (1995).

Results: There were double dissociations between the results of sequential actions and those of tests in which the subject was requested to put pictures/scripts of actions in the correct order. The number of LAF of the patient was smaller than that of controls, and showed no correlation with error numbers. In the controls, LAF was positively correlated with the proportion of action units characterized by spatial change. The number of the patient's next fixations was significantly smaller than that of controls, and negatively correlated with that of errors in general.

Conclusions: LAF was thought to prompt spatial organization. While the patient did not utilize LAF sufficiently, the number of LAF was not correlated with the error number. The total number of errors was associated with the reduction of next fixations, whereas the error characteristics were possibly attributable to LAF or other factors.

Correspondence: *Masashi Odagiri, master degree, Faculty of Health Care Science, Himeji Dokkyo University, 7-2-1 kamiohno, Himeji 670-8524, Japan. E-mail: odagiri@himeji-du.ac.jp*

S.M. SHIPLEY, B.M. KLUGER & C.M. FILLEY. Accuracy of Community Acquired P.E.T. Scans in the Diagnosis of Dementia.

Objective: Fluoro-deoxy-glucose positron emission tomography (PET) scanning was approved by the US FDA for diagnostic evaluation of dementia in September 2004. However, no studies have evaluated the utility of community-acquired PET scans for dementia. Our objective was to determine diagnostic accuracy of community-acquired PET scans for dementia diagnosis.

Participants and Methods: We reviewed records of all patients seen in the University of Colorado Hospital Neurobehavior Clinic between September 2004 and September 2010 to identify those who had PET scans as part of their diagnostic evaluation. We compared the accuracy of radiologist PET readings to our consensus clinical diagnosis.

Results: We identified forty-six of 1580 patients with PET scans; mean age 63 years. Twenty-five (54.4%) were misdiagnosed based upon their

PET report. The most common misdiagnosis based upon PET was Alzheimer's disease (68%). Thirteen patients (52%) had another form of dementia and twelve patients (48%) had either no clinical or neuropsychological evidence of dementia or a reversible etiology. This included four patients with a psychiatric cause of cognitive impairment and two who were normal.

Conclusions: Community-acquired PET scans have a significantly lower diagnostic value than reported in prior research studies. Moreover, PET scans carry the major risk of patients being misdiagnosed with an incurable neurodegenerative disease. While we recognize the potential for selection bias in our sample, we recommend further prospective studies of PET in community settings and caution clinicians to carefully consider the potential risks and benefits of PET scans in dementia diagnosis.

Correspondence: *Sheena M. Shipley, B.S. Psychology, Neurology and Psychiatry, University of Colorado Hospital, 4500 S. Monaco St., 536, Denver, CO 80237. E-mail: SShipley.S5@aol.com*

L.M. SILVA, J. LOWE, S.P. VERNEY & R.A. YEO. The Relationship Between Verbal IQ and the Anterior Vermis in Children Born Very Low Birth Weight/Preterm.

Objective: Children born very low birth weight (VLBW; <1800 grams) and/or preterm (<33 weeks gestation) frequently have cerebellar hypoplasia, and a constellation of cognitive deficits. The cerebellum, now shown to be involved in many non-motor functions, has a protracted maturation process similar to the frontal lobes, and new evidence suggests the cerebellum may be more vulnerable to environmental factors than subject to genetics. However, relationships between specific cerebellar structures and cognitive functions have not been extensively investigated.

Participants and Methods: We investigated anterior vermis volume differences in a sample of 20 participants (VLBW $n=12$) between 3 and 4 years old (mean = 42.8 months). Volumetric data collected using a Siemens 3T Trio TIM scanner showed no group difference in anterior vermis volume (means: VLBW = 1866.17 mm³, control = 2360.25 mm³; $t = 1.4$, ns). Verbal IQ (VIQ) scores on the Wechsler Preschool and Primary Scale of Intelligence, 3rd edition, were significantly different between groups (VIQ means: VLBW = 91, controls = 109; $t = 3.3$, $p = 0.004$).

Results: Anterior vermis volume was significantly correlated with VIQ in the total sample ($r = 0.6$, $p = 0.006$). This correlation remained significant in the VLBW group ($r = 0.64$, $p = 0.03$), even when controlling for number of days on ventilation, but did not remain significant in the control group ($r = 0.27$, ns).

Conclusions: The possibility of a differential relationship between anterior vermis volume and language ability in VLBW children may have implications for development of interventions, particularly given environmental vulnerability and the protracted cerebellar maturation process.

Correspondence: *Lynette M. Silva, M.S., Psychology, University of New Mexico, 525 W. Arlington Pl., #346, Chicago, IL 60614. E-mail: lmsilva@unm.edu*

Forensic Neuropsychology

D.M. CROSSMAN. Psychopathic Personality and Attention: A College Sample.

Objective: The relation between psychopathy and attention has been extensively studied. Some studies suggest superior performance on attention tasks, while others suggest diminished attention capacity in people with psychopathy. Most of this research has been conducted on incarcerated populations, hence little is known about the relation between attention and psychopathy in other populations. We aimed to determine if diminished divided attention can be identified among relatively high scorers on the PPI-R in an undergraduate population.

Participants and Methods: Participants were 109 undergraduate students at an upstate NY University. They were administered the Psychopathic Personality Inventory-Revised (PPI-R; Lilienfeld and Wid-

ows, 2005) and the Paced Auditory Serial Addition Task, as a measure of divided attention (PASAT; Gronwall, 1977). Pearson correlations were conducted to determine the relation between score on PPI-R, its three factors (Self-Centered Impulsivity, Fearless Dominance, and Coldheartedness) and score on the PASAT.

Results: In both men and women, as score on the Coldheartedness factor increased, PASAT total correct decreased, suggesting diminished divided attention ($r(29) = -.36$, $p=.03$; $r(72) = -.20$, $p=.04$, respectively).

Conclusions: In both sexes, as score on Coldheartedness increased, performance on the divided attention task decreased, suggesting those high on Coldheartedness have difficulty attending to peripheral stimuli. This may contribute to the insensitive interpersonal style exhibited by people with psychopathy such that they have difficulty dividing their attention between their goal-oriented tasks and the needs and feelings of others, especially if others feelings are incongruent with the psychopath's goals.

Correspondence: *Donna M. Crossman, M.S., Psychology, SUNY Binghamton, 21 Chestnut Street, 2nd Floor, Binghamton, NY 13905. E-mail: dcrossm1@binghamton.edu*

T.J. FARRER, R. FROST & D.W. HEDGES. Traumatic Brain Injury Among Juvenile Offenders: A Meta-Analysis.

Objective: Previous research suggests that traumatic brain injury (TBI) is common among incarcerated individuals and that TBI can lead to violent and aggressive behavior. However, few studies have examined the prevalence and odds of TBI among juvenile offenders. The present meta-analysis sought to establish the overall prevalence of TBI among juvenile offenders and to measure odds ratios for TBI among juvenile offenders compared to control groups.

Participants and Methods: Multiple data bases were searched to identify articles related to TBI and juvenile offense. Across identified studies, we extracted prevalence rates of TBI among juvenile offenders and, when available, control groups. A weighted grand average was calculated to determine the overall frequency of TBI across all source studies. Next, an odds ratios for number of cases and non-cases of TBI among juvenile offenders compared to controls was calculated.

Results: Nine studies comprising 1524 juvenile offenders met inclusion criteria for this analysis. The majority of the offenders were male (86.7%) and the mean age at assessment was 15.7 years. The weighted average prevalence of TBI among juvenile offenders was 30.6-percent. Five studies included control groups for odds ratio calculation. The pooled odds ratio for TBI among juvenile offenders compared to controls was 3.38 (95-percent confidence interval, 1.52 to 7.54, $p = 0.003$).

Conclusions: Findings suggest that TBI is a common condition among juvenile offenders and that TBIs are 3.38 times more likely among juvenile offenders than controls. These data support the idea that TBI may be influential in the etiology of juvenile offense.

Correspondence: *Thomas J. Farrer, M.S., Psychology, Brigham Young University, 1001 Kimball Tower, P.O. Box 25543, Provo, UT 84602-5543. E-mail: thomasfarrer@yahoo.com*

R. FROST, T.J. FARRER & D.W. HEDGES. Intimate Partner Violence and Traumatic Brain Injury: A Meta-Analysis.

Objective: Traumatic brain injury (TBI) is often associated with long-term disturbances in behavior and emotional control and has been linked to both physical and emotional aggression. Intimate-partner violence (IPV) is a considerable social problem with millions of cases each year. The association between TBI and aggressive behavior suggests that TBI may be associated with IPV. The aim of this study is to analyze the literature on TBI and IPV in order to assess the relationship between the two.

Participants and Methods: Multiple data bases were searched to identify articles related to TBI and IPV. Prevalence rates of TBI among perpetrators of IPV were extracted from identified studies. TBI prevalence

in the general population was estimated at 10, 20, 25, and 38.5 percent. A pooled weighted mean frequency was calculated; subsequently, a single-sample test of proportions was used to assess the differences between the prevalence of TBI in IPV perpetrators and the estimated prevalences of TBI in the general population.

Results: Six studies containing a total of 222 subjects met inclusion criteria. The weighted mean age across all samples was 32.6 years; all of the subjects were male. Fifty-three percent (119) of the IPV perpetrators had a history of TBI, a prevalence significantly higher ($p < .0001$) than all estimates of TBI in the general population.

Conclusions: The prevalence of TBI is significantly higher in the IPV population than the general population. Given the known association between TBI and aggressive behavior, it is reasonable to assume that TBI may play a role in the perpetration of IPV.

Correspondence: *R Brock Frost, Psychology, Brigham Young University, 120 Wymount Terrace, Provo, UT 84603. E-mail: brock.frost@gmail.com*

D.D. HARGRAVE, R.W. SCHROEDER, R.J. HEINRICH & L.E. BAADE. Examination of Decreasing Scores from TOMM Trial 2 to the Retention Trial as an Indicator of Negative Response Bias.

Objective: Poor performances on recognition memory tests are commonly used as an indication of negative response bias, particularly in mildly impaired patients. A test specifically developed for use in this manner is the Test of Memory Malingering (TOMM). Many studies have evaluated the utility of the three TOMM trials. However, none have investigated the potential utility of discrepancies between trials. The present study examined whether a decrease in performance from Trial 2 to the Retention Trial is a useful indicator of negative response bias in a sample of mild traumatic brain injury (mTBI) litigants.

Participants and Methods: Data were collected from mTBI litigants referred to an academic medical center for a forensic neuropsychological evaluation. Litigants were classified as either probable malingerers ($n = 20$) or non-malingers ($n = 24$) using Slick et al. criteria (1999). Groups were not significantly different in gender, age, or years of education.

Results: A decrease of one point or greater from TOMM Trial 2 to the Retention Trial resulted in 96% specificity and 50% sensitivity. This held true even for scores that were above the recommended cutoff score of 45 (e.g. Trial 2 = 50, Retention = 49).

Conclusions: Findings indicate that any decrement in performance from Trial 2 to the Retention Trial is suggestive of negative response bias in mTBI litigants. Future research should seek to replicate these findings with a larger sample.

Correspondence: *David D. Hargrave, M.A., Psychiatry and Behavioral Sciences, University of Kansas School of Medicine, 7829 E. Rockhill, Ste. 105, Wichita, KS 67206. E-mail: dhargrave@kumc.edu*

K.C. BORJA & F. OSTROSKY. Early Trauma and Adult Psychopathy.

Objective: To assess the frequency of different types of traumatic events and its relationship with the level of psychopathy present in a Mexican adult inmate population. Also, to elucidate whether a specific type of abuse can predict the level of psychopathy observed.

Participants and Methods: 194 inmates in a high security male-only prison in Mexico City convicted for both major and minor offenses were assessed. File reviewing and extensive semi-structured clinical interviews were carried to evaluate the inmates' criminal career. The Early Trauma Inventory was applied to assess the frequency and diversity of events experienced before the participants were 18 years of age.

Results: An association was found between the experience of traumatic events and the level of psychopathy of male inmates. Inmates with high psychopathy had experienced more emotional and sexual abuse than those with low psychopathy, and more stressful events than those with low and medium psychopathy. The rates of physical abuse were significantly higher in inmates with medium and high psychopathy when compared to the low psychopathy group.

Conclusions: Negative psychosocial conditions, specifically stressful events, physical, emotional and sexual abuse have a relationship with psychopathy present in adult males that have engaged in criminal activities, some of them committing extremely violent acts.

Correspondence: *Karina C. Borja, Bachelor, Neuropsychology and Psychophysiology, UNAM, 3004 Universidad Av., D-11, 2nd floor, Col. Copilco-Universidad, Mexico 04510, Mexico. E-mail: borja83@yahoo.com*

S. SULLIVAN & P.J. DONOVICK. Imprisoned Abilities: A Comparison of the Cognitive Abilities of Prisoners and Non Prisoners.

Objective: The relation between general intelligence and speed of processing has been widely researched. However, there is limited data regarding the relation among simple motor speed, complex information processing, and intellectual ability, especially in incarcerated populations. The purpose of this study was to examine the relation between simple psychomotor speed and intelligence, as well as complex processing speed and intelligence, in incarcerated and non-incarcerated males.

Participants and Methods: Data were obtained from a large archival data set. Participants were referred for neuropsychological assessment at either mental health units in prisons ($N=178$) or at a private practice or a community hospital ($N=36$) in upstate New York. Selected cases were included if they contained data for the Purdue Pegboard, a category fluency test – Animals version, and IQ from either a Wechsler Adult Intelligence Scale – III or a Kaufman Brief Intelligence Test.

Results: As found in prior research from this laboratory, prisoners completed fewer years of education than civilians, with an average of 10 and 13 years respectively. Additionally, prisoners had lower non-verbal ($M=77.6$, $SD=15.3$) and verbal IQ scores ($M=77.3$, $SD=14.5$) than civilians' nonverbal ($M=96.1$, $SD=17.9$) and verbal ($M=96.7$, $SD=16.8$) IQ scores. Furthermore, prisoners had lower full scale IQ scores than civilians, with averages of 76 and 96 respectively. Group differences were also found on a complex processing task and a simple motor speed test. Regardless of differences in IQ, simple motor speed and complex processing were moderately correlated with intelligence in both groups.

Conclusions: These results suggest that simple psychomotor speed and complex processing speed are important components of general intellectual ability and that the pattern of relation among these abilities is consistent despite level of education. This study also provides further evidence that prisoners commonly have a lower education level and lower general intellectual ability than civilians.

Correspondence: *Sara Sullivan, Binghamton University, 14 Seminary Ave, Apt 1, Binghamton, NY 13905. E-mail: ssullivan3@binghamton.edu*

TBI (Adult)

V. ARMSTRONG, H. HANNAY, L. PAPA & S.C. HEATON. Outcome Prediction Following Severe Traumatic Brain Injury: Comparison of the Disability Rating Scale (DRS) and Glasgow Outcome Scales (GOSS and GOSE).

Objective: To assess the relative relationship of demographic and injury severity predictor variables to three widely used global outcome measures six-months following severe traumatic brain injury (TBI).

Participants and Methods: Demographic and acute care data was collected from a multicultural sample of 91 patients with severe TBI ($GCS \leq 8$) admitted to two Level 1 trauma hospitals located in Texas and Florida. Patient age, education, best day 1 GCS motor score, best day 1 pupil reactivity, and first post-injury Marshall CT scan classification were chosen as predictor variables in long-term outcome models that utilized six month post-injury patient ratings on the Glasgow Outcome Scale-Structured version (GOSS), the Glasgow Outcome Scale-Extended version (GOSE), and the Disability Rating Scale (DRS). Relationships were examined utilizing multinomial regression and/or hierarchical multiple regression.

Results: Acute care and demographic variables significantly improved each model's overall ability to predict six-month post-injury outcome

($p < .01$). However, only best day 1 GCS motor score and patient age consistently emerged as significant independent predictors, with these variables explaining the largest proportion of outcome variability when the DRS served as the primary endpoint, $R^2 = .19$ and $R^2 = .08$ for best day 1 GCS motor score and patient age, respectively.

Conclusions: The DRS demonstrated a stronger association with clinical predictor variables than either the GOSS or the GOSE. Development of a structured interview may serve to facilitate its use in a variety of settings.

Correspondence: *Victoria Armstrong, Ph.D., Psychology, Louis Stokes VAMC, 10701 East Blvd., Cleveland, OH 44106. E-mail: Victoria.Armstrong3@va.gov*

M. CAREY, T.F. BERGQUIST, J. MICKLEWRIGHT & A. BROWN. Mayo Classification System for Traumatic Brain Injury in persons presenting for post-acute rehabilitation.

Objective: One of the challenges to describing clinical samples treated for long-term symptoms after TBI is the inability to definitively quantify injury severity using available classification systems. The Mayo Classification System (MCS) classifies traumatic brain injury severity based upon available indicators and can be utilized 1) retrospectively, and 2) when medical record data is limited. The MCS was retrospectively used to examine the proportion of participants with definite vs. probable vs. possible brain injuries who presented to a comprehensive day treatment (CDT) rehabilitation program.

Participants and Methods: Adults with TBI who presented to the Mayo Clinic CDT program between 1988-2010 were included. Acute hospital care was often received elsewhere and in many cases only limited medical records were available for review. Of the 187 persons who completed this program, 110 had TBI as primary diagnosis. Participants were 18-69 years of age, had 8 to 20 years of education, and were 77% male.

Results: Ninety-five percent of our sample was retrospectively classified using the MCS. Consistent with expectation, the majority of participants (92%) were classified as having definite brain injury, 6% had a probable and 2% had a possible injury.

Conclusions: Results demonstrated that the MCS is an effective tool for describing and quantifying injury severity in persons with TBI presenting for treatment, often years after their original injury and with limited outside medical records.

Correspondence: *Thomas F. Bergquist, Ph.D., SMH - 3MB, Mayo Clinic, 200 First St. SW, Rochester, MN 55905. E-mail: bergquist.thomas@mayo.edu*

W.L. RIEMAN, G.M. BERRIOS-SIERVO & A.C. MAERLENDER. The Effects of Moderate Exercise on Recovery from Concussion: A Preliminary Study.

Objective: To determine if daily moderate exercise delays recovery time in concussed college athletes.

Participants and Methods: Concussed college athletes were consented and randomly assigned to a rest or exercise condition. Data collected included daily physical and cognitive symptoms, substance use, and perceived mental exertion. Continuous physical activity was obtained via a watch-like monitor worn by each participant for the duration of the study. The exercise condition included 20 minutes of daily moderate stationary bicycle riding and subsequent ratings of perceived physical exertion. ImPACT was used to evaluate cognitive abilities following injury and to determine recovery. Participants were considered recovered once physical and cognitive status returned to baseline.

Results: There were five participants in each group (7 females, 3 males) from diverse ethnic backgrounds. Days to recovery were 14.8 for the rest group and 19.8 for the exercise group. No significant difference was found between the groups for mean recovery time ($p = 0.673$). Physical exertion data were collected across groups for percent of sedentary ($M = 64.04$), light ($M = 25.81$), moderate ($M = 9.17$), and vigorous ($M = 0.11$) physical activity. Average maximum level of mental exertion was reported at a moderate level ($M = 4.71$). Twenty percent reported binge drinking within five days prior to injury.

Conclusions: Physical activity was successfully monitored using non-invasive methods. This is the first known concussion study to quantify mental exertion, which may also play a role in recovery time. Thus far, moderate physical exercise does not delay recovery time in concussed athletes, supporting the overall hypothesis. Further data regarding substance abuse increases our understanding of its impact on concussion recovery.

Correspondence: *Gretchen M. Berrios-Siervo, Psy.D., Dartmouth Medical School, 1 Medical Center Drive, Lebanon, NH 03756. E-mail: gretchen.m.berrios-siervo@hitchcock.org*

F. BINEY & H.J. HANNAY. The Relationship Between Blood Alcohol Level and Global Outcome of Individuals With Severe Traumatic Brain Injury.

Objective: The current study examined the relationship between blood alcohol level (BAL) and functional outcome as measured by the Disability Rating Scale (DRS) in the first six months after traumatic brain injury (TBI) when injury severity and demographic factors are controlled. The study also examined the relationship between BAL and mortality at one month post injury.

Participants and Methods: Three hundred and ninety three closed head injury (CHI) patients consecutively admitted to a Level 1 trauma center with recorded admission BALs were evaluated at 1, 3 and 6 months post injury to determine functional outcome. Hierarchical linear and logistic regression analyses were conducted to test differences in functional outcome and mortality between a low BAL and high BAL group.

Results: BAL and DRS scores were not associated significantly at 1, 3 or 6 months post injury when severity of injury, demographic and other predictors were included in the prediction model. Injury severity as measured by the Best Day 1 GCS and age were associated with higher scores on the DRS (indicating greater disability) at 1, 3 and 6 months post injury. BAL was not associated significantly with mortality at one month post injury when similar predictors were controlled. However, when ethnicity was removed from the model, moderate BALs were associated with decreased mortality.

Conclusions: In this study, BAL was not associated with functional outcome in the first six months after traumatic brain injury when injury severity and age are controlled. BAL was not related to mortality when ethnicity was controlled. These findings have implications for appropriate demographic control when assessing the relationship between BAL and outcome in TBI samples.

Correspondence: *Fedora Biney, M.S., The University of Houston, 126 Heyne Building, The University of Houston, Houston, TX 77204. E-mail: febiney@aol.com*

M. BLAHNIK, K. MCGUIRE, J. GONZALEZ & M. ARMSTRONG. Blast vs. Non-Blast mTBI: Comorbid Problems in OEF/OIF Veterans and Service Members Screened and Treated at the Minneapolis VA Health Care System.

Objective: Overlapping mTBI and mental health conditions in individuals returning from combat in Iraq and Afghanistan have been well-documented (RAND, 2008). Hoge et al. (2008) detailed the relationship between mental health problems, physical health complaints, and mTBI secondary to blast, as well as other mechanisms of injury (e.g., fall, vehicle accident). The current study investigated whether there is greater incidence of mental health and pain conditions in OEF/OIF individuals who sustained mTBI due to blast versus other mechanisms of injury during deployment.

Participants and Methods: Data was collected via retrospective chart review of OEF/OIF combat Veterans and service members who were screened for probable TBI in 2008 and 2009 and referred to the Polytrauma Rehabilitation Center for outpatient evaluation and treatment. Analyses included independent samples t-tests to compare individuals who sustained mTBI secondary to blast and those who sustained mTBI secondary to other etiologies during OEF/OIF deployment. Variables of interest included demographic information, presence of comorbid mental health and pain conditions, and whether the individual sought mental health treatment post-deployment.

Results: Individuals who sustained mTBI due to blast were more likely to experience PTSD ($p < 0.05$) and seek mental health treatment post-deployment ($p < 0.05$) than those who sustained mTBI secondary to other etiologies. No significant differences were seen in problems with pain, alcohol or drug problems, depression, anxiety, or other psychiatric disorders.

Conclusions: Individuals who sustain mTBI due to blast during OEF/OIF deployment are more likely to develop PTSD and seek mental health treatment. Implications for screening and transdisciplinary treatment are discussed.

Correspondence: *Melanie Blahnik, Psy.D., Minneapolis VA Medical Center, One Veteran's Drive, 4K-TBI, Minneapolis, MN 55418. E-mail: melanieblahnik@msn.com*

C.C. BOSWORTH, K. KRISHNAN, T. PRICE, A.P. LAFOND, J. GATSON & C.D. MARQUEZ DE LA PLATA. Interhemispheric Hippocampal Connectivity Among Boxers.

Objective: Repeated concussions are known to lead to serious neurologic consequences including chronic traumatic encephalopathy. Boxers receive concussive and sub-concussive blows during a fight, and are therefore at increased risk for Dementia Pugilistica (DP), a condition characterized by cognitive, motor, and behavioral impairments. One potential underlying mechanism of DP may be Traumatic Axonal Injury (TAI), which is known to affect the interhemispheric connectivity (IHC) of bilateral brain structures such as the hippocampus. We examined whether hippocampal IHC was compromised among a sample of boxers, and whether their IHC changed after receiving a boxing-related concussion.

Participants and Methods: Resting state fMRI data were acquired from 5 boxers and 9 healthy controls, using 3T fMRI scanners. Each boxer was scanned twice: once at baseline, and again within 7 days of injury. The hippocampi were divided into head, body, and tail regions for analysis.

Results: An Independent sample t-test showed boxers displayed increased IHC in the body of the hippocampus at baseline, compared to controls. Post-injury, boxers had decreased IHC in the head of the hippocampus and increased IHC in the body and tail compared to controls.

Conclusions: Boxers appear to have altered IHC connectivity, as their anterior hippocampal connectivity shows compromise. This alteration is more marked among recently concussed boxers, as they demonstrate decreased anterior hippocampal IHC as well as increased posterior IHC. This shift from anterior to posterior connectivity may be demonstrating plasticity, as the brain is attempting to maintain homeostasis, but uses less efficient pathways due to axonal injury.

Correspondence: *Christopher Bosworth, B.S., University of Texas Southwestern Medical Center at Dallas, 5323 Harry Hines Blvd, Dallas, TX 75390. E-mail: christopher.bosworth@utsu.edu*

C. BOTTARI, N. GOSSELIN, J. CHEN & A. PTITO. The Benefit Of Triangulating fMRI, ERP And Measures Of Complex Everyday Activities To Better Understand Mild Traumatic Brain Injury.

Objective: Even at one year post-injury, a significant number of individuals with mild traumatic brain injury (mTBI) continue to experience symptoms that interfere with complex everyday activities. However, no study has combined modern investigative techniques such as functional magnetic resonance imaging (fMRI), event-related potentials (ERP), and measures of activities of daily living (ADL) to investigate the relation between brain functioning and independence in ADL after mTBI. The objective of the study was to describe the cognitive, cerebral and everyday functioning of 3 persons with persistent symptoms post mTBI.

Participants and Methods: Three subjects with mTBI were tested using novel investigative techniques: fMRI and ERP, during a working memory task, IADL Profile (direct observation) and ADL Profile (interview).

Results: Three subjects at an average of 15 weeks post-injury reported decreased independence in complex everyday activities secondary to physical, cognitive and/or psychological symptoms. Direct observation

using a standardized measure of everyday activities showed that the 3 participants scored below healthy controls on the budgeting task. In addition, changes in the BOLD signal as well as in the electrical activity of the brain were observed. In the presence of normal performances but slower reaction times on the working memory tasks, all 3 subjects showed reduced activations in the mid-dorsolateral prefrontal cortex with fMRI and in two of them abnormal P300 component of the ERP was also observed.

Conclusions: These results suggest that reduced independence in complex everyday activities secondary to mTBI correlates with reductions in brain activation in the prefrontal cortex, abnormal ERP or slower reaction times on working memory tasks. Hence, utilization of these diverse yet complementary investigative techniques can contribute to a more objective understanding of the functional impact of mTBI on complex everyday activities and offer an opportunity for more targeted interventions.

Correspondence: *Carolina Bottari, PhD, Ecole de Readaptation, Faculté de Médecine, Université de Montréal, 7077 ave du Parc, office 405-35, C.P. 6128 succursale centre-ville, Montréal, QC H3C3J7, Canada. E-mail: carolina.bottari@umontreal.ca*

C. BOTTARI, H. SI CHAIB, N. GOSSELIN & A. PTITO. Fatigue Secondary To a Mild Traumatic Brain Injury And Its Impact On Complex Activities Of Daily Living.

Objective: Few studies have investigated the impact of fatigue on independence in complex activities of daily living (ADL) in persons with mild traumatic brain injury (mTBI). The principle goal of the present study was to determine if the fatigue experienced by persons with mTBI was associated with decreased ADL independence. Also, we aimed to determine whether there was an association between fatigue and demographic and clinical variables such as post concussive symptoms and time post injury.

Participants and Methods: 31 participants presenting with mTBI and 17 control subjects completed the Fatigue Severity Scale (FSS), the Beck Depression Inventory (BDI), the Post Concussion Scale-Revised (PCS-R), the Posttraumatic Stress Disorder Checklist (PCL) and the ADL Profile interview.

Results: Results showed that fatigue post-injury was associated with decreased practice of complex everyday activities in the community (shopping) and decreased independence in both domestic (daily house cleaning) and community activities (telephoning for information, walking or moving outdoors). Participants with mTBI reported higher levels of fatigue than control subjects on the FSS questionnaire. No correlations were found between fatigue, age, sex and time post-injury. Fatigue did, however, correlate with the presence of post concussion symptoms, depression, anxiety and post-traumatic stress in mTBI subjects.

Conclusions: Participants presenting with mTBI reported more fatigue than healthy controls and the presence of fatigue was strongly correlated with depressive symptoms. Fatigue secondary to mTBI should be considered an important determinant of reduced independence in complex everyday activities.

Correspondence: *Carolina Bottari, PhD, Ecole de Readaptation, Faculté de Médecine, Université de Montréal, 7077 ave du Parc, office 405-35, C.P. 6128 succursale centre-ville, Montréal, QC H3C3J7, Canada. E-mail: carolina.bottari@umontreal.ca*

E. CHAMARD, L. HENRY, Y. BOULANGER & M. LASSONDE. Metabolic Changes in the Acute Phase of Female Athletes after Sports-Related Concussions.

Objective: Sports-related concussions affect between 1.6 and 3 million individuals every year in the US alone. This injury is defined as a closed head injury resulting in a transient alteration in mental status and brain processes. Despite negative neuroimaging findings, many athletes display neurophysiological alterations and physical, cognitive and emotional post-concussion symptoms. A recent study using magnetic resonance spectroscopy (1H-MRS) confirmed neurometabolic changes in

the acute post-concussion phase and showed a correlation between self-reported symptoms and neurometabolic changes in male concussed athletes. However, no study has yet investigated neurometabolic alterations following a concussion in female athletes in spite of the fact that they show worse outcomes and a longer rehabilitation time compared to male athletes.

Participants and Methods: We thus investigated the effects of sports concussion on brain metabolism using ¹H-MRS by comparing a group of 10 non-concussed female athletes with a group of 8 concussed female athletes of the same age (mean 20 years) and education (mean 14 years). All athletes were scanned within 14 days following concussion in a 3T Siemens MRI. **Results:** The analysis revealed a significant decrease in myo-inositol in the left hippocampus, as well as a significant increase of glutamate in the right dorsolateral prefrontal cortex.

Conclusions: These results confirm cortical neurometabolic changes in the acute phase following a concussion and demonstrate for the first time neurometabolic alterations specific to a population of concussed female athletes. Correspondence: *Emilie Chamard, Université de Montréal, 90 Vincent d'Indy, Montréal, QC H2V 2S9, Canada. E-mail: emilie.chamard@umontreal.ca*

K. DAVIS, J. KEAN, D. PARROTT & J. CONGER. Significance of Delirium Associated Motor Disturbance on TBI Recovery.

Objective: Research devoted to evaluating delirium within general medical facilities consistently report on abnormal psychomotor behavior and its association with differential patient outcomes (e.g. hospital-acquired complications and mortality). The aim of the present study was to expand upon this research by investigating the effects of delirium related motor disturbance on traumatic brain injury (TBI) recovery.

Participants and Methods: Participants included 35 TBI survivors diagnosed with delirium upon hospital admission. Growth Curve Models and Analysis of Covariance (ANCOVA) were conducted to investigate the effect of motor disturbance presentation on delirium recovery and functional independence at post-acute rehabilitation hospital discharge.

Results: Despite similar ratings of delirium severity at hospital admission, motor subtype (agitated, hypomotoric, mixed or none) was a significant predictor of delirium recovery, with hypomotoric patients demonstrating the flattest recovery slope. Significant differences in the magnitude of functional recovery were also found among motor subtypes, even after accounting for the covariance of initial symptom severity and the number of non-delirious days the patient was able to engage in therapy ($F(3, 26)=8.13, p=.001, \text{partial } \eta^2=.48$). The largest recovery was found among delirious patients with no motor disturbance and/or agitation ($M=57.39, SE=6.24$ and $M=57.05, SE=6.55$ respectively), followed by mixed ($M=48.27, SE=8.27$) and hypomotoric disturbances ($M=25.10, SE=4.92$).

Conclusions: Overall, these results provide strong support for the presence of delirium associated motor subtypes following TBI. Further, the construct validity and clinical applicability of these subtypes were strengthened by the identification of quantitative differences in delirium recovery and TBI prognosis. Methodological difficulties and recommendations for future research are discussed.

Correspondence: *Kimberly Davis, M.S., Primary Children's Hospital, 5322 Cobble Creek Road, 16B, Salt Lake City, UT 84117. E-mail: kim.cappa@gmail.com*

J.E. MACHAMER, N. TEMKIN & S. DIKMEN. Health Related Quality of Life in Traumatic Brain Injury: Is a Proxy Report Necessary?

Objective: Despite its importance to care, clinicians and researchers often discount patient-reported outcomes in favor of proxy reports in persons with traumatic brain injury (TBI). The rationale relates to concerns about lack of awareness of patients regarding their functioning. However, although lack of awareness occurs in some patients with severe TBI or involving certain lesion locations, this conclusion has been over generalized. The objective of this study is to determine the validity of patient-reported health related quality of life by evaluating its relationship to injury severity and more objective indices of outcome in a representative series of adults with TBI at 6 months post injury.

Participants and Methods: Consecutive sample of 374 persons with TBI at least 14 years old and having post-resuscitation Glasgow Coma Scale score 12 or below, an acute seizure or a CT scan showing TBI-related findings. Seventy-six percent (374/491) of the eligible survivors were assessed at 6 months post injury.

Main Outcome Measure: Life Satisfaction Survey

Results: The greatest decrease in satisfaction was in ability to think and remember, work, income and leisure activities. Dissatisfaction significantly relates to the functional limitation in that area as judged by them ($p < .001$) or someone who knows them well ($p < .001$). The most severely injured group reported the most dissatisfaction for 15 out of 17 areas assessed.

Conclusions: Patients with TBI, in general, do not need a proxy to report on their behalf regarding their limitations or health related quality of life. Degree of dissatisfaction relates to degree of functional limitations judged by them or their proxy.

Correspondence: *Joan E. Machamer, MA, Rehabilitation Medicine, University of Washington, Box 359612, Seattle, WA 98104. E-mail: machamer@u.washington.edu*

M. DUNNAM, L. MALTA, N. MATTILA, K. DONNELLY, J. DONNELLY, G. WARNER, J. KITTLESON & C. BRADSHAW. Clarifying the Relationship Between Mild Traumatic Brain Injury and Post-traumatic Stress Disorder.

Objective: Warzone-related mild traumatic brain injury (mTBI) has been associated with Posttraumatic Stress Disorder (PTSD) in current war Veterans. PTSD symptoms include trauma re-experiencing (e.g., nightmares), avoidance and numbing symptoms (e.g., avoiding trauma reminders, blunted emotions), and hyperarousal symptoms (e.g., insomnia, poor concentration). Symptom overlap and similarities in neural abnormalities in PTSD and mTBI complicate diagnosis and treatment. The present study investigated the relationship between mTBI status and PTSD symptoms.

Participants and Methods: 296 current war veterans were assessed via the PTSD Checklist-Military Version (PCL-M) and a semi-structured interview to determine head injury status following deployment.

Results: Veterans with TBI endorsed higher total PCL-M scores compared to Veterans without TBI, $p < .001$. A MANOVA of individual symptom scores found significantly higher scores across all PTSD symptoms, $p < .001$. Planned univariate tests found that TBI was associated with higher scores for each symptom, $p < .001$ to $p < .005$. A stepwise regression analysis of symptom predictors of TBI status found that nightmares and insomnia were the strongest links between mTBI and PTSD, $p < .001$.

Conclusions: Results suggest that comorbid mTBI is associated with an exacerbation of PTSD symptoms, particularly hyperarousal and re-experiencing symptoms. Insomnia and nightmares can sometimes persist even after an otherwise successful course of exposure therapy for PTSD. Traditional exposure therapy for Veterans with mTBI and PTSD might need to be augmented with adjunctive interventions for insomnia and nightmares.

Correspondence: *Mina Dunnam, Ph.D., Behavioral Health Care, Stratton VA Medical Center, Stratton VA Medical Center, 113 Holland Avenue, Albany, NY 12208. E-mail: mina.dunnam@va.gov*

M. EDMUNDSON. A Meta-Analytic Review of Minnesota Multiphasic Personality Inventory (MMPI) Profile Elevations Following Traumatic Brain Injury.

Objective: Psychologists often use the Minnesota Multiphasic Personality Inventory (MMPI) to describe problematic personality and psychological changes following traumatic brain injury (TBI). The present meta-analysis examined the pattern of mean Hedges' d values on MMPI validity (L, F, K) and clinical (1-4, 6-0) scales in individuals with TBI.

Participants and Methods: Database keyword searches yielded 30 studies that provided post-injury MMPI profiles of individuals with TBI. Studies were required to include a pure TBI sample, individuals who were ≥ 18 at injury, and means and SDs for most MMPI clinical scales.

Results: Analyses, conducted separately for studies using the MMPI vs. MMPI-2, showed large effects for scales F, 1, 2, 3, 7, and 8, and at least a small effect for L on both the MMPI and MMPI-2; however, due to the dearth of studies reporting additional validity scale scores (e.g., VRIN, TRIN, Fp), it is unknown how random responding and severe psychopathology affected the obtained effects. Using Q statistics, moderating effects were found for injury severity on scale 3, compensation-seeking/litigation status on scales 1, 2, 3, and 7, and time-post injury on scales F, 1, 7, 8, 9, and 0. The available information was insufficient to examine the effect of lesion location or time-post injury for samples with differing injury severities on MMPI profiles.

Conclusions: Results suggest individuals with TBI experience significant levels of psychopathology that may be moderated by injury severity, compensation-seeking/litigation status, and time post-injury. Discussion includes a literature critique given the meta-analytic findings and implications for future study of personality following TBI.

Correspondence: *Maryanne Edmundson, M.S., Psychology, University of Kentucky, 464 N MLK Blvd, Apt 2, Lexington, KY 40508. E-mail: m.s.edmundson@gmail.com*

M. ENSLEY, M. O'NEIL, L. HUTSON, S. TUN, K. CARLSON & D. STORZBACH. Factor Structure, Reliability, and Validity of the British Columbia Postconcussion Symptom Inventory (BC-PSI) in Veterans With and Without Blast Exposure and Mild TBI.

Objective: Post-Concussion Syndrome (PCS) is a disorder commonly associated with mild traumatic brain injury (mTBI), though it is also observed in healthy populations. In order to better assess PCS symptoms, self-report measures have been utilized as diagnostic tools, some of which are designed to pair with formal diagnostic systems (e.g., ICD-10 and DSM-IV-TR). This study will assess the factor structure and utility of the British Columbia Postconcussion Symptom Inventory (BC-PSI).

Participants and Methods: Participants were 1200 OEF/OIF veterans who received a TBI screen at the PVAMC. Participants were divided into three groups: 1) A no explosion group; 2) An explosion-exposed group with no reported concussion symptoms; 3) An explosion-exposed group with reported concussion symptoms. 105 participants completed a clinical interview, a neuropsychological evaluation, and the BC-PSI.

Results: We conducted an exploratory factor analysis on all 16 BC-PSI items to determine the maximum number of factors with eigenvalues greater than 1.00. We ran 4-, 5-, and 6-factor models, all obtaining eigenvalues greater than 1.00 and supported by the scree plot. BC-PSI items 1, 5, 14, and 15 did not load greater than .35 on any factors; thus, they were removed from the model. The most theoretically supported model was a 5-factor structure with the following factors: cognitive, somatic, mental health, anger, and fatigue.

Conclusions: The BC-PSI was designed to specifically pair with the ICD-10 items for PCS. This 5-factor model supports some symptom criteria from the ICD-10; however, analysis of factor score differences by group suggests that discrepancy between participant groups is variable across items and subscales.

Correspondence: *Megan Ensley, MA, Portland VA Medical Center, Portland VA Medical Center, P3MHDC-Ensley, 3710 SW US Veterans Hospital Road, Portland, OR 97239. E-mail: megan.ensley@va.gov*

J. EVANS, E. HANSON, B. BARTNIK-OLSON & S. ROPACKI. Perceived Quality of Life as a Mediator of Neuropsychological and Psychological Outcomes Following Mild Traumatic Brain Injury.

Objective: Traumatic brain injury (TBI) in adolescents and adults can result in cognitive, emotional, behavioral and neurological deficits that can persist more than a year after injury. The aim of the current preliminary study was to use a comprehensive neuropsychological assessment to determine the nature of cognitive impairments and their relationship with specific psychosocial factors, including coping skills and perceived quality of life, following mild TBI (mTBI). Understanding this possible relationship is necessary to establish effective treatment strategies, which may involve a focus on psychological factors.

Participants and Methods: This study included 18 mTBI subjects and 12 healthy control subjects. Neuropsychological tests administered measured domains such as intelligence, attention, language, verbal and non-verbal memory, visual construction, fine motor speed, and executive functioning. Psychological and life satisfaction measures assessed perceived quality of life, coping style, anxiety, and depression.

Results: MTBI subjects showed decreased attention, verbal and non-verbal memory, quality of life, and increased depression and anxiety when compared with healthy controls. Additionally, it was found that perceived quality of life mediated the relationship between head injury and attention, depression, and anxiety.

Conclusions: The findings from the current study suggest that treatment interventions focused on improving an individual's perceived quality of life may result in improved attention and amelioration of depression and anxiety following TBI.

Correspondence: *Julia Erans, M.A., Psychology, Loma Linda University, 11130 Anderson St, #117, Loma Linda, CA 92354. E-mail: jkroh@llu.edu*

L.M. FORD-JOHNSON, J. LENGENFELDER, A. ARJUNAN, A. SMITH, N.N. CHIARAVALLI & J. DELUCA. Examination of Executive Functions in TBI using the DKEFS.

Objective: The DKEFS is a set of executive function measures that includes tasks with a switching component. We examined 4 tasks with a switching component and assessed the impact of switching performance on learning and memory in a TBI sample.

Participants and Methods: 42 individuals with moderate-severe TBI, and 19 aged and education matched healthy controls (HCs), were administered the DKEFS and CVLT-II.

Results: Individuals with TBI demonstrated significantly poorer performance relative to HCs on all of the DKEFS switching tasks: Trail Making; Number-Letter Switching, $F(1, 59) = 19.756, p = .000$; Verbal Fluency; Category Switching, $F(1, 60) = 15.446, p = .000$; Design Fluency; Switching, $F(1, 60) = 27.446, p = .000$; Color-Word Interference: Inhibition/Switching, $F(1, 59) = 19.858, p = .000$. In the TBI group, significant correlations were found between 3 of the DKEFS switching measures and CVLT-II learning and memory scores, whereas for HCs, no significant association was found between switching measures and learning and memory scores.

Conclusions: HCs demonstrated intact switching performance whereas TBI participants exhibited difficulty. Switching performance was related to learning and memory abilities in persons with TBI, but not for HCs, suggesting that intact executive functioning is necessary for learning and memory performance. These findings have implications for understanding the role executive abilities may play in learning and memory for individuals with TBI and important in designing rehabilitation interventions. Efforts focusing on improving executive function skills in populations with both executive dysfunction and memory deficits may enhance learning and memory abilities. Correspondence: *Lawanda M. Ford-Johnson, Psy.D., Neuroscience & Neuropsychology Lab, Kessler Foundation Research Center, 300 Executive Drive, Suite 70, West Orange, NJ 07052. E-mail: lfordjohnson@kesslerfoundation.org*

M.J. FIGUEROA, E. GARDIZI, E.M. HOLCOMB & R. HANKS. Medical Comorbidities and Health Insurance as Predictors of Functional Outcome Following Traumatic Brain Injury.

Objective: Demographic factors and injury characteristics such as age, education, and posttraumatic confusion, are known to influence functional outcome after moderate to severe traumatic brain injury (TBI). To date, studies have not looked at the effects of health insurance type and comorbid medical conditions which are hypothesized to significantly contribute to functional outcomes above and beyond demographic variables.

Participants and Methods: Hierarchical multiple regression was used to examine the relationship between insurance type and comorbid medical conditions with regard to functional outcome in 96 persons with moderate to severe TBI. Comorbid medical conditions were measured using the Modified Cumulative Illness Rating Scale (MCIRS), while level of handicap was rated by certified examiners on the Disability Rating Scale (DRS).

Results: As expected, years of education, insurance type, and length of posttraumatic confusion were significant predictors of level of handicap one year post injury, but not age. Analysis of the total MCIRS score showed that the presence of EENT (eye, ear, nose, throat, larynx), psychological/behavioral and musculoskeletal in particular significantly affected functional outcome. The greatest amount of unique variance in DRS scores was accounted for by type of insurance and length of post-traumatic confusion, while medical comorbidities and level of education were the next strongest predictors.

Conclusions: The findings emphasize the importance of treating comorbid medical conditions, particularly the presence of EENT, psychological/behavioral, and musculoskeletal symptoms with adequate health-care to improve quality of life and reduce health care costs in the long run for this population.

Correspondence: *Maritza J. Figueroa, Ph.D., Rehabilitation Institute of Michigan, 261 Mack Avenue, Detroit, MI 48201. E-mail: mfiguero2@dmc.org*

W. GARMOE, A. NEWMAN & J. CLARK. The Relationship of Self-Awareness in Moderate and Severe Traumatic Brain Injury Patients in the Inpatient Rehabilitation Setting with Self-Awareness Six Months Post-Discharge.

Objective: Severe traumatic brain injury (TBI) often results in impaired self-awareness (ISA), leading to poor judgement decisions, difficulties adapting to change, loss of appreciation for the impact of one's behavior on others, and reduced motivation for rehabilitation and use of compensatory strategies. The present study examined the relationship of early self-awareness to awareness six months later. Early awareness was hypothesized to be predictive of awareness six months later, and only modest relationships were expected between self-awareness and cognitive functioning.

Participants and Methods: Subjects consisted of 70 consecutive adult TBI admissions to an acute inpatient specialty brain injury treatment program. Each subject was administered the Functional Self-Assessment Scale (FSAS) and a neuropsychological screening battery. Clinicians independently rated each subject's functioning using the FSAS. Self-awareness was defined in terms of the discrepancy between self and clinician ratings. Six-months later, subjects returned as outpatients and were administered a self-awareness measure (Patient Competency Rating Scale) and a neuropsychological test battery.

Results: TBI subjects demonstrated impaired self-awareness on the inpatient rehabilitation unit, over-estimating their functional abilities relative to ratings by clinicians. Self-Awareness as measured by the FSAS correlated significantly with several neuropsychological summary indices, and each correlated significantly with self-awareness six months later. Stepwise multiple regression demonstrated that only self-awareness as measured by the FSAS accounted for significant variance in predicting self-awareness scores six months later.

Conclusions: Level of self-awareness during inpatient brain injury rehabilitation predicts level of self-awareness six months later, and is a more robust predictor than neuropsychological indices. Early assessment of self-awareness following TBI may lead to more precise treatment interventions for those with persistent ISA.

Correspondence: *William Garmoe, Ph.D., Psychology Service, National Rehabilitation Hospital, 102 Irving Street, NW, Washington, DC, DC 20010. E-mail: william.s.garmoe@medstar.net*

A.C. GRAEFE, M.T. SCHULTHEIS, K.J. MANNING, D. NEYENS, D. SALVUCCI, R. MITURA, D. KLIMCHUK & L. BOYLE. The Relationship Between Neuropsychological Performance and Self-reported Task Demands in Acquired Brain Injury.

Objective: Individuals with acquired brain injury (ABI) may have impaired self-awareness of behavioral, physical, and cognitive deficits even many years after injury. In the present study, we sought to examine the relationship between neuropsychological functioning and self-reported appraisal of the task demands of a virtual reality driving task.

Participants and Methods: Participants (N = 40) included those with acquired brain injury (n = 23) and healthy controls (n = 17). Neuropsychological tasks measured simple attention, working memory, inhibition, and judgment. A self-report task demand questionnaire measured mental demand, physical demand, effort, and frustration level. Correlations between neuropsychological performance and task demand were examined separately for participants with ABI and healthy controls.

Results: Results for those with ABI showed that greater physical demand was associated with poorer performance on measures of simple attention (r = -.54), working memory (r = -.46), and inhibition (r = -.51); perceived effort demand was associated with poorer performance on a measure of inhibition (r = -.48); and higher frustration level was associated with better performance on measures of simple attention (r = .55) and working memory (r = .47). By contrast, results for healthy controls showed that both greater mental and physical demand were associated with poorer performance on a measure of simple attention (r = -.53; r = -.53); and that greater effort and greater frustration were associated with better performance on a measure of working memory (r = .50; r = .53).

Conclusions: These results suggest a relationship between neuropsychological performance and the appraisal of the demands of a cognitively complex task, such as driving. Additionally, they indicate that the pattern of this relationship is different for those with brain injuries when compared to those without, and supports previous findings that individuals with brain injuries report a greater level of physical impairment than cognitive impairment.

Correspondence: *Anna C. Graefe, B.A., Drexel University, 2318 Spruce St. Apt. 2R, Philadelphia, PA 19103. E-mail: anna.graefe@gmail.com*

R. KRISHNA M.D., N. GIORDANO M.D., M. GRINN, B. NANGIA M.D. & N. SOTUDEH. The Role of Diffusion Tensor Imaging in the Diagnosis of Sub-Acute Mild Traumatic Brain Injury: A Case Report.

Objective: To report on the ability of Diffusion Tensor Imaging (DTI) to accurately diagnose a patient with mild Traumatic Brain Injury (TBI).

Participants and Methods: This is the case of a previously healthy, 23-year-old, African American male who was involved in a motor vehicle accident (MVA), resulting in head trauma without loss of consciousness. Following the MVA, he complained of a persistent headache associated with dizziness, difficulty maintaining balance, and insomnia; all symptoms suggestive of mild TBI. Prior to the MVA this patient was a working city bus driver without any significant past medical history. The patient sought neurological consultation 2 days later when his symptoms failed to subside. He was evaluated with a neurological examination and an Acute Concussion Evaluation. Following clinical assessment, an EEG, MRI, and DTI scans were conducted 5 days after the accident.

Results: Although the patient's symptoms are consistent with post-traumatic headache, the clinical neurological examination did not yield any significant findings related to headaches. An Acute Concussion Evaluation diagnosed this patient with concussion w/o loss of consciousness. However, MRI of the Brain remained unremarkable and EEG was inconclusive. A DTI scan revealed several foci of decreased fractional anisotropy at the gray-white matter junction of both frontal lobes and in the left external capsule. These findings are representative of axonal injury and are indicative of posttraumatic gliosis.

Conclusions: In the United States, 1.7 million people sustain TBIs each year. Additionally, many cases go unreported since a majority of TBI complications are not obvious in the acute stage. In this case, DTI was used as a means of secondary prevention. DTI yielded positive findings not possible with standard imaging techniques. DTI has demonstrated the ability to accurately and objectively diagnose TBI. A larger multicentric study should be conducted to better understand the role of DTI in the screening, diagnosis, and treatment of TBI.

Correspondence: *Ranga Krishna M.D., MD, Methodist Hospital, 1513 Voorhies avenue, Brooklyn, NY 11235. E-mail: rkrishna@pol.net*

J. HAMMERQUIST, T. KIMPTON, R. MADATHIL & S. HALL. Attitudes and Behaviors Regarding Helmet Use Among Intermediate and Advanced Skiers and Snowboarders.

Objective: This study compared attitudes and behaviors regarding helmet use between intermediate and advanced ability levels. Given that advanced skiers and snowboarders have more experience and navigate more technical terrain, it was hypothesized that they would (1) report more concussions, (2) endorse helmet use at a higher rate, (3) encourage helmet use by others at a higher rate, and (4) rate helmet necessity higher than intermediate skiers and snowboarders.

Participants and Methods: A survey of snowboarders' and skiers' attitudes, experiences, and behaviors about ski helmets was administered to 105 introductory psychology students.

Results: Over one-third (37.3%) of advanced skiers and snowboarders had been knocked unconscious while skiing or snowboarding; 11.3% of intermediate skiers and snowboarders reported the same. Twenty-five percent (25%) of advanced respondents reported wearing a helmet; only 5.9% of intermediate skiers and snowboarders reported the same.

Seventy percent (70%) of advanced skiers and snowboarders reported that they would encourage others to wear a helmet, and 42.9% thought helmet use was necessary. Among intermediate skiers and snowboarders, only 57.2% would encourage others to wear a helmet, and less than 35% thought helmet use was necessary.

Conclusions: Attitudes and behaviors surrounding ski helmets appear to be related to experience. Compared to intermediate skiers and snowboarders, advanced-level skiers and snowboarders reported more concussions, were more likely to wear a helmet, were more likely to recommend helmets to others, and rated helmets as more necessary. These findings warrant further investigation into the factors that influence one's choice to wear a helmet.

Correspondence: *Julia Hammerquist, Psychology, University of Montana, Skaggs Building Room 143, Missoula, MT 59812-1584. E-mail: julia.hammerquist@umconnect.umt.edu*

R.A. KEHOE, R.M. ROTH, L.A. FLASHMAN & T.W. MCALLISTER. Subjective Report of Executive Function in Mild Traumatic Brain Injury (mTBI).

Objective: Subjective reports of cognitive problems are common shortly after mTBI, but there is little empirical data specific to the nature and severity of executive function (EF) complaints. We sought to determine whether patients recovering from mTBI report more difficulties with EF than non-injured controls, and whether subjective report was related to measures of mood, anxiety, or abnormal structural neuroimaging (mild vs. complicated mild TBI).

Participants and Methods: Participants were 96 adults with mTBI evaluated less than 90 days post-injury (mean 50.51 days), and 40 non-injured controls who completed the Behavior Rating Inventory of Executive Function-Adult (BRIEF-A), Beck Depression Inventory-II (BDI-II), and State-Trait Anxiety Inventory (STAI). Multivariate analysis of variance was conducted to assess for group differences on the BRIEF-A.

Results: Groups did not differ with respect to age, gender, or baseline intellect; controls were more educated and thus this was adjusted for in subsequent analyses. The patient group reported poorer EF overall and on 7 of 9 subscales on the BRIEF-A, however, these differences were non-significant when adjusted for mood (BDI-II & state anxiety). Furthermore, when the eight patients with clinically significant levels of depression (BDI-II > 14) were eliminated, all group differences were rendered non-significant. When controlling for mood, patients with complicated mTBI reported significantly worse EF compared with uncomplicated mTBI.

Conclusions: Findings indicate that the subjective report of problems with EF by patients within the recovery phase from mTBI is related to their mood. This supports the importance of considering affective distress in patients with mTBI and EF complaints.

Correspondence: *Reid A. Kehoe, Psy.D., Psychiatry, Dartmouth Medical School, One Medical Center Drive, Lebanon, NH 03756. E-mail: reid.a.kehoe@dartmouth.edu*

R.J. KIERNAN. Minor Head Injury and the Rear-End Impact.

Objective: Rear-end motor vehicle accidents are common in today's world of sudden freeway stops and distracted drivers, and they often result in minor head injuries that are difficult to diagnose. Seven forensic cases, evaluated over the past two years, are presented that illustrate the unique nature of this syndrome.

Participants and Methods: Airbags seldom deploy in these accidents (only 1/7 cases) because of the direction of impact. Those involved typically do not have more than a minimal loss of consciousness because the head impact lacks forward rotational trauma to the brainstem. They are often found sitting in their car (5/7 cases) at the accident scene. The mild alterations in consciousness that occur in this population fail to predict the degree of cognitive impairment.

Results: These patients have a high incidence of unrecognized vestibular system dysfunction (7/7 cases) with evidence of vestibular ocular reflex problems, usually visual blurring, and vestibular balance reflex changes, typically dizziness and dysequilibrium. They demonstrate a mild traumatic brain injury pattern on neuropsychological testing with impaired word finding, mental tracking and cognitive efficiency suggestive of a contracoup frontal lobe syndrome.

Conclusions: These cases often result in contentious litigation because the degree of disability and the cognitive test findings are beyond what can be predicted from alterations in consciousness alone. Moreover, the vestibular components of the disability involve vague symptoms like visual blurring that contribute to a somatoform pattern on the MMPI-2 and make it difficult to sustain focusing on many so-called effort tests. Correspondence: *Ralph J. Kiernan, Ph.D., private practice, P. O. Box 294, La Honda, CA 94020. E-mail: margolies-kiernan@sbcglobal.net*

B. KNEZEVIC, S.R. MILLIS & R.A. HANKS. A Mixed-Effects Modeling Approach to Measuring Recovery in Processing Speed Following Traumatic Brain Injury.

Objective: Although previous studies have found and described the heterogeneity in recovery of cognitive abilities following a traumatic brain injury (TBI) (e.g., Millis et al., 2001), a limited number of studies have examined whether this recovery continues several years following TBI and whether the recovery is uniform across individuals.

Participants and Methods: Using archival data from the Southeastern Michigan Traumatic Brain Injury System (SEM-TBIS), recovery of processing speed following TBI was assessed with the Symbol Digit Modalities Test (SDMT) written subtest. SDMT was given during hospitalization and at 1, 2, 3, 4, 5, 10, 15, and 20 years post-injury. 227 patients in the SEM-TBIS database met the inclusion criteria of having completed at least three SDMT administrations.

Results: A mixed-effects statistical modeling strategy revealed substantial variability in SDMT performance at baseline as well as in the change over time. Age, education, and length of the post-traumatic amnesia (PTA) were significant predictors of this variability in SDMT performance. In particular, individuals who acquired TBI at an older age, or the longer the PTA, showed slower recovery of processing speed following TBI. However, higher education was a positive predictor of the recovery of processing speed following TBI. In contrast, gender was not found to be a statistically significant predictor.

Conclusions: In conclusion, cognitive recovery following TBI appears to be complex. This study clearly demonstrates variability in recovery even after the first year, a promising finding for the neuropsychological rehabilitation community, treatment development, and TBI survivors.

Correspondence: *Bojana Knezevic, MA, Psychology, University of Windsor, 401 Sunset Avenue, Windsor, ON N9B 3P4, Canada. E-mail: knezevic@uwindsor.ca*

D. KRCH & N. CHIARAVALLOTI. Subjective Memory in TBI is Associated with Psychosocial Factors Rather than Objective Memory Performance.

Objective: Cognitive impairment is the leading cause of disability after TBI, with memory the most common deficit. Evaluation of memory is

accomplished primarily through formal objective testing and supplemented with self-report measures. However, self-report often conflicts with results of formal testing, and in these cases, perceived poor memory may be related to poor awareness, impairment in other cognitive domains, or psychological distress rather than impairment in memory. The goal of the current study was to explore which factors may be related to subjective memory in TBI.

Participants and Methods: Forty-one individuals with moderate-severe TBI, aged 38.6 ± 12.2 , with 13.9 ± 2.1 years of education were evaluated on subjective memory (MFQ), objective memory (CVLT-II, OT-SRT, RBMT, Prose Memory), and psychosocial functioning (CMDI, STAI Trait, FSS, SF-12, SWLS) measures. The relationship between the MFQ and objective memory and psychosocial measures were explored using Pearson product-moment correlations.

Results: Statistically significant positive correlations were found between the MFQ and CMDI ($r = -.41$, $p = .008$), STAI Trait ($r = -.57$, $p < .001$), FSS ($r = .48$, $p = .002$), and SF-12 ($r = .55$, $p < .001$). There was no relationship between MFQ scores and performance on any learning or recall trial on any of the objective memory tests, nor with overall satisfaction of life.

Conclusions: Poorer perceived memory was associated with greater depression, anxiety, and fatigue, and lower health-related quality of life. There were no significant relationships between subjective memory and objective learning and memory performance or satisfaction with life. Findings suggest that self-report memory impairment in TBI may serve as a clinical indicator of distress rather than of true memory deficits.

Correspondence: *Denise Krch, PhD, Neuropsychology & Neuroscience Laboratory, Kessler Foundation Research Center, 300 Executive Dr., Suite 70, West Orange, NJ 07052. E-mail: dkrch@kesslerfoundation.org*

M. KRENGEL, E. BAKER & A. HENDRICKS. Examination of cognitive and health symptoms in OEF/OIF Veterans: The impact of multiple TBI-related events.

Objective: Traumatic brain injury (TBI) and post-traumatic stress disorder (PTSD) are the signature war wounds of the current conflicts in Iraq and Afghanistan; and etiology can be blast explosions or blunt trauma (non-blast). Service members upon entering the VA system are screened and those who meet criteria for possible TBI are referred for a comprehensive TBI evaluation (CoTBI). This evaluation includes questions pertaining to deployment and post-deployment events that meet criteria for TBI. These data allow for examination of the impact of multiple concussive injury on current symptomatology, which, although studied in sports concussion, is lacking in the OEF/OIF literature.

Participants and Methods: Our research team has analyzed administrative data on clinician based documentation of TBI, PTSD diagnosis, and severity of cognitive, affective, somatosensory, and vestibular symptoms on a 22-item screen. It was hypothesized, based on the literature on sports concussion, that there would be an increase in symptom severity with a post-deployment event. It was also hypothesized that Veterans with PTSD would have increased severity of symptoms and that there would be an additive effect. The sample was stratified by number of events (1 deployment or 1 deployment + 1 post-deployment), etiology of deployment event (blast and non-blast), and by presence or absence of PTSD and included 3545 participants. A 3-way MANOVA was conducted followed by univariate ANOVAs.

Results: No differences were found between blast and non-blast events in terms of severity of symptoms; however, Veterans with PTSD in general had higher average severity scores. Significant differences ($p < .01$) were found in severity of all symptoms with an additional post-deployment event. There was an additive effect such that individuals without PTSD and a post-deployment event had the largest increase in symptom severity.

Conclusions: Clinical and research implications will be discussed.
Correspondence: *Mazine Krengel, Ph.D., Neurology, Boston University School of Public Health, 725 Albany St, Suite 7B, Boston, MA 02115. E-mail: mhk@bu.edu*

M. KRISHNAN, N. SMITH & J. DONDERS. Use of the Tower of London – Drexel University, Second Edition (TOLDX) for Adults with Traumatic Brain Injury.

Objective: The Tower of London - Drexel University, Second Edition (TOLDX) is a standardized variant of the tower task, a well-known test of problem solving. The TOLDX has not previously been validated for use with adults with traumatic brain injury (TBI). The current study seeks to determine whether TBI is associated with worse performance on the TOLDX.

Participants and Methods: Performance on the TOLDX was compared for two groups of clinical patients, 56 individuals with complicated-mild to severe traumatic brain injury (sTBI), and 68 individuals with uncomplicated, mild traumatic brain injury (mTBI), and 128 demographically matched, healthy controls provided from the instrument standardization sample. Performance on the TOLDX in patient samples was also compared to performance on another measure of problem solving, the Wisconsin Card Sorting Test (WCST).

Results: Both TBI groups performed worse than controls on several TOLDX measures, but the TBI groups did not differ from each other. Multinomial logistic regression had poor three-group classification accuracy. A logistic regression comparing only controls and patients with sTBI had an improved classification rate of 63.9%. Length of coma was associated with worse performance on the TOLDX in patients with sTBI. WCST perseverative responses scores were only weakly correlated with TOLDX performance.

Conclusions: Patients with TBI of all severity levels performed worse than controls on the TOLDX. Although there was some suggestion of a relationship between injury severity and worse TOLDX performance, this was not a consistent pattern. Furthermore, shared variance between the TOLDX and WCST was limited, suggesting that these instruments may assess different cognitive skills. The TOLDX may offer complementary data to other problem solving measures in evaluating cognitive impacts of TBI.

Correspondence: *Mohan Krishnan, PhD, Psychology, Mary Free Bed Rehabilitation Hospital, 235 Wealthy St SE, Grand Rapids, MI 49503-5299. E-mail: mkrishnan@alumni.ufl.edu*

R. LANGE, B. IVINS, S. PANCHOLI, G. IVERSON & F. LOIUS. Factors Influencing Postconcussion Symptom Reporting Following Traumatic Brain Injury in the Military.

Objective: Differential diagnosis of the postconcussional disorder (PCD) is complex. The purpose of this study is to identify factors that are most strongly related to PCD symptom reporting following traumatic brain injury (TBI).

Participants and Methods: Participants were 159 US military service members (Age: $M = 29.1$, $SD = 8.4$) who sustained a TBI, divided into two groups: PCD-Present ($n = 79$) and PCD-Absent ($n = 80$). Participants completed a neuropsychological evaluation at Walter Reed Army Medical Center ($M = 8.3$ months post injury [$SD = 13.4$]). Factors examined included age, education, gender, ethnicity, premorbid IQ, time post injury, number of deployments, geographical location of injury, bodily injury severity, brain injury severity, mechanism of injury, intracranial abnormality, depression, post-traumatic stress, symptom exaggeration, and effort testing.

Results: The PCD-Present group endorsed greater symptoms of depression ($p < .001$, Cohen's $d = 1.41$) and post-traumatic stress ($p < .001$, $d = 1.36$). They also had greater scores on a measure of symptom exaggeration ($p < .001$, $d = 1.27$), and were more likely to fail effort testing ($p < .001$). The PCS-Absent group was more likely to have a day-of-injury intracranial abnormality ($p < .001$), have a longer period of unconsciousness following injury ($p = .007$, $d = .43$), have a greater severity of bodily injuries ($p = .006$, $d = .56$), and have higher scores on a measure of positive impression management ($p < .001$, $d = 1.14$). Using regression analyses, the most significant variables in the prediction of PCD symptom reporting were post-traumatic stress ($p < .001$), exaggeration of symptoms ($p = .019$), and poor effort ($p = .024$). Post-traumatic stress explained the largest amount of unique variance (8.8%, $r = .30$, medium effect size).

Conclusions: Many factors unrelated to brain injury itself were influential in self-reported post-traumatic symptoms in this population. Post-traumatic stress was the most significant predictor.

Correspondence: *Rael Lange, Defense and Veterans Brain Injury Center, 10663 Pine Haven Terrace, North Bethesda, MD 20852. E-mail: rael.lange@gmail.com*

S. PANCHOLI, R. LANGE, T. BRICKELL, A. BHAGWAT & L. FRENCH. Self-reported Cognitive Complaints and Neuropsychological Test Performance Following Traumatic Brain Injury in US Military Service Members.

Objective: The purpose of this study was to examine the relation between self-reported cognitive complaints and neuropsychological test performance following traumatic brain injury (TBI).

Participants and Methods: Participants were 109 US military service members (Age: $M=29.3$, $SD=8.7$) who sustained a TBI and completed neuropsychological testing at the Walter Reed Army Medical Center within the first 2 years post-injury ($M=6.2$ months, $SD=5.3$). All participants had passed symptom validity testing and had completed the Neurobehavioral Symptom Inventory (NBSI), PTSD Checklist (PCLC), Personality Assessment Inventory (PAI), and a neurocognitive test battery. Selected neurocognitive tests included 17 measures that addressed three self-reported cognitive complaints from the NBSI: (a) attention/concentration, (b) memory, and (b) processing speed/organization.

Results: Self-reported cognitive complaints were not significantly correlated with neurocognitive test performance, with the exception of 5 of the 17 measures. The strength of this relation was weak ($r=.19-.27$). Rather, self-reported cognitive complaints were significantly correlated with PCLC total scores ($r=.50-.58$) and more than half of the PAI clinical scales (e.g., Somatic Complaints and Anxiety-related Disorders, Depression, and Schizophrenia scales; $r=.40-.58$). The rate of agreement between subjective cognitive complaints and neurocognitive test scores was low. For example, less than 6.4% of the sample reported subjective cognitive complaints as being 'moderate or higher' and had low neurocognitive test scores (e.g., <16th percentile). For a large minority of the sample (38.5%-45.9%), subjective cognitive complaints (i.e., moderate or higher) were reported in the presence of neurocognitive test scores that fell within normal limits (i.e., 16th percentile or higher).

Conclusions: These results suggest that subjective cognitive complaints were not associated with neurocognitive test performance, but were rather associated with psychological distress.

Correspondence: *Rael Lange, Defense and Veterans Brain Injury Center, 10663 Pine Haven Terrace, North Bethesda, MD 20852. E-mail: rael.lange@gmail.com*

J. LENGENFELDER, H. GENOVA, G. WYLIE, A. SMITH, N. CHIARAVALLI & J. DELUCA. Using fMRI to examine the use of organizational strategies on verbal list learning in individuals with TBI.

Objective: To examine patterns of fMRI activation while learning verbal lists in individuals with TBI.

Participants and Methods: Participants consisted of 18 individuals with moderate-severe TBI and 18 matched HC who learned two lists of words during fMRI. Each word list was composed of 16 words (4 words in 4 categories), similar to the CVLT-II. The first list of words was randomly presented and no learning strategy was given. For the second list, the words were grouped according to their categories and individuals were instructed to use the grouping strategy when learning. To examine group differences, a t-test ($p<.005$) using AFNI was run to examine what brain regions were significantly more or less active in individuals with TBI compared to HCs for each list.

Results: For the first list, both groups demonstrated similar activation of frontal areas. For the second list when an organizational list-learning strategy was used, individuals with TBI demonstrated

less activation in frontal regions compared to HC. List X Group interaction indicated that only the right middle frontal gyrus was significantly different between groups, with the HC demonstrating increased activation in this area. Semantic clustering on the CVLT-II in individuals with TBI as it relates to fMRI activation will also be presented.

Conclusions: Individuals with TBI do not seem to be activating areas necessary for utilizing organizational strategies. These findings have implications in designing rehabilitation interventions. Efforts focusing on teaching organizational strategies in a population known to have both executive dysfunction and memory deficits may subsequently improve learning and memory abilities.

Correspondence: *Jeannie Lenggenfelder, Kessler Foundation Research Center, 300 Executive Drive, Suite 70, West Orange, NJ 07052. E-mail: jlenggenfelder@kesslerfoundation.org*

C.A. LOCKWOOD, J. POOLE & J.A. MOSES. Facial Affect Recognition in a VA Polytrauma Patients.

Objective: This study aims to explore the relationship between facial affect recognition and overall neuropsychological performance in a VA polytrauma population.

Participants and Methods: Participants: 124 veterans, ages 21-58, mean education 13 years, with positive standard VA screen for possible mild to moderate TBI. Measures: Neuropsychological Assessment Battery- Screening Module (S-NAB) and a shortened version of Ekman's Facial Affect Recognition measure (FAR). The measures violated assumptions of normality; thus, data were analyzed using Spearman's rho correlation analyses.

Results: Significant positive correlations were found between FAR z-score and S-NAB Total Scale and the Spatial, Executive, and Memory Indices z-scores. There was also a trend towards significance between the FAR z-score and the S-NAB Language Index z-score.

Conclusions: Veteran polytrauma patients with worse performance on screening measures of spatial, executive, and memory abilities perform worse on a measure of facial affect recognition. Facial affect recognition is considered the most important nonverbal cue of emotional information. Furthermore, impairment in facial affect recognition may have significant interpersonal, emotional, and overall well-being consequences; as such, clinicians must examine this ability more closely in polytrauma patients. To date, no research literature examines the relationship of overall cognitive functioning on facial affect recognition within the polytrauma population. This finding represents an important addition to the research literature in that an increasing number of OIF/OEF veterans and service members return from war zones with this signature injury, and clinicians must aim to better understand the complex neuropsychological sequelae following TBI.

Correspondence: *Courtney A. Lockwood, M.S., Palo Alto University, 60 Corto Lane, Woodside, CA 94062. E-mail: courtneylockwood@gmail.com*

T. LEE-WILK, C.A. LOCKWOOD, M.C. DUX, K. AUMAN, K. MURDOCK, P. DISCHINGER & J.E. WILK. Post Concussive Symptoms in Single vs. Multiple Mild Traumatic Brain Injury.

Objective: To prospectively examine group differences in cognitive and psychosocial functioning in a sample of patients with mild traumatic brain injury (mTBI) status post motor vehicle accident (MVA) with and without history of prior mTBI.

Participants and Methods: Participants ($N=180$), ages 18-64, were recruited from an urban hospital trauma center following mTBI. Participants were administered measures of social and emotional functioning and completed a computerized neuropsychological battery (ANAM™) at 7-10 days and 3, 6, and 12 months post injury. Independent t tests were performed to examine group differences between participants with single ($n=141$) vs. multiple ($n=39$) mTBI.

Results: The multiple mTBI group performed worse on a test of working memory and sustained attention (ANAM Running Memory CPT) at 3 months ($t=2.9$, $p<.01$). However, significant difference disappeared

by 12 month follow up. There were no significant differences on other cognitive measures or assessments of psychological symptoms. The multiple mTBI group was also more likely to report changes in work status immediately following their current mTBI ($\chi^2=5.2$, $p=.04$), but this difference disappeared by 12 month follow up.

Conclusions: These data indicate no significant differences between MVA victims at 12 months post-injury, with or without a previous history of mTBI. However, there were some differences in cognitive and work functioning in the more acute recovery phase. Data suggest that history of multiple mTBI is associated with slower recovery of function, but not persistent dysfunction. These findings, if replicated, suggest that those with multiple concussions may benefit from closer evaluation of aspects of cognition and vocational services to optimize functional abilities.

Correspondence: *Terry Lee-Wilk, Ph.D., VAMHCS, 10 N Greene Street, Baltimore, MD 21201. E-mail: terry.lee-wilk@va.gov*

K. MC DONALD, E. JEFFAY & K. ZAKZANIS. Longitudinal Evidence of Trait-like Concussive Symptoms In A Healthy Sample.

Objective: Post-concussion syndrome (PCS) refers to persisting physical and neurobehavioral impairments following a mild traumatic brain injury (mTBI) beyond the expected three month benchmark for recovery. Symptoms of PCS have high base rates, but the temporal stability of these base rates has not been extensively investigated. To facilitate the interpretation of self-reported PCS symptoms, particularly over time, the current study aimed primarily to investigate the longitudinal stability of PCS symptomatology in a healthy sample using the Rivermead Post Concussion Symptom Questionnaire (RPQ).

Participants and Methods: A total of 12 University of Toronto students in an Introductory Psychology course were assessed at two time points an average of 12 weeks apart. The primary variables were the RPQ total score, the RPQ-3 score, and the RPQ-13 score.

Results: The reliability of each of the 16 symptoms included in the RPQ was also investigated. Moderately high endorsement rates of PCS symptoms were found in the current healthy sample at both the total test score and individual item levels. Stability of these base rates were found to be low ($r = .20$) to very low ($r = .05$) for test scores, and high ($r = .97$) to very low ($r = .04$) for individual symptom endorsements.

Conclusions: This combination introduces the threat of high false positive PCS diagnoses when interpreting self-reported post-concussion symptoms. Additional research is required to determine whether the low test-retest reliability is due to error or due to the state-like nature of PCS symptomatology.

Correspondence: *Elyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A5, Canada. E-mail: eliyas.jeffay@utoronto.ca*

K. MC DONALD, E. JEFFAY, A. TROYER & K. ZAKZANIS. Component Analysis of Verbal Fluency in Patients with Moderate and Severe Traumatic Brain Injury.

Objective: We set out to examine the sensitivity of verbal fluency component scores to those who have incurred a moderate to severe Traumatic Brain Injury (TBI). Clustering and switching verbal fluency scores were compared between healthy controls and patients with moderate and severe TBI.

Participants and Methods: Fifty-four healthy controls, along with 8 moderate TBI and 12 severe TBI patients were included in the study.

Results: Our findings demonstrate that both comparisons yielded component score effect sizes larger than that of total words generated for both phonemic and semantic fluency. In addition, semantic fluency component scores were specifically found to correspond to larger component score effect sizes than phonemic fluency component scores.

Conclusions: While verbal fluency tests such as the Controlled Oral Word Association test may be a useful test tool to elicit evidence of neuropsychological impairment in patients who have incurred a moderate or severe TBI, our findings are consistent with previous research in

demonstrating that it is not sensitive enough to be considered clinically discriminative, particularly beyond the expected timeframe of recovery. Yet, our findings also demonstrate that component scores derived from this test may benefit the practicing clinician and add to their neuropsychological test toolbox an additional index of verbal fluency that is more sensitive to moderate and severe TBI.

Correspondence: *Elyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A5, Canada. E-mail: eliyas.jeffay@utoronto.ca*

K.A. MCGUIRE, M.M. BLAHNIK, A.H. SIM, M.L. OIEN & G.J. LAMBERTY. Neuropsychological Characteristics in OEF/OIF Veterans and Service Members with High vs. Low Demoralization on the MMPI-2.

Objective: Researchers have found increased risk of mental health problems in individuals returning from combat operations in Iraq and Afghanistan (Hoge, 2004; 2009). Psychiatric symptoms also have been found to impact cognitive performance (Elliot, 1998). The current study examined associations between performance on neuropsychological measures and general neuropsychiatric distress in OEF/OIF Veterans and service members referred to the Polytrauma Rehabilitation Center at the Minneapolis VA Health Care System for further assessment of mild TBI (mTBI).

Participants and Methods: A retrospective chart review was completed on 90 OEF/OIF Veterans and service members who were referred for neuropsychological evaluation, had passed symptom validity testing (TOMM), and had completed the MMPI-2. Analyses included independent samples t-tests comparing neuropsychological performance of individuals with clinically elevated scores on the MMPI-2 Demoralization RC scale (RCd) and those who scored within normal limits on RCd. **Results:** Individuals with high RCd scores performed significantly more poorly than those low on RCd on Stroop Word, Color, and Interference scales, BVMR-Delayed Recall, Trails A and B, and Digit Span. Trends toward weaker performance on CVLT-II Delayed Free Recall, PASAT Total, and Digit Symbol also were noted.

Conclusions: OEF/OIF Veterans and service members presenting for assessment of mTBI who reported high levels of demoralization also demonstrated weaker performance on tasks of memory, processing speed, and working memory. These findings are consistent with the literature to date and underscore the importance of assessing emotional functioning as part of neuropsychological evaluation in the OEF/OIF population.

Correspondence: *Kathryn A. McGuire, Ph.D., Physical Medicine & Rehabilitation, Minneapolis Veterans Affairs Health Care System, One Veterans Drive, 4K TBI, Minneapolis, MN 55417. E-mail: kathryn.mcguire@va.gov*

J.A. MORENO & M. MCKERRAL. Sexuality after traumatic brain injury.

Objective: Traumatic brain injury (TBI) can directly and indirectly affect important aspects related to sexuality and sexual function due to the various cognitive, psychiatric/behavioral and physical/functional sequelae presented by survivors. In fact, it has been suggested that 50 to 60% of persons with TBI report some level of disruption in their post-injury sexual functioning. A comprehensive examination of the literature on sexuality after TBI and its clinical implications is required to understand the perception from different perspectives (patient, partner, clinician). The objective of this study was to critically review the empirical evidence concerning TBI and sexuality.

Participants and Methods: A literature review was performed in databases related to psychology and health sciences such as PsychINFO, Proquest, PsychArticles, and Medline. The keywords that were used in the search were traumatic brain injury and sexuality, and their variants.

Results: Studies were classified according to the participants enrolled and findings are presented from the professionals' (7%), the patients' (64%), the non-injured spouse's (7%), and the patient-partner's perspectives (22%).

Conclusions: Most of the evidence based literature concerning TBI and sexuality has been described from the patient's perspective. The partner's perspective was addressed primarily to have an index of the effect of sexual dysfunction on the relationship and only in one study it was used to establish if the patient's self-report was an accurate measure of his or her actual sexual functioning. Loss of insight or anosognosia may limit the patient's self-perception of deficits and may be an obstacle when trying to get reliable information concerning sexuality issues. A comprehensive approach is required to address sexual functioning of TBI survivors since they have special medical, legal, behavioral, and education needs.

Correspondence: *Jhon A. Moreno, MSc, Alexander Moreno, Université de Montréal, 2350 Boulevard Édouard-Montpetit Apt: 14219, Montréal, QC H3T1J4, Canada. E-mail: neuropsicalex@yahoo.fr*

C. OGRAM, D.M. RAMANATHAN & F.G. HILLARY. Age Disparities in Functional Outcome Following TBI.

Objective: Despite known differences in outcome following traumatic brain injury (TBI) between young adults and the elderly, there is a lack of research examining specific areas of functional outcome affected by age at hospital discharge. This study examined young adults and elderly individuals with TBI to understand the influence of age on Functional Independence Measure (FIM) scales.

Participants and Methods: This study analyzed 1,615 individuals with moderate to severe TBI from the Hershey Medical Center Trauma Database from 1978 to 2008. Functional level was determined using discharge scores on the FIM for individuals in two age subgroups: young adults (18-30) and elderly (65-97).

Additionally, two elderly subgroups were created: 65-78 and 79-97.

Results: MANOVA analyses demonstrated that elderly adults had significantly lower total FIM scores compared to younger adults. However, within the FIM scales, significant between-group differences were only demonstrated on two subscales: Locomotion and Transfer Mobility.

No significant differences were found between elderly subgroups (ages 65-78 and 79-97) on FIM total or subscale scores.

Conclusions: The results demonstrate differences in functional outcome between elderly and young adults following TBI, specifically in FIM subscales measuring physical abilities. This finding may be attributable to pre-morbid physical limitations in the elderly that hinder their ability to achieve a full FIM score regardless of injury. Moreover, advancing age within the elderly sample was not associated with poorer outcomes. These findings indicate the importance of age-corrected norms for the FIM, which can better guide rehabilitation and interventions post-injury.

Correspondence: *Caitlin Ogram, The Pennsylvania State University, 906 Stargazers Rd, Coatesville, PA 19320. E-mail: cmo16S@psu.edu*

R.V. PARISH, R.L. COLDREN, M.L. RUSSELL, M.P. KELLY & M. DRETSCH. No Significant Differences between Blast and Blow Concussions in Soldiers in a Combat Environment across Multiple Neurocognitive Measures and Symptoms.

Objective: The current study seeks to evaluate whether significant differences exist between individuals with blast versus blow-related concussions across neurocognitive screening measures, reported concussive symptoms, demographic, mental or physical health factors. It is hypothesized that no significant differences exist between the groups.

Participants and Methods: Seventy-one U.S. Army Soldiers (age 18-50) presenting for concussion-related care within 72 hours of event in Iraq were assessed by MACE, ANAM, and traditional neurocognitive tests from January to April 2009. Follow-up ANAM testing was performed 10 days after initial testing +/- 5 days. Extant pre-injury baseline ANAM results were obtained. Causes of concussions were tracked: blast vs. blow vs. combination. Demographic and symptom information was obtained by questionnaire.

Results: Statistical analysis was performed using Stata v11.1. Proportions were compared using Fisher's exact test and continuous data with the Mann-Whitney U test or the Kruskal Wallis test, since the data was

not normally distributed and the sample size too small to invoke the Central Limit Theorem. A p-value of <0.05 was considered statistically significant. Twenty-one subjects were excluded: two for poor effort, three female subjects, and 16 with combined blast/blow injuries. Of the remaining 50 male subjects, 34 had blast injuries and 16 blow injuries. There were no statistically significant differences in between blast and blow subjects in demographic, service, physical or mental health factors; sleep; concussive symptoms; MACE, traditional neurocognitive testing, post-injury ANAM, or follow-up ANAM scores (available on 21 blast and 13 blow subjects). Pre-injury ANAM scores were compared where available and no statistically significant differences were seen between 22 blast and 8 blow subjects.

Conclusions: These findings suggest no significant differences between blast and blow concussion sequelae in Soldiers in a combat environment across multiple neurocognitive measures and symptoms.

Correspondence: *Robert V. Parish, Ph.D., Landstuhl Regional Medical Center, CMR 402 Box 2095, Apo, AE, NY 09150. E-mail: rparish@yahoo.com*

N.J. PASTOREK, K.L. MAESTAS, S.M. LIPPA & M. TROYANSKAYA. Effect of Demographic and Clinical Characteristics on Social Participation in Returning Veterans with Histories of Mild Traumatic Brain Injury.

Objective: Measurement of rehabilitation outcome in veterans with histories of mild traumatic brain injury (mTBI) is complicated by several key issues including relatively lengthy time since injury and the presence of comorbid physical and psychiatric conditions. While monitoring symptom severity may be informative for the management of individual symptoms, success in social participation may be more relevant for treatment planning and outcome evaluation in a population of individuals already living in the community. The aim of this study was to identify demographic and clinical characteristics that influence social participation in veterans with histories of mTBI.

Participants and Methods: The impact of symptoms on social participation was measured cross-sectionally in 73 Operation Enduring Freedom/Operation Iraqi Freedom veterans (57 participants with histories of mTBI and 16 controls) with the Participation Index from the Mayo-Portland Adaptability Inventory-4, an 8-item scale developed to measure social participation in individuals with acquired brain injury. The Participation Index was completed via self report.

Results: In regression analyses with age, gender, education, time since deployment, and mTBI status as predictors, only mTBI status was associated with social participation ($\beta = .28, p < .05$), with the model accounting for 17.3% of the variance in social participation ratings. The addition of presence/absence of depression, posttraumatic stress disorder, and postconcussive syndrome to the model described above accounted for an additional 29.0% of variance, with posttraumatic stress disorder ($\beta = .41, p < .01$) then being the only predictor in the full model that was associated with social participation.

Conclusions: In conclusion, success in social participation is affected by mTBI status, although posttraumatic stress disorder appears to have a more significant impact on social participation in the population of returning veterans.

Correspondence: *Nicholas J. Pastorek, Ph.D., Michael E. DeBakey VA Medical Center, 2002 Holcombe Blvd, RCL 117, Houston, TX 77030. E-mail: nicholas.pastorek@gmail.com*

R.K. PEACH. Cognitive Deficits Associated with Impaired Discourse Production After Traumatic Brain Injury.

Objective: Recent work has shown that sentence planning is disrupted following traumatic brain injury (TBI). What is unknown is whether this is due to a fundamental linguistic deficit or to impairments to other cognitive processes. This study investigated whether problems with sentence planning for discourse after TBI are associated with impaired linguistic processes, disturbances to attention, memory, executive functioning, concept formation and/or reasoning, or some combination of these processes.

Participants and Methods: Fifteen individuals six months post severe TBI matched for level of language functioning participated in this study. Discourse samples were obtained and transcribed orthographically. The mean number of mazes (fillers, repetitions, revisions) per utterance was calculated to index sentence planning and monitoring. Cognitive measures were also completed including Trail Making Test, Sentence Repetition and Digit Span Forward, Digit Span Backwards, Controlled Oral Word Association, Boston Naming Test, Likenesses and Differences (Similarities), Verbal Absurdities and Raven's Coloured Progressive Matrices (RCPM). Stepwise linear regression analysis was performed to determine the way that cognitive deficits contribute to participants' discourse production.

Results: A significant model was built accounting for 62 percent of the variation in participants' sentence planning. Sentence Repetition and RCPM were chosen as significant predictors with sentence planning being negatively affected by sentence repetition performance and positively affected by RCPM performance.

Conclusions: Sentence planning deficits for discourse following TBI are associated with impairments in the recruitment of attention for language processing. RCPM inclusion in the model is consistent with previous findings showing problems for language impaired individuals on this task.

Correspondence: *Richard K. Peach, Ph.D., Communication Disorders & Sciences, Rush University Medical Center, 1018B Armour Academic Center, 600 South Paulina Street, Chicago, IL 60612. E-mail: richard_k_peach@rush.edu*

A. PEECHATKA, J.D. MEDAGLIA, K.S. CHIOU, J. SLOCOMB, D.M. RAMANATHAN & F.G. HILLARY. A Longitudinal fMRI Study of Working Memory in TBI During Early Recovery.

Objective: Working memory (WM) is a fundamental cognitive process that is susceptible to deficit following traumatic brain injury (TBI). Previous literature using functional imaging to examine working memory consistently revealed recruitment of the prefrontal cortex and anterior cingulate cortex after injury. Recent work has demonstrated that prefrontal recruitment can be reduced by task practice and has a negative relationship with performance.

Participants and Methods: The goal of this study was to examine working memory over early recovery within 9 participants with moderate to severe TBI (3-12 on the Glasgow Coma scale) at 3, 6, and 12 months post injury. At each time point, participants completed non-verbal working memory tasks during functional imaging data collection on a 3T MRI scanner.

Results: Paired sample t-tests indicated that over time whole brain fMRI signal significantly increased from 3 months to 6 months and from 6 months to 12 months. Region of interest analysis indicated that from 3 months to 6 months fMRI signal in the left prefrontal cortex (LPFC) increased followed by a signal decrease from 6 months to 12 months. Conversely, involvement of the right prefrontal cortex (RPFC) decreased from 3 months to 6 months and remained the same from 6 months to 12 months.

Conclusions: The behavior of the RPFC suggests that during neural stress the RPFC is highly recruited but as recovery time increases the RPFC signal subsides without concurrent decrease in task performance. These findings may support a neural efficiency hypothesis in which less PFC modulation is seen during better performance.

Correspondence: *Alyssa Peechatka, Psychology, Pennsylvania State University, 251 E College Ave, State College, PA 16801. E-mail: alp5230@psu.edu*

M. POTVIN, V. PARADIS, P. BRAYET, J. GIGUÈRE & I. ROULEAU. The EXACT (EXAMen Cognitif abrégé en Traumatologie): Proposition of a Brief Cognitive Examination in Traumatology.

Objective: The role of the clinical neuropsychologist in trauma hospitals is to briefly assess the global cognitive functioning of patients who sustained a traumatic brain injury (TBI) in order to determine their

orientation at the time of discharge. However, the few global cognitive instruments available for this clinical purpose present certain limits. The aim of this study was to design a new test: 1) that can be administered bed side; 2) that briefly assesses all cognitive functions; and 3) that is sensitive to the sequelae of a TBI.

Participants and Methods: The EXACT is composed of 22 subtests assessing different cognitive processes (maximum score totaling 100 points). This test can take approximately 20 minutes to be performed. The EXACT was administered to 21 normal control participants (aged 18 to 71 years) and 23 patients (aged 17 to 76 years) hospitalized for a mild to severe TBI sustained two months prior.

Results: Analyses showed that the total score obtained by TBI patients (mean 82.39 ± 15.66) was significantly lower than that of normal control participants (mean 97.14 ± 2.27). Items assessing processing speed, behavioral regulation, calculation, episodic memory, working memory, attentional and executive functions (i.e. abstraction, reasoning and mental activation) were more impaired than those evaluating visual gnosis, ideomotor praxis and language (denomination, oral expression, oral/written comprehension, reading and repetition). Results on the EXACT were significantly correlated with the performance on the MMSE ($r = 0.92$).

Conclusions: The EXACT appears to be a useful brief clinical test to assess the global cognitive functioning of patients hospitalized with a TBI. Correspondence: *Marie-Julie Potvin, Ph.D., Neurotraumatologie, Hôpital du Sacré-Coeur de Montréal, 5400, Boulevard Gouin Ouest, Montréal, QC H4J 1C5, Canada. E-mail: potvin.marie_julie@courrier.uqam.ca*

A.R. RABINOWITZ & P.A. ARNETT. Cognitive Inconsistency Before and After Sports-Related Concussion in a Sample of College Athletes.

Objective: In older individuals, intraindividual variability across a neuropsychological test battery has been associated with impending cognitive decline and dementia (Kliegel, 2004; Holtzer et al., 2008). The present study examines cognitive inconsistency within college athletes tested at baseline and post-concussion.

Participants and Methods: As part of a sports-concussion management program, 71 college athletes were administered a battery of neuropsychological tests and a measure of symptoms (Post-Concussion Symptom Scale, PCSS) at baseline and post-concussion. Test indices were transformed into standard score units, using athletes at baseline as a reference. The intraindividual mean of these scores was derived as a measure of overall performance, and the intraindividual standard deviation was derived as a measure of performance variability.

Results: Performance variability was significantly greater than 0 at baseline ($M = 12.05$; $t_{70} = 23.20$; $p < .001$) and post-concussion ($M = 12.39$; $t_{70} = 21.30$; $p < .001$). Overall performance was negatively correlated with performance variability at both time points ($r = -0.44$; $p < .001$; and $r = -0.52$; $p < .001$, respectively). At both time points, the WTAR FSIQ estimate was significantly correlated with overall performance, but not performance variability. Paired sample t-tests revealed that overall performance and performance variability did not differ across time-points.

Conclusions: Results suggest that there is a relationship between cross-test intraindividual variability and mean level of performance, such that, as performance improves cross-test variability decreases. There was no effect of concussion on overall performance or performance variability. Clinical and theoretical implications of these findings will be addressed.

Correspondence: *Amanda R. Rabinowitz, M.S., Psychology, The Pennsylvania State University, 95 Governor Street, 1B, Providence, RI 02906. E-mail: arr200@psu.edu*

D.M. RAMANATHAN, N. MCWILLIAMS, P. SCHATZ & F.G. HILLARY. Increase in Traumatic Brain Injury Incidence in Older Adults: 18-Year Trends in Pennsylvania.

Objective: A trimodal age distribution of traumatic brain injury (TBI) risk has been identified indicating children under 5, individuals between the ages of 15-24 and 65 years and older are at the greatest risk for in-

jury. However, in addition to being at greater risk for TBI, older adults tend to have poorer outcomes compared to young adults. Currently, there is a need for research focusing on how elderly TBI has changed as the US population shifts. Thus, this study aimed to provide a statewide account of moderate-severe TBI incidence rates in the elderly.

Participants and Methods: The current study analyzed data from Pennsylvania accredited trauma centers collected in the Pennsylvania Trauma Outcome Study between 1992-2009. Incidence rates for TBI were calculated using US Census Bureau estimates for individuals ages 65-90 (separated into 3 subgroups: 65-73, 74-82 and 83-90).

Results: Out of 18,164 moderate-severe TBIs sustained by adults in Pennsylvania, individuals ages 65-90 accounted for 3,895 (21%). The incidence of elderly TBI has approximately doubled in the past 18 years. This increase remains after controlling for population growth and increases in trauma centers. Data indicate that the increase in elderly TBI is greatest for individuals ages 83-90.

Conclusions: Individuals 83-90 years of age have the highest risk for injury in the current study. Prevention and awareness of TBI in the elderly is imperative in reducing the likelihood of injury and disability. Therefore, continued statewide work is needed to demonstrate trends in elderly TBI nationwide to further add to the knowledge base used for prevention and rehabilitation work.

Correspondence: *Deepa Ramanathan, M.S., The Pennsylvania State University, 610 Bruce V. Moore Building, University Park, PA 16802. E-mail: deepar@psu.edu*

M. RAMIREZ FLORES & F. OSTROSKY SHEJET. Which neuropsychological tests allow differentiate the severity of TBI?

Objective: The traumatic brain injury (TBI) causes cognitive disturbances that remain years after the injury. The life expectancy of patients with TBI is directly related to physical-cognitive sequelae. It is common to use a compendium of neuropsychological tests to determine the severity of cognitive impairment, which extends the evaluation, however it is important to determine which of them could give a better and faster approach to grade severity. The aim of this study was to analyze a group of patients with TBI and healthy group, which are more sensitive neuropsychological tests to detect deficiencies after TBI.

Participants and Methods: Were evaluated 25 patients (severe = 15, Moderate = 10) of 31.6 ± 10.2 old years and 13.8 ± 3.2 years of schooling, paired with a healthy control group. Were applied neuropsychological neuropsychological attention and memory (23 tests that measure verbal and visual memory, different types of attention and executive functions), Battery frontal lobe and executive functions (14 tests that assess aspects dorsolateral, orbitofrontal and fronto-medial areas).

Results: Cluster analysis identified four tests in the area of memory, attention (Rey complex figure, visual detection, episodic memory) and five for executive functions (subtraction 40-3, WCST, semantic grouping, Stroop interference, Proverbs).

Conclusions: Together, these tests allowed reclassifying patients in cognitive severity levels, which allows more accurate assessment with brief tests, which benefits the patient to get his prognosis for recovery and helps determine the assessment process or treatment to follow.

Correspondence: *Maura Ramirez Flores, Psychophysiology, Faculty of Psychology, National Autonomous University of Mexico, Av. Universidad 3004, UNAM, Mexico City 04510, Mexico. E-mail: mau_ramz@comunidad.unam.mx*

M. RAMIREZ FLORES & F. OSTROSKY SHEJET. Computerized Neuropsychological Battery in Mexican TBI's Patients.

Objective: Recently the use of computerized neuropsychological tests has been increasing due to the ease of doing cognitive measures in several people at once, as well as the ability to move the material for eval-

uation. In patients with traumatic brain injury (TBI), the effects of secondary injury such as ischemia, hemorrhage, and so on, is important to make measurements that allow medical personnel to act quickly. The purpose of this study was to assess the cognitive deficits of patients with TBI and compared with a healthy control group.

Participants and Methods: Were assessed 10 patients with TBI and 10 controls, mean age was 32 years old and 12 years of education. Was applied a Computerized Neuropsychological Battery (Lozano and Ostrosky, 2007), which consists of 17 tasks that assess the areas of attention and executive functions, verbal and visual memory, reaction time and laterality, also are provided in each one the scores of correct answer and runtime.

Results: Differences were found in verbal memory ($p=.025$), association ($p=.031$), visual memory ($p=.006$), CNT ($p=.048$), simple reaction time ($p=.036$); complex reaction time ($p=.010$), go no go ($p=.000$), and semi-complex figure ($p=.020$). The data suggest a decreased ability to process verbal and visual memory in encoding and recall, decreased simple and complex reaction time, and difficult to inhibit behavior, possibly linked to the presence of diffuse axonal injury.

Conclusions: The results suggest the usefulness of computerized battery for cognitive assessment in Mexican patients with TBI because the data are similar to those found with pencil-paper tests, computerized tests allow obtain data quickly as well as help to formulate health intervention programs and cognitive consulting for people with TBI.

Correspondence: *Maura Ramirez Flores, Psychophysiology, Faculty of Psychology, National Autonomous University of Mexico, Av. Universidad 3004, UNAM, Mexico City 04510, Mexico. E-mail: mau_ramz@comunidad.unam.mx*

K.A. REDMOND, A.R. LOUGHAN & R. PERNA. Functional Gains and Traumatic Brain Injury: Transdisciplinary Neurorehabilitation Interventions for Patients with Long Standing TBI.

Objective: Literature regarding functional gains after brain injury suggests that the majority of improvements made by individuals occur within the first two years of treatment. There is minimal research addressing the efficacy of neurorehabilitation interventions beyond two years post-injury. This study examines improvements in adaptive functioning based on years post injury.

Participants and Methods: Individuals ($N=238$; M age=39.2; 66% men, 34% female) receiving transdisciplinary neurorehabilitation services were assessed at admission and discharge using the Mayo Portland Adaptability Inventory-4 (MPAI-4; Malec & Lezak, 2003). Individuals were placed into one of three groups depending on years post injury (Group A=0-2yrs, $n=29$; Group B=2-4yrs, $n=34$; Group C=4+yrs, $n=176$). Within group and between group analyses were performed.

Results: Analyses found significant improvement at discharge compared to admission in all three groups as measured by the MPAI-4 (Group A: $t=3.975$, $p=.000$; Group B: $t=2.970$, $p=.006$; and Group C: $t=8.975$, $p=.000$). When investigating the differential benefit between groups, no significance was found ($F=1.274$, $p=.136$), indicating that each group showed equivalent improvement in areas such as cognitive, motor, and sensory abilities, emotional and interpersonal adjustment, and social participation.

Conclusions: Results from this study revealed that neurorehabilitation treatments produce functional gains in each of the groups studied, which suggests brain plasticity long post injury. Additionally, no significant change difference between the three groups indicates that improvements are being made regardless of years post injury. This purports functional recovery may be attained far beyond the previously suggested two year post-recovery timeframe. Correspondence: *Kelly A. Redmond, MS, Walden University, 293 Coldbrook Rd, Hampden, ME 04444. E-mail: fire2750fighter@yahoo.com*

K. HOLLEY, P. ROSKOS, K. LINDSAY, J.D. GFELLER & R. BUCHOLZ. The Reliability and Validity of the Neurological Outcome Scale for Traumatic Brain Injury (NOS-TBI) in Persons with Post-Acute Traumatic Brain Injury (TBI) and Healthy Control Participants.

Objective: The NOS-TBI was developed based on the NIH Stroke Scale to measure neurological deficits following TBI. Studies conducted by the

NOS-TBI authors indicated the inventory has adequate psychometric properties in acute TBI patients. This study further examined the psychometrics of the NOS-TBI using a community sample of post-acute TBI patients and healthy controls. In the current study, internal consistency reliability and correlations between the NOS-TBI and other outcome measures were calculated. Differences in NOS-TBI scores between control participants and mild, moderate, and severe TBI participants were expected.

Participants and Methods: Seventy-seven participants were administered the NOS-TBI as part of an ongoing prospective study (49 TBIs and 28 controls). Cronbach's alpha, Spearman's Rho correlations, and univariate analyses were calculated.

Results: Internal consistency of the NOS-TBI was found to be high (Cronbach's alpha = .80). The NOS-TBI had multiple moderate significant correlations (ranging from -.33 to .41) with other outcome measures used in TBI (e.g. Disability Rating Scale, Community Integration Questionnaire, and neuropsychological tests) in the expected direction. NOS-TBI scores were significantly higher in the TBI participants compared to controls ($F=6.53$, $p<.05$). Post-hoc comparisons showed that severe TBI patients had significantly higher scores compared to mild TBI patients, moderate TBI patients, and controls.

Conclusions: Results provide additional supportive psychometric data for the NOS-TBI and suggest the inventory assesses a related, but unique, construct compared to other instruments. In our sample, the NOS-TBI appeared most sensitive to neurological deficits in severe TBI patients. Findings suggest that the NOS-TBI has promise as a measure that complements other TBI outcome instruments.

Correspondence: *P. Tyler Roskos, PhD, Neurosurgery, Saint Louis University, 1320 South Grand Blvd., O'Donnell Hall, St. Louis, MO 63104. E-mail: roskspt@slu.edu*

S. ROSTAMI, J.D. MEDAGLIA, E.J. BRYER & F.G. HILLARY. Functional Imaging Findings of Working Memory after Traumatic Brain Injury: a Meta-analysis.

Objective: In the past decade, a number of studies have examined cognitive function in traumatic brain injury (TBI) via functional neuroimaging techniques. Independent research has demonstrated increased functional activation in TBI samples during cognitive tasks, especially those involving working memory (WM). This meta-analysis compiles the results from studies which used functional magnetic resonance imaging (fMRI) to examine WM functioning in individuals with TBI compared to healthy individuals.

Participants and Methods: Functional neuroimaging data from a total of 346 adults who sustained mild, moderate, and severe TBI and 296 demographically matched healthy adults from 20 studies were included in the current meta-analysis.

Results: It was found that adults with TBI reveal WM impairments associated with increased cerebral activation in the right hemisphere, irrespective of the WM task or TBI severity. Prefrontal cortex (PFC) recruitment in TBI subjects was most commonly observed.

Conclusions: Overall, the results indicate recruitment of neocortical regions associated with cognitive control during demanding tasks. These findings of this study will be discussed in the context of competing hypotheses regarding the nature of neural recruitment in PFC.

Correspondence: *Sohayla Rostami, Department of Psychology, The Pennsylvania State University, 610 Bruce V. Moore Building, University Park, PA 16802. E-mail: sur5154@psu.edu*

L.A. SCHAEFER, H. HENKELL & K. SULLIVAN. The MoCA in Inpatients with Traumatic Brain Injury: Relationship to Functional Outcome.

Objective: The Montreal Cognitive Assessment (MoCA) was developed to identify mild cognitive impairment (Nasreddine, et al, 2005). It has also been used in other populations, including vascular disease and stroke (Pendlebury et al, 2010), and was found to be superior to the MMSE as a screening tool amongst rehabilitation inpatients (Ag-

garwal & Kean, 2010). Its relationship to functional outcome in acute rehabilitation patients has also been examined in stroke (Toglia et al, 2011), but not in traumatic brain injury (TBI). This study examines the relationship between cognitive impairment, as measured by the MoCA, and discharge functional status and improvement in acute TBI inpatients.

Participants and Methods: A retrospective analysis of inpatients on an acute rehabilitation unit of a suburban academic medical center with primary diagnosis of TBI or who were referred for cognitive assessment due to suspected TBI (N=19; mean age = 49 years; 11 male, 8 female) was conducted. All patients were administered the MoCA and FIM. The motor subscale of the FIM (mFIM) at discharge and motor relative functional efficiency (mRFE) were each computed and correlated with the MoCA, and MoCA subscores, using Spearman rank correlation coefficients.

Results: There was no significant association between MoCA scores and the mFIM (Spearman $r = .084$; $p=0.731$), although there was a trend toward significance with mRFE (Spearman $r = .431$; $p=0.066$). The MoCA visuoexecutive subscore did show a significant correlation with mRFE (Spearman $r = .506$; $p=0.027$). There was also a trend toward significance for the MoCA attention subscore and the mRFE (Spearman $r = .412$; $p=0.080$).

Conclusions: The MoCA visuoexecutive subscore was the strongest predictor of functional improvement in the TBI patients, even more so than the total score. These results replicate those of Toglia, et al (2011). Although this was a retrospective study with a small N, this study highlights the value of using the MoCA with TBI patients given its relationship to functional outcome.

Correspondence: *Lynn A. Schaefer, PhD, Physical Medicine and Rehabilitation, Nassau University Medical Center, 2201 Hempstead Turnpike, Box 31, East Meadow, NY 11554. E-mail: lschae@numc.edu*

A.L. SHANDERA-OCHSNER, D. BERRY, J.P. HARP, M. EDMUNDSON, L.O. GRAUE, A. ROACH & W.M. HIGH. Outcome in OIF/OEF Veterans with PTSD and History of Concussion.

Objective: While there is literature on the neuropsychological consequences of PTSD or mTBI alone, less has been done to explore their combined effect. The major goal of the study was to determine whether OIF/OEF veterans with PTSD+mTBI have poorer cognitive and psychological outcomes than veterans with PTSD-o, mTBI-o, or combat exposure alone. Two specific aims were based on previous research. 1.) To determine whether veterans with PTSD+mTBI have deficits in information processing speed and response inhibition relative to veterans in the other groups. 2.) To explore characteristics of veterans with PTSD+mTBI by examining differences on measures of psychiatric distress.

Participants and Methods: The sample included 19 OIF/OEF veterans with histories of deployment mTBI (mTBI-o), 18 with current PTSD (PTSD-o), 21 with PTSD+mTBI, and 21 with combat experience but no PTSD or deployment mTBI (CC). Groups were formed using structured interviews for deployment mTBI and PTSD. All participants underwent comprehensive neuropsychological testing, including neurocognitive and psychiatric malingering tests. Veterans who scored outside established cut points on any malingering test were excluded from analyses.

Results: Results of 2-way ANOVAs of cognitive tests revealed a significant PTSDxmTBI interaction on D-KEFS phonemic fluency. Significant main effects of PTSD were found on 2 D-KEFS switching tasks, D-KEFS verbal fluency, verbal memory (immediate, short, & long-delay), & reaction time/variability. Significant main effects for mTBI were found on 3 D-KEFS switching tasks, short-delay verbal memory, processing speed, and reaction variability. 2-way ANOVAs of psychiatric tests revealed main effects of PTSD for a large number of MMPI-2-RF and other scores. mTBI showed main effects on several psychiatric variables.

Conclusions: Overall, the pattern of results suggests that the separate effects of current PTSD and history of deployment mTBI in veterans of OIF/OEF may produce worse neuropsychological profiles in those who have both.

Correspondence: *Anne L. Shandera-Ochsner, M.S., University of Kentucky, 4030 Tates Creek Road, #1147, Lexington, KY 40517. E-mail: ashandera@gmail.com*

J.R. SOBLE, L.B. SPANIERMAN & J. FITZGERALD SMITH. Neuropsychological Functioning of OEF/OIF Combat Veterans with PTSD and Mild TBI.

Objective: Previous research has found that Posttraumatic Stress Disorder (PTSD) is associated with impaired neuropsychological functioning, particularly with attention and memory, among combat veterans. However, the blast-related injuries hallmark to the wars in Afghanistan (Operation Enduring Freedom [OEF]) and Iraq (Operation Iraqi Freedom [OIF]) has resulted in a new population of combat veterans who sustained a mild traumatic brain injury (TBI) in addition to PTSD. Indeed, much remains unknown of the cognitive impairment and outcomes associated with this novel PTSD/mild TBI comorbidity. Thus, the purpose of the present study was to investigate potential differences in the neuropsychological functioning of OEF/OIF combat veterans with PTSD and a comorbid mild TBI versus those with classic PTSD.

Participants and Methods: The researchers used a record review design and examined the neuropsychological assessment data of 125 OEF/OIF combat veterans (59 with classic PTSD and 66 with PTSD and comorbid mild TBI) across the seven central domains of neuropsychological functioning.

Results: Profile analyses yielded three findings. First, the neuropsychological functioning of those with PTSD and comorbid mild TBI did not differ significantly from those with classic PTSD. Second, neither group demonstrated notable performance deficits across measures of cognitive functioning. Finally, both groups reported elevated symptoms of depression and anxiety in the moderate severity range.

Conclusions: The lack of observed neuropsychological deficits combined with elevated levels of psychopathology suggests that comorbid mental health conditions may underlie subjective cognitive complaints. Thus, interventions aimed at first addressing PTSD and associated mental health conditions may prove advantageous in treating combat veterans with comorbid mild TBI.

Correspondence: *Jason R. Soble, M.S., Counseling Psychology, University of Illinois at Urbana-Champaign, 17102 Carrington Park Dr., Unit 329, Tampa, FL 33647. E-mail: soble@illinois.edu*

S. SORG, M.W. BONDI, N. LUC, E. LANNI, D.M. SCHIEHSER, D.C. DELIS, L.R. FRANK & L. DELANO-WOOD. Loss of Consciousness is Associated with Disrupted Frontal White Matter and Impaired Executive Functions in Veterans with Mild Traumatic Brain Injury.

Objective: Many Afghanistan and Iraq war veterans continue to struggle years after withstanding a mild traumatic brain injury (mTBI). The range of severity from being dazed to experiencing formal losses of consciousness (LOC) may partly account for variable long-term cognitive and functional outcomes post-mTBI. As reduced white matter integrity and impaired executive functioning (EF) are associated with TBI, we used diffusion tensor imaging (DTI) to investigate whether injury severity (LOC) was related to executive dysfunction and white matter integrity.

Participants and Methods: Thirty-six combat military veterans with mTBI completed neurocognitive assessment and were scanned using DTI. EF impairment was defined as 1 SD below the mean on one or more of three EF tests. Fractional anisotropy (FA) was extracted from known TBI predilection sites identified on diffusion images.

Results: After removing 10 participants due to suboptimal effort, 11 of 26 participants evidenced executive dysfunction. Of participants reporting LOC (n=14), 57% were impaired on EF, compared with just 25% of the non-LOC group (n=12, $p<.10$). DTI analysis found lower FA within the ventral ($p<.01$) and dorsal ($p<.04$) prefrontal white matter, and splenium ($p<.05$) in the LOC group. Groups did not differ on demographic characteristics or psychiatric measures.

Conclusions: Within our sample of combat veterans, LOC was associated with poorer white matter integrity in frontal and posterior regions, and the LOC group demonstrated a higher proportion of EF impairment than the non-LOC group. Findings highlight the heterogeneity of cognitive outcomes following mTBI and suggest that identifying the severity level within mTBI may aid prognosis and guide treatment.

Correspondence: *Scott Sorg, UCSD, 8500 Gillman Drive, La Jolla, CA 92307. E-mail: ssorg@ucsd.edu*

J. DYKSTRA, E. BOLINGER & J. SUHR. The Effects of Negative Response Expectancies on Head Injury Recall and PCS Symptom Report in Football Players.

Objective: Research on negative response expectancies suggests individuals may have different perceptions of their condition after exposure to negative information. We assessed the effects of diagnosis threat in football players who initially reported no head injuries.

Participants and Methods: Football players were randomly assigned to read an article about football players getting dementia (n=56) or about football players being ambidextrous (n=55). They completed scales assessing neuroticism, Barnum vulnerability, and state mood, in addition to cover story measures assessing scientific understandability of the "sports psychology" articles. The two groups were compared on post-study report of head injury history and PCS symptoms.

Results: Individuals who read about dementia recalled more prior head injuries than individuals who read the ambidexterity article, $p<.05$. Groups were not different in PCS symptoms. PCS symptom report was related to higher neuroticism, $p<.001$, Barnum vulnerability, $p<.001$ and current negative affect, $p=.002$, but was not related to number of concussions, $p=.60$, or years of playing football, $p=.71$.

Conclusions: Consistent with prior studies, PCS symptom report was vulnerable to psychological factors and not head injury variables. Although results suggested diagnosis threat resulted in inaccurate recall of head injury history, it was not related to PCS report. Possible explanations for findings include general athlete expectations for good recovery after head injury, which may have resulted in defensiveness in the diagnosis threat group, or, given the study was conducted in a year in which the relation of football playing to neurological consequences was highlighted in the media, awareness of the threat in the control group.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

P. SUNDERARAMAN, J. ANG BS., B.J. SANDELLA MD., N. ZAHEDI., D. MARTIN BS., E.S. HONG MD, & M.T. SCHULTHEIS PHD. Preliminary descriptors of changes in neuropsychological performance and driving performance in young adults after concussion.

Objective: To examine and describe the changes in performance on cognitive tests (paper-and-pencil and computerized) and changes in driving performance, at two time points – immediately after concussion, and after medical clearance was given for return-to-play.

Participants and Methods: Prospective design, with consecutive referrals from the athletic trainer were assessed immediately after the concussion (x=3 days), and again after medical clearance was given for return to play. All data were collected in an outpatient research setting. Participants were college students (N=9; 5 males, 4 females) with clinically diagnosed concussion. Mean age was 20 years, and 90% of them were Caucasians. All were active drivers with greater than 2 years driving experience. The mean number of previously reported concussions was two.

MAIN OUTCOME MEASURES: Participants were administered neuropsychological measures of attention, working memory and processing speed [parallel forms of the Symbol Digit Modalities Test (SDMT), Trails A and B and Digit Span], the Immediate Post-Concussion Assessment and Cognitive Testing (the ImPACT test), and a behind-the-wheel (BTW) driving simulator evaluation. For the driving performance, center lane deviation and velocity (speed) were examined for simple straight lane segments without distractions.

Results: Preliminary examination indicated that almost 90% of the participants had improved performance on the relatively less complex tests (Trails A, and composite Speed measures from the InPACT). Comparatively only 63% showed improvements on the complex measures of working memory. Driving performance improvement was observed in 66% of the participants.

Conclusions: This preliminary evaluation of cognitive and driving performance suggests that changes in performance can be measured as recovery from concussion occurs. Greater variability in observed improvement in cognitively complex tasks and driving measures may suggest less recovery in these higher order domains and functional task. Correspondence: *Preeti Sunderaraman, Second Year Graduate student in Neuropsychology., Drexel University, PSA Building Room, Philadelphia, PA 19104. E-mail: preeti.ps@gmail.com*

M.E. THAIS, G.C. CAVALLAZZI, D.A. FORMOLLO, L.D. CASTRO, A.L. NAU, C.M. RODRIGUES, R. SCHMOELLE, R. GUARNIERI, M.L. SCHWARZBOLD, A.P. DIAZ, A. HOHL, M.J. MADER, M.N. LINHARES & R. WALZ. Admission Pupillary Examination is Associated with Long-Term Cognitive Prognosis in Severe Brain Injured Patients.

Objective: Objectives: Pupillary abnormalities of patients with traumatic brain injury (TBI) are associated with morbidity and mortality. Here we investigated the association between pupillary admission abnormalities and cognitive performance in long-term survivor's patients with severe TBI (Coma Glasgow Scale ≤ 8).

Participants and Methods: Methods: We compared the cognitive performance evaluated in average 3 (SD= ± 1.8) years after hospitalization of patients admitted with severe TBI and isochoric pupils ($n = 28$), left midriasis ($n = 9$), right midriasis ($n = 10$) and controls ($n = 26$) matched for age, sex and education level (mean 9 ± 5 years).

Results: Results: There were no significant differences in the performance among patients groups and controls in the Letters Fluency, Digit Span, Similarities, Vocabulary and Block Design. In comparison to controls, patients with admission left midriasis and isochoric pupils showed significant lower scores in Category Fluency. Patients with admission left midriasis showed a significant lower score than controls in all the investigated verbal and non-verbal memory tests except in RAVLR Rec. Patients with isochoric pupils showed lower scores than controls in RAVLT total, RAVLT retention, RAVLT delayed, RAVLT recall and LMI. Patients with admission right midriasis disclose lower performance than controls only in the RAVLT delayed test. Non-verbal memory tests of patients with isochoric and right midriasis did not differ from controls.

Conclusions: Conclusion: Admission pupillary examination of patients with severe TBI is associated with their long-term cognitive prognosis. (Work supported by FAPESC and CNPq)

Correspondence: *Maria E. Thais, Centro de Neurociências Aplicadas, Universidade Federal de Santa Catarina, mariaemilia@globo.com, Florianópolis 88015-701, Brazil. E-mail: mariaemilia@globo.com*

H.G. TRONTEL. Diagnosis Threat in a Mild Traumatic Brain Injury Population.

Objective: To examine the effect of diagnosis threat on neuropsychological test performance in a mild Traumatic Brain Injury (mTBI) population. **Participants and Methods:** Participants with a history of mTBI were randomly assigned to either a diagnosis threat group or a control group. The diagnosis threat group was told that they were selected to participate based on their history of head injury and they might expect to perform worse on testing. Participants in the control group were told to perform to the best of their ability. All participants were given a neuropsychological test battery followed by self-report measures assessing their beliefs about their performance. It was hypothesized that individuals who have their history of mTBI made salient prior to testing (i.e., diagnosis threat) would perform worse on neuropsychological testing compared with individuals who did not have their history of mTBI made salient.

Results: Preliminary findings indicate that participants in the Diagnosis Threat group scored lower than participants in the control group on measures of immediate and delayed memory, verbal information, visuospatial ability, and attention. Additionally, participants in the Diagnosis Threat group reported that they performed worse and had lower confidence in their performance than control participants.

Conclusions: Preliminary findings suggest that diagnosis threat is an important factor in neuropsychological test performance. This research has implications for clinicians in regards to diagnosis and neuropsychological assessment. Further research is warranted to help clarify the impact of potential diagnosis threat issues to neuropsychological testing results.

Correspondence: *Haley G. Trontel, M.A., Clinical Psychology, University of Montana, 1877 E Broadway St, Missoula, MT 59802. E-mail: haley.trontel@umontana.edu*

U.M. VENKATESAN, O.A. SCHANZ, J.D. MEDAGLIA, K.S. CHIOU, J. SLOCOMB, R.G. FRANKLIN & F.G. HILLARY. Is Right Right? Hemispheric Differences During Visuospatial Working Memory in TBI.

Objective: Recent neuroimaging studies of verbal working memory (WM) in TBI have demonstrated functional recruitment in the right prefrontal cortex. However, the role of the right hemisphere in tasks of nonverbal WM remains unclear. The present study investigated the relationship between task activation and performance during visuospatial WM practice.

Participants and Methods: Twelve individuals with moderate or severe TBI and twelve healthy participants completed a visuospatial WM task during fMRI. Participants were given an analog of the Sternberg paradigm using computerized human faces. The first (T1) and last (T2) of five total task runs were considered in the current analysis. Twenty (ten bilateral) ROIs commonly implicated in nonverbal WM were defined using the SPM8 WFU PickAtlas. Percent signal changes were calculated in the MarsBar toolbox and correlated with task accuracy.

Results: In the TBI sample, moderate to high correlations between activation and accuracy were obtained in left Brodmann Area (BA) 32 ($r=.787, p=.002$), right BA 32 ($r=.698, p=.012$), and the left hippocampus ($r=.707, p=.010$) at T1. Similar correlations were obtained for the comparison of T1 activation with change in accuracy between time-points. All significant relationships between T2 activation and T2 accuracy or change in accuracy were within right hemisphere regions. Greater activation in the right hippocampus was consistently associated with better accuracy. These relationships were not observed in the healthy sample.

Conclusions: While both left and right ROIs support visuospatial WM performance during task acquisition, in those with TBI, right-hemispheric processing may make greater contributions to accurate performance as the task is proceduralized.

Correspondence: *Umesh M. Venkatesan, Psychology, The Pennsylvania State University, 610 Moore Building, University Park, PA 16802. E-mail: umv5002@psu.edu*

B. WALDRON-PERRINE, R.J. SPENCER, H.A. TREE, S. CHEN, S.D. NA, P.H. PANGILINAN & L.A. BIELIAUSKAS. Prediction of Reported Post-concussive Symptoms in a Veteran Population: Contribution of Injury-related Factors and Emotional Distress.

Objective: Post-concussive cognitive, somatic and affective symptoms are frequently reported after traumatic brain injuries (TBIs) of varying severities. These symptoms are often believed to reflect sequelae of the injury, but an increasing amount of research has demonstrated the non-specificity of post-concussive symptoms (PCS). It is thus unclear to what extent injury-related vs. non-injury-related characteristics influence reporting of post-concussive symptoms.

Participants and Methods: Data were collected on 612 veterans [age 34.7 (13.3)] consecutively referred to a VA polytrauma TBI clinic. All veterans received a clinical interview to assess for TBI and completed the Neurobehavioral Symptom Inventory (NSI; a measure of PCS), a battery of neuropsychological tests, and self reports of emotional distress [PTSD Checklist (PCL); Hospital Anxiety and Depression Scale

(HADS)] and sleep dysfunction [Insomnia Severity Index (ISI)]. Hierarchical multiple regression assessed the contributions of (Step 1) age, education and premorbid functioning (Shipley Vocabulary), (Step 2) injury severity (duration of loss of consciousness) and neuropsychological functioning (Trails B), and (Step 3) sleep disturbance, anxiety, depression and PTSD symptoms in predicting total post-concussive symptoms (NSI).

Results: The total model accounted for 49% of the variance in PCS with 40% of the variance attributable to Step 3. Anxiety and depression each contributed 3% of unique variance ($p < .001$) with age, sleep disturbance and PTSD also making distinctive contributions ($p < .05$).

Conclusions: Emotional distress rather than injury-related characteristics predict the bulk of PCS reporting in this veteran sample. This is important for clinicians to consider as they make attributions about etiology of PCS.

Correspondence: *Brigid Waldron-Perrine, Ph.D., Neuropsychology, VA Ann Arbor Healthcare System, 116B, 2215 Fuller Rd, Ann Arbor, MI 48105. E-mail: brigid.waldron@gmail.com*

M. WEBER, M. FRANCIS & M.G. EDWARDS. Are Group Analyses Suitable For Mild Traumatic Brain Injury Research?

Objective: Mild traumatic brain injury (TBI; or concussion) research is largely dominated by group comparison studies. However, group comparison may mask inter-individual differences relevant to the injury assessment and cause biased generalizations to be drawn. To illustrate this, we compared neuropsychological data from participants with and without mild TBI at a group and an individual level.

Participants and Methods: Neuropsychological data from 23 contact sport university athletes with mild TBI, where time since injury was at least three months (i.e., complete recovery could be assumed) were contrasted to 47 matched (demographics, subjective symptomatology, health behaviours) athletes with no sport-related mild TBI self-report. The neuropsychological assessment consisted of cognitive functions tests including attention and speed of information processing, verbal memory and executive functions.

Results: At a group level, univariate non-parametric analyses compared the test performance between the two groups and revealed that athletes with sport-related mild TBI performed worse on immediate free verbal memory recall and executive function shifting compared to the group without mild TBI self-report. At an individual level, a 95% confidence interval of test performance by the athletes with no sport-related mild TBI history was derived, and each injured athlete's test performance compared to the confidence interval. This revealed significant deviance profiles showing multiple different types of neuropsychological abnormalities, suggesting that there are individual differences in impairments, presumably caused by different profiles of injury.

Conclusions: The data are discussed in terms of their significance to recent injury definitions, applied neuropsychological test batteries and the suitability of group comparisons to sport-related mild TBI research.

Correspondence: *Mareen Weber, PhD, Center for Anxiety, Depression and Stress Research, McLean Hospital, 115 Mill St, Belmont, MA 02478. E-mail: mareen.weber@gmail.com*

J. WINGO, J. ST. ANDRE, I. MOALLEM, C. EVANS, B. SMITH, A. URBAN & T. PAPE. An Evidence-Based Review of Neuropsychological Assessment for Diagnosis of Mild TBI.

Objective: Mild traumatic brain injury (mTBI) results from a variety of causes. Expert opinions on whether or not cognitive symptoms in post-acute patients correspond with the organic brain injury subsequent to exposure to a mTBI event remain in dispute. Most experts agree that acute symptoms can be caused by a mTBI and systematic reviews of the evidence indicate that overall cognitive functioning returns to baseline within three months. Screening and diagnostic tests are critical components of neuropsychological services. Early detection facilitates referrals to initiate rehabilitation interventions early to foster better outcomes. The current state of evidence regarding diagnostic accuracy, however, is poor. While limited, evidence regarding diagnostic accuracy of standardized neuropsychological instruments has not been systematically reviewed in the past ten years.

Participants and Methods: As part of a larger mTBI diagnostic accuracy study, a systematic review of summary evidence regarding diagnostic accuracy was conducted. Neuropsychological tests used to determine whether or not cognitive symptoms correspond with mTBI were included in this evidentiary review. We reviewed 1,283 published studies between 1990 and June 2011 using PubMed, PsychInfo, and The Cochrane Library that used neuropsychological instruments to assess the nature and extent of the brain injury within the temporal context of the mTBI exposure. We included articles on adults with mTBI published in a peer-reviewed journal.

Results: For each neuropsychological test, we report the range of sensitivity and specificity, the ranges of the positive and negative likelihood ratios, as well as sources of variation.

Conclusions: Expert clinical consensus denotes the importance in accurately determining whether or not cognitive symptoms correspond with the nature and extent of the organic brain injury and temporally with a single TBI event, multiple TBI events, or TBI events combined with trauma as well as other mental health conditions.

Correspondence: *Jana Wingo, M.A., Loyola University Chicago, 6525 N Sheridan, Chicago, IL 60646. E-mail: jana.wingo@gmail.com*

M.J. WRIGHT, T.C. GLENN, C.A. SIDERS, E. WOO, D.L. MCARTHUR, D.A. HOVDA, P. VESPA & N.A. MARTIN. The Frontotemporal Signature of TBI-Induced Acute Cerebral Metabolic Crisis.

Objective: Acute cerebral metabolic crisis (ACMC) following traumatic brain injury (TBI) results in frontotemporal atrophy that correlates with neuropsychological deficits. We sought to determine if ACMC would directly predict recovery of cognition related to frontotemporal integration

Participants and Methods: Our sample was comprised of 27 moderate-to-severe TBI survivors. 74% suffered acceleration-deceleration injury, 81% were male, and 52% were Caucasian. All were fluent in English and had no significant psychiatric, learning disability, or ADHD history. Participants underwent jugular bulb catheterization and cerebral metabolic rate of glucose (CMRglc) from blood samples collected 0-7 days post-injury was determined. Participants completed the Buschke Selective Reminding Test (SRT) and phonemic fluency trials (FAS) at approximately 6 and 12 months post-injury. T-scores for the Long-term Storage score from the SRT and the phonemic fluency trials were averaged at both time points to provide an index of frontotemporal integration. The difference of these scores was calculated to provide an index of frontotemporal integration recovery (FTI-Diff). Hierarchical regression was employed to determine if acute CMRglc predicted FTI-Diff above and beyond Glasgow Coma Scale (GCS) scores.

Results: While GCS did not significantly contribute to the regression ($F(1,25)=1.65, B=0.08, SE B=.54, adj R^2=.02, p>.05$), CMRglc did significantly predict FTI-Diff ($F(1,24)=18.28, B=9.19, SE B=2.15, adj R^2=.42, p<.001$) accounting for approximately 40% of the variance.

Conclusions: This study suggests that ACMC-related CMRglc is predictive of recovery of frontotemporal integration. This finding in conjunction with previous work suggests that interventions to reduce ACMC may result in improved cognitive outcomes for TBI survivors.

Correspondence: *Matthew J. Wright, Ph.D., Psychiatry, Harbor-UCLA Medical Center, 1124 W. Carson St., B-4 South, Rm. 111 (Box 490), Torrance, CA 90502. E-mail: mwright@labiomed.org*

M.J. WRIGHT, L. OBERMEIT, C.A. SIDERS, C.L. KERNAN, E. WOO, H. KAKAVAND, R.S. SWERDLOFF, C. WANG, R.C. CANTU, K.M. GUSKIEWICZ & D.F. KELLY. The Ratio of Concussions to Games Predicts Attention in Retired Professional Football Players.

Objective: Multiple sports-related concussions are associated with declines in attention. Our goal was to determine if the ratio of concussions to games (C/G) would predict attention above and beyond concussions alone.

Participants and Methods: Our sample was comprised of 54 retired NFL players. Participants were 3-38 years post-professional play ($M=20.07$ yrs, $Mdn=21.00$ yrs), middle aged ($M=46.98$ yrs, $Mdn=46.50$ yrs, $range=32-65$ yrs), and well educated ($M=16.36$, $Mdn=16.00$, $range=14-20$). 54% reported three or more NFL concussions, 57% were Caucasian, and all were fluent in English. Exclusions

included significant psychiatric condition, learning disability, ADHD history, and non-football-related neurologic condition. Participants completed Digit Span (DS) from the WAIS-III, Trail Making Test, part A (TMT-A), and the Symbol Digit Modalities Test, oral and written trials (SDMT-O, SDMT-W, respectively). Correlations between concussion frequency and attention T-scores were computed. Hierarchical regressions were employed to determine if the C/G could predict attention above and beyond concussions alone.

Results: SDMT-O and SDMT-W correlated with concussions. Neither concussions nor the C/G predicted SDMT-O performances. Concussions predicted SDMT-W performances ($F(1,52)=7.17$, $B=-.68$, $SE B=.25$, $R^2=.12$, $p=.01$), and the C/G added significantly to the model ($F(1,51)=4.79$, $B=-2.10$, $SE B=.96$, $R^2=.20$, $p=.03$).

Conclusions: Concussions and the C/G are predictive of attention in retired NFL players. Both accounted for about 20% of the variance in SDMT-W performances; concussions accounted for about 12% of the variance and the C/G accounted for an additional 8% of the variance. Both the frequency of concussions and the C/G should be tracked for football players, as attention is germane to both their ability to play and to avoid injuries. Correspondence: *Matthew J. Wright, Ph.D., Psychiatry, Harbor-UCLA Medical Center, 1124 W. Carson St., B-4 South, Rm. 111 (Box 490), Torrance, CA 90502. E-mail: mwright@labiomed.org*

L.R. YOZAWITZ, M. TIERNEY, J. SOLOMON, J. GRAFMAN & F. KRUEGER. Voxel-based Lesion Symptom Mapping of Letter and Category Fluency Performance in Individuals with Penetrating Traumatic Head Injuries.

Objective: Neuroimaging and lesion studies suggested that letter fluency is mediated primarily through the frontal cortex, whereas category fluency through the temporal cortex. Our study examined this putative dissociation in individuals with focal brain lesions from penetrating traumatic head injuries (pTBI).

Participants and Methods: Our sample consisted of 195 individuals with pTBI tested 35 years post injury. We examined three measures of the Delis-Kaplan verbal fluency subtest (i.e., letter fluency, category fluency, and category switching) applying voxel-based lesion symptom mapping (VLSM) to identify brain regions associated with impaired performance.

Results: First, our VLSM findings replicated prior studies by identifying the same key cortical regions mediating verbal fluency and revealing cortical lesion differences upon letter and category fluency performance. Lesions within the left inferior frontal gyrus, left superior frontal gyrus, left parahippocampal gyrus, and left superior temporal gyrus had the greatest effect on letter fluency performance, whereas lesions within the anterior cingulate and left fusiform gyrus on category fluency. Second, we reveal novel findings demonstrating that lesions in frontal and temporal areas were salient in affecting both letter and category fluency. Moreover, lesions of the superior parietal lobule affected category (but not letter) fluency. No uniquely identified areas of cerebral mediation for category switching were identified.

Conclusions: Our findings that both frontal and temporal regions appeared contributory to the performance of letter and category fluency may help in understanding the role of complex neural networks for supporting executive motor and cognitive functioning.

Correspondence: *Lyanne R. Yozawitz, B.A., Cognitive Neuroscience Section, National Institutes of Health/NINDS, 10 Center Drive, Room 7D43, MSC 1440, Bethesda, MD 20814. E-mail: lyozawitz@gmail.com*

TBI (Child)

J. ALBERTY, J. PIVONKA-JONES, K. FREIER RANDALL & S. ASHWAL. A Comparison of Delayed Visual/Verbal Memory in Bilingual and Monolingual Children with Traumatic Brain Injury.

Objective: While verbal memory is proposed to be the most impacted cognitive domain in pediatric traumatic brain injured (TBI) populations there is paucity of research regarding bilingual pediatric TBI populations. This study compared memory within and between bilingual (Spanish/English) and monolingual (English) pediatric TBI patients.

Participants and Methods: 18 children (M age=11.67 years (SD=3.7), 61% males, 50% bilingual) were assessed as part of a larger longitudinal study evaluating neuropsychological outcomes in moderate/severe pediatric TBI at 3 (Time 1) & 12 months (Time 2) post-injury. The Children's Memory Scale was used to measure visual/verbal immediate and delayed memory.

Results: Using a mixed model ANOVA a significant interaction was present between delayed memory at Time 1 and delayed memory at Time 2. With groups combined delayed verbal and visual memory scores (VerbalM=94.89, SE=3.07; VisualM=101.39, SE=3.47) at Time 1 were significantly lower than delayed verbal and visual memory scores (VerbalM=101.00, SE=3.23; VisualM=116.72, SE=2.40) at Time 2. A paired samples t-test showed bilingual TBI participants had a significant difference between their delayed verbal memory (M=101.00, SE=4.18) and delayed nonverbal memory at Time 2 (M=112.56, SE=3.83), $p=0.02$, $r=0.71$. Bilinguals had significantly lower delayed verbal memory scores compared to their delayed visual memory scores at Time 2.

Conclusions: Congruent with the literature delayed verbal memory was more significantly impacted than visual memory. Further, both bilinguals and monolinguals demonstrated less recovery of verbal memory compared to visual memory over time. Interestingly, although visual memory improved over time in both groups, monolinguals ameliorated more significantly. Bilingual recovery/rehabilitation necessitates further investigation.

Correspondence: *Julie Alberty, MA, Pediatric Psychology, Loma Linda University, 1833 Calafia Street, Glendale, CA 91208. E-mail: jalberty@llu.edu*

J. BELLEROSE, M. NEUGNOT CERIOLI, E. VERA-ESTAY & M.H. BEAUCHAMP. Moral Reasoning Abilities Following Paediatric Traumatic Brain Injury.

Objective: Paediatric traumatic brain injury (TBI) is a common cause of disability in children and can result in long-lasting cognitive and social difficulties, such as poor social problem-solving and decision-making. However, the link between TBI and the occurrence of socially maladaptive behaviours is poorly understood. Moral reasoning (MR) is a high-level cognitive ability necessary for adequate social functioning, which may be affected after paediatric TBI. This study aimed to examine MR difficulties after paediatric TBI as a potential contributor to social problems.

Participants and Methods: The So-Moral Task (Social-Moral Reasoning Aptitude Level, Dooley et al., 2010) was used to measure MR maturity in adolescents (aged between 11 and 19 years) with TBI (N = 26, 19 mild, 7 moderate/severe), and a matched control group (N = 47).

Results: Adolescents with TBI (33.94 ± 1.50) had significantly lower moral maturity compared to the control group (38.64 ± 1.30) ($t(60.48) = 2.36$; $p < .05$). In particular, children with moderate/severe TBI had significantly worse moral reasoning skills than the control group.

Conclusions: Moderate and severe TBI sustained during childhood may cause a deficit in MR development and could account for some social problems that are reported during adolescence.

Correspondence: *Jenny Bellerose, University of Montreal, 3320 Côte-Ste-Catherine, apt 6, Montreal, QC H3T 1C6, Canada. E-mail: jenny.bellerose@umontreal.ca*

E.H. GERST, C.G. VAUGHAN, E.L. MCGUIRE & G.A. GIOIA. The Influence of Testing Environment on Performance in Baseline Concussion Testing of Children.

Objective: Acquisition of accurate pre-injury baseline testing data is important for the understanding of the post-injury cognitive changes associated with concussions in children. This study examines differences in the mode of baseline testing- group versus individualized - on performance on Pediatric Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT), a computerized task which measures neurocognitive performance and post-concussion symptoms.

Participants and Methods: Participants were 301 children (60.8% male), ages 5-12 years ($m=8.80$, $SD=2.16$) with 64 tested individually

and 237 tested in a group format (modal group size = 8). A subsample of 68 children with a reported diagnosis of ADHD was examined separately. Testing was conducted/supervised by trained clinic staff. Test environment also varied by location (ice rinks, schools and clinic) and use of carrels.

Results: No significant differences were found between individual and group testing conditions for the 3 Composite standard scores and Total Symptom raw score ($p > .05$). Location of testing produced no significant differences in the 3 Composite scores and Total Symptom score. Additionally, the use or absence of carrels did not result in significant differences between the groups. There was no interaction effect found between the differing testing conditions and diagnosis of ADHD on the 3 Composite scores and Total Symptom score.

Conclusions: Children tested in a group format exhibited similar neurocognitive test performance and level of symptom ratings when compared to those tested individually. The absence of differences in baseline test scores and symptom reports suggests that a controlled and closely monitored group testing environment produces similar baseline results as individualized testing. Test scores obtained in these two settings are equivalent.

Correspondence: *Elyssa H. Gerst, Children's National Medical Center, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850. E-mail: egerst@childrensnational.org*

M.E. KRAMER, S. SUSKAUER, E. DEMATT, C. SALORIO & B. SLOMINE. Using Early Ratings of Responsiveness to Predict Inpatient Rehabilitation Discharge Status in Children with Significant Brain Injury.

Objective: We evaluated the test operating characteristics of responsiveness as measured by the Cognitive and Linguistic Scale (CALS) for predicting discharge status from inpatient rehabilitation in children with a variety of brain injury etiologies.

Participants and Methods: Twenty-two children ages 3-18 who sustained a brain injury requiring inpatient rehabilitation and had the lowest possible rating at rehabilitation admission on the Functional Independence Measure for Children (WeeFIM total score=18) were included. Children were administered the WeeFIM and CALS at admission and discharge from rehabilitation. Children were grouped based on etiology: TBI $n=14$; Mixed Etiology $n=8$ (anoxic brain injury, encephalitis, etc). Test factor was dichotomized rating on CALS Responsivity item at admission: a) patient responds to stimulation less than half of the time, or b) responds to stimulation half of the time or more. Outcome condition of interest was total dependence (Total WeeFIM Developmental Functional Quotient [DFQ] less than 30) versus partial dependence (Total WeeFIM DFQ greater or equal to 30) at discharge.

Results: Operating characteristics of CALS Responsivity rating cutoff predicting total dependence at discharge for the TBI group were: Sensitivity=100%, Specificity=86%. Operating characteristics of CALS Responsivity rating cutoff for the Mixed Etiology group were: Sensitivity=33%, Specificity=100%.

Conclusions: CALS Responsivity rating at admission accurately discriminated between discharge groups for children with TBI but not other etiologies. This is consistent with existing literature suggesting that earlier return of consciousness is associated with better functional outcome in individuals with TBI. However, more research is needed to elucidate the recovery trajectories of children with other etiologies of significant brain injury.

Correspondence: *Megan E. Kramer, Ph.D., Neuropsychology, Kennedy Krieger Institute, 1750 East Fairmount Ave, Baltimore, MD 21231. E-mail: kramerm@kennedykrieger.org*

A. MAERLENDER & A. ALT. The Effect of Sleep the Night Before on Baseline Neuropsychological Screening and Symptom Reporting.

Objective: The objective of this study was to determine if there was an effect of sleep on self-reported symptom presentation and/or computerized neuropsychological test scores in a standard concussion man-

agement program. Sleep has long been known to affect cognitive performance, although some research has shown less effect on standardized neuropsychological tests. Symptom presentation is a standard element of concussion assessment and is frequently the primary element of concussion assessment. Current protocols require baseline assessment against which post-concussion assessment results are compared. Thus, the validity and reliability of baseline findings are of critical importance.

Participants and Methods: Data was analyzed from 2,002 high school athletes (1,159 male, 843 female) who were administered a computerized neuropsychological screening test (ImpACT) and health history questionnaire. Number of previous concussions, learning disability status and age were shown to account for significant variance in test scores and symptoms, and were used as covariates in a regression equation. Sleep related symptoms were removed from the symptom scale.

Results: Sleep the night before had no significant effects on test scores, but the effect on symptoms was significant. Hours of sleep the night before testing was shown to be related to self-reported symptoms, after controlling for covariates (males: $\beta = -.438$, $p = .002$; females: $\beta = -.955$, $p < .001$).

Conclusions: Lowered amounts of sleep the night before testing was related to an increase in symptom totals, which could reduce the difference between baseline and post-test scores. Smaller differences in symptom totals may make an athlete appear less symptomatic (relative to baseline) and thus interpreted as non-concussed from a symptom point of view.

Correspondence: *Art Maerlender, PhD, Psychiatry, Dartmouth Medical School, DHMC, 1 medical Center Dr, Lebanon, NH 03756. E-mail: art.maerlender@dartmouth.edu*

S.R. MCCAULEY, E.A. WILDE, T.L. MERKLEY, E.D. BIGLER, A.C. VASQUEZ, Z. CHU, J.V. HUNTER & H.S. LEVIN. The Relation of Regional Diffusion Tensor Imaging with Incentivized Event-Based Prospective Memory in Children following Traumatic Brain Injury.

Objective: Limited data currently exist regarding brain-behavior relations of event-based prospective memory (EB-PM) in children with traumatic brain injury (TBI). Previous studies by our group have reported significant increases in EB-PM performance in these children using monetary incentives. The objective of this study was to demonstrate the relation between incentive-based EB-PM performance and alterations in regional diffusion tensor imaging (DTI) indices in children with TBI.

Participants and Methods: Participants were children (range 7-17 years, mean = 11.9) with moderate-to-severe TBI ($n=39$) or controls with orthopedic injuries ($n=40$) prospectively recruited into a longitudinal study of outcome following TBI and evaluated at approximately 3 months (mean=123.0+28.1 days) postinjury. Participants were administered an incentive-based EB-PM task and underwent neuroimaging. DTI was registered to an anatomical MRI, and white matter (WM) parcellation was performed automatically through the FreeSurfer software suite. Average fractional anisotropy (FA) was derived for each WM parcellation region. Regions shown to be involved in fMRI studies of EB-PM in healthy adults were analyzed.

Results: Using the false discovery rate for dependencies, significant between-group differences (from $p < .05$ to $p < .0001$) were found for FA in the WM of bilateral medial and lateral orbitofrontal, left anterior and posterior cingulum, portions of right dorsolateral prefrontal, and left temporal lobe regions. WM regions including left and right lateral and medial orbitofrontal, left anterior and posterior cingulum, and left fusiform gyrus correlated significantly (all $p < .009$) with high-, but not low-, motivation EB-PM scores in the TBI group. No correlations were significant (all $p > .10$) in the OI group.

Conclusions: These results are consistent with previous studies in healthy adults and extend previous findings of our group by demonstrating structures related to incentive-based EB-PM performance. These structures also are vulnerable to TBI.

Correspondence: *Stephen R. McCauley, PhD, Physical Medicine and Rehabilitation, Baylor College of Medicine, 1709 Dryden Rd. Ste. 1200, Houston, TX 77030. E-mail: mccauley@bcm.edu*

T.L. MERKLEY, E.A. WILDE, E.D. BIGLER, A. LLOYD-DAVIES, M. MACLEOD, G. HANTEN, S. MULLINS, L. EWING-COBBS, M.E. AITKEN, Z.D. CHU, J.V. HUNTER & H.S. LEVIN. Inhibitory Control, Volumetrics and White Matter Integrity of Caudal Anterior Cingulate Following Early Pediatric Traumatic Brain Injury.

Objective: The caudal anterior cingulate (CAC) is often implicated in inhibitory control. The current study investigated the relationship between CAC volumetrics, DTI metrics, and performance on tasks of inhibitory control (D-KEFS Color-Word Interference Task [CWIT]) in pediatric TBI participants in the late chronic phase of recovery (mean post-injury interval=9.6 years).

Participants and Methods: Participants included 18 children (ages 9-18) who had a TBI years previously (mean age at injury=4.2 years) and 18 matched controls. T1-W MRI data were analyzed using Freesurfer for volume measurement of the CAC gray and white matter. FA and ADC of the cingulum bundle were derived using Philips fiber tracking software.

Results: Greater right cortical volume of the CAC was observed in the TBI group ($p = 0.05$), however there were no other group differences for volumetrics or DTI metrics. The TBI group performed more slowly on the inhibition ($p=0.041$) and inhibition/shift ($p=0.059$) trials of the CWIT, and committed more errors on the inhibition trial ($p=0.023$). In the TBI group, decreased left CAC white matter volume was associated with increased error commission on the inhibition trial of the CWIT ($p=0.007$) and increased right CAC white matter volume was associated with increased error commission on the inhibition/switch trial ($p=0.040$). Increased left ADC was related to slower word reading ($p=0.043$) and inhibition trial ($p=0.041$) performance.

Conclusions: Although in this sample of brain-injured children volumetric reductions in the CAC were not observed in the late chronic phase, white matter volume of the CAC did relate to error commission on a task of inhibitory control. The TBI group demonstrated slower performance and increased error commission rates for tasks that required inhibitory control. White matter integrity (ADC) of the left CAC may be related to processing speed. Reduced inhibitory control in the chronic phase of early childhood TBI may be a reflection of abnormal development of the CAC.

Correspondence: *Tricia L. Merkley, Psychology, Brigham Young University, 1001 Kimball Tower, Brigham Young University, Provo, UT 84602. E-mail: merkleytl@gmail.com*

L.M. MORAN, E. BIGLER, M. DENNIS, C.A. GERHARDT, K.H. RUBIN, T. STANCIN, H. TAYLOR, K.A. VANNATTA & K.O. YEATES. Relationship between Social Information Processing and Perceived Social Competence in Pediatric Traumatic Brain Injury.

Objective: Previous research suggests that children with traumatic brain injury (TBI) demonstrate deficits in social information processing. This study aims to evaluate whether performance on a laboratory measure of social information processing predicts ratings of perceived social competence.

Participants and Methods: Participants included 8 to 12 year old children, 23 with severe TBI, 56 with complicated mild-to-moderate TBI, and 61 with orthopedic injuries (OI). For each of five scenarios involving a negative event with an unclear cause, children selected from a fixed set of choices the attribution for the cause of the event, their emotional reaction to the event, and how they would behave in response. Children completed the five scenarios twice, with the antagonist being an unfamiliar peer in one instance and the child's best friend in the other. Social competence was assessed using parent ratings on the Social scale of the Adaptive Behavior Assessment System.

Results: Overall, children with severe TBI were less likely than children with OI to make attributions of external blame, choose anger as their emotional reaction, and respond by avoiding the antagonist; they were more likely to respond by requesting adult intervention. Among children with severe TBI, feelings of anger in situations with friends were negatively related to ratings of social competence on the ABAS. Among children with complicated mild-to-moderate TBI, avoidant responses towards unfamiliar peers were negatively related to social competence and requests for adult intervention in situations with friends were positively related to social competence.

Conclusions: The results provide evidence for effects of TBI on social information processing that may help account for social difficulties as perceived by parents.

Correspondence: *Lisa M. Moran, M.A., Psychology, The Ohio State University, 1835 Neil Ave, Room 10S, Psychology Bldg., Columbus, OH 43210. E-mail: moran.170@osu.edu*

J.B. NEWMAN, P.K. ISQUITH, G.A. GIOIA & C.G. VAUGHAN. Evidence of Validity for Pediatric ImPACT Based on Convergence with Working Memory and Processing Speed Tasks.

Objective: Pediatric ImPACT is a computer-administered repeatable assessment tool for children 5-12 years sensitive to the effects of concussion. We examined evidence for validity based on relationships with paper and pencil measures of working memory and speed of processing.

Participants and Methods: Multiple subsamples (ranging from 21 to 119 children) from a larger clinic sample of children with recent concussions completed both Pediatric ImPACT and one or more additional paper and pencil measures as part of a flexible neuropsychological battery. Pediatric ImPACT is composed of a child-report symptom rating scale and a computer-administered battery of neurocognitive tests tapping response speed, learning and memory, and accuracy/speed efficiency. Paper and pencil measures included WISC-IV Digit Span and Coding, Symbol Digit Modalities Test (SDMT), NEPSY Verbal Fluency, Woodcock Johnson (WJ-III) Math and Reading Fluency, and Auditory Consonant Trigrams (ACT).

Results: There were numerous moderate correlations between Pediatric ImPACT scores and paper and pencil measures. Faster Response Speed on Pediatric ImPACT was associated with higher digits forward and backward scores ($p \leq .001$), faster speed on Coding ($p \leq .01$), SDMT ($p \leq .001$), basic math calculations and reading fluency ($p \leq .001$), better working memory ($p \leq .01$), and better category ($p \leq .001$), but not phonemic (ns), verbal fluency. Higher learning and memory accuracy on Pediatric ImPACT was also associated with better digits forward ($p \leq .001$), category ($p \leq .001$) fluency, and better working memory ($p \leq .01$) but was not associated with aforementioned speed measures (ns).

Conclusions: Faster response speed on Pediatric ImPACT was associated with a range of processing speed and working memory measures, while better learning and memory performance was associated more selectively with working memory tasks but not speed tasks. Overall, the pattern of correlations offers convergent and discriminant evidence of validity for Pediatric ImPACT.

Correspondence: *Julie B. Neuman, PhD, Pediatric Neuropsychology, Children's National Medical Center, 15245 Shady Grove Rd, Suite 350, Rockville, MD 20850. E-mail: jnewman@childrensnational.org*

J.B. NEWMAN, A. SU, J. GOLDSTONE, P. METZ, E. GERST & G. GIOIA. Parental Concern and Perceived Need for School Accommodations Following Concussion: Children with ADHD and/or LD vs. Typically Developing Children.

Objective: We examined parent-reported concern regarding learning/academic performance following a concussion and perceived need for school accommodations, among children previously diagnosed with ADHD and/or LD and typically developing (TD) children.

Participants and Methods: Forty-six concussed children (age 14.1 ± 2.5) with a pre-existing diagnosis of ADHD and/or LD (Mixed Clinical (MC) group) were compared to concussed TD children, matched on age, gender, and race. Parents completed the School Information Sheet as part of a standard clinical assessment. T-tests and Chi-square analyses were performed using SPSS.

Results: Groups differed with regard to the number of previous concussions and pre-existing IEP/504 plans. Parents of TD children showed similar rates of overall concern as those of children with pre-morbid difficulties. However, there was a trend ($p = .075$) for MC parents to per-

ceive a greater need for services following the injury than TD parents. Post-hoc evaluation of specific clinical groups suggested parents of children with ADHD had a higher perceived a need for services ($p \leq .01$) than their TD counterparts. More specifically, parents with child with ADHD reported a higher need for extra time ($p = .02$).

Conclusions: Parents expressed similar levels of concern for learning/academic problems following a concussion, regardless of premorbid level of difficulty. However, preliminary analysis suggests that parents of children with ADHD may have a higher perceived need for academic services. Larger sample size is needed to better compare across clinical groups and control for potential covariates such as pre-existing IEP/504 services and previous concussions. Future research should also examine neuropsychological test performance, recommended school services, and the perceived benefit of services received.

Correspondence: *Julie B. Newman, PhD, Pediatric Neuropsychology, Children's National Medical Center, 15245 Shady Grove Rd, Suite 350, Rockville, MD 20850. E-mail: jnewman@childrensnational.org*

R.L. PETERSON, M.W. KIRKWOOD, H.G. TAYLOR, T. STANCIN, T.M. BROWN & S.L. WADE. Internalizing Symptoms in Adolescents Following Traumatic Brain Injury Are Associated with Parental Anxiety.

Objective: Previous research has demonstrated that pediatric traumatic brain injury (TBI) increases the risk for internalizing problems, but findings have varied regarding the influence of injury, individual, and environmental factors. We hypothesized that internalizing symptoms would be elevated in teens following TBI and would be associated with injury severity and demographic/social variables.

Participants and Methods: Participants included 132 teens who had sustained a complicated mild to severe TBI within the past 1 to 6 months. Internalizing problems were measured via both maternal ($n=127$) and paternal ($n=72$) report on the Child Behavior Checklist. We also measured family functioning, parent psychiatric symptoms, and post-injury teen neurocognitive function.

Results: Mean ratings of internalizing problems were within the normal range for both parents. However, a substantial minority of the sample demonstrated clinically elevated internalizing problems, with relative risk of approximately 2.5. Higher levels of teen internalizing symptoms were associated with female gender, lower SES, poorer family function, and greater mother and father psychiatric symptoms. We found no relationship between internalizing problems and injury severity, age at injury, race, or post-injury neurocognitive function. Only mother and father psychiatric symptoms explained unique variance in teen internalizing problems in a regression model. Among parent psychiatric problems, anxiety was most strongly associated with teen internalizing symptoms.

Conclusions: We replicated previous findings that internalizing problems are elevated following pediatric TBI and are associated with demographic and social variables. Finding that teen internalizing symptoms following TBI are associated with parental anxiety is a novel result. Possible reasons for this association are discussed.

Correspondence: *Robin L. Peterson, Ph.D., Psychology; University of Denver, 2155 S. Race Street, Denver, CO 80208. E-mail: robin.peterson@du.edu*

M.D. SADY, E. GERST, A. GRIFFIN, A. JACKSON, C. FERNANDEZ, J. NEWMAN, C.G. VAUGHAN & G.A. GIOIA. Gender Differences in Adolescents' Reporting of Emotional Symptoms Prior to and After Concussion.

Objective: To examine the influence of gender and injury characteristics in emotional symptoms in adolescents with recent concussion.

Participants and Methods: Adolescents aged 13-18 years ($n=278$; 60% male) who sustained a concussion within the past 30 days and 449 uninjured adolescents (80% male) completed the emotional symptoms scale on the Post Concussion Symptom Inventory (PCSI) and the emotional dysregulation items on the monitoring form of the BRIEF. Adolescents with concussion completed the scales, as a preinjury retrospective baseline and postinjury. Differences by gender on baseline ratings were analyzed using t-tests; while postinjury changes (difference scores) were submitted to ANOVA to explore the influence of age, gender, injury characteristics, and history of emotional difficulties.

Results: No gender differences were found on the scales in either uninjured adolescents' ratings or injured adolescents' retrospective reports ($p > .05$, Cohen's $d = .19-.21$). For post-injury changes in symptoms, ANOVA indicated a significant interaction between gender and loss of consciousness (LOC) and/or amnesia on pre- to post-injury difference scores on the BRIEF emotional regulation items with a trend toward significance on PCSI ratings. Post hoc comparisons indicated that females with LOC/amnesia reported greater increases in emotional symptoms and dysregulation than females without LOC/amnesia and males ($p < .01$).

Conclusions: Male and female adolescents report similar levels of pre-injury emotional functioning, as assessed in uninjured individuals and by retrospective preinjury report. Females with concussion, particularly those who report LOC or amnesia, report a much greater increase in emotional symptoms relative to males when assessed within 30 days of concussion. The data suggest that girls with certain injury characteristics are more likely to report substantial changes pre- to post-injury relative to boys.

Correspondence: *Maegan D. Sady, Ph.D., Pediatric Neuropsychology, Children's National Medical Center, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850. E-mail: maegan.sady@gmail.com*

M.D. SADY, P.K. ISQUITH, E. GERST, C.G. VAUGHAN & G.A. GIOIA. Pediatric ImPACT Neurocognitive Performance and Symptom Reporting During Recovery from Childhood Concussion.

Objective: We examined longitudinal changes in Pediatric ImPACT symptom reports and neurocognitive test performance in children with and without concussion to evaluate the utility of the measure for detecting concussion effects and tracking recovery.

Participants and Methods: Symptom ratings and neurocognitive scores of 3 overlapping samples of 5-12 year-olds were analyzed using three methods: (1) 213 children with concussion grouped by timing of first post-injury assessment (1, 2, or 3 weeks) compared to matched controls using ANOVAs; (2) 37 children with concussion evaluated serially over 4 weeks post-injury using repeated measures MANOVA with planned contrasts, and; (3) 270 children with concussion evaluated up to 4 times within 20 weeks of injury using growth curve models.

Results: (1) Compared to controls, children with concussion showed significantly greater symptoms and lower learning/memory scores in weeks 1-2 and worse response speed in weeks 1-3. (2) Children's learning/memory performance improved significantly by visit 2, and response time and symptom ratings by visit 3. (3) Slope was significant and in the expected direction for all variables. Age at injury and gender were significant predictors for several neurocognitive tests and symptom ratings, particularly measures of memory and physical symptoms.

Conclusions: These analyses indicate that children with concussions show recovery trends in symptom ratings and neurocognitive performance with the greatest differences relative to controls detected early post-injury. Recovery trajectories were modified by demographic factors indicating that there are group-level similarities and individual differences in recovery. Pediatric ImPACT was sensitive to changes in functioning, providing support for the utility of Pediatric ImPACT for tracking recovery in children with concussions.

Correspondence: *Maegan D. Sady, Ph.D., Pediatric Neuropsychology, Children's National Medical Center, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850. E-mail: maegan.sady@gmail.com*

E. SUDIKOFF, C. SALORIO, J. ROSENBERG & B. SLOMINE. Behavior after TBI in children who require brief hospitalization.

Objective: Traumatic Brain Injury (TBI) is a major cause of death and disability in children. Studies show that children have significant unmet healthcare needs following TBI. In this study, we examine changes in behavior and executive functioning post-injury and factors associated with post-injury functioning.

Participants and Methods: 100 children with TBI requiring an overnight hospital stay who were evaluated in a neurobehavioral screening clinic were examined (70% male, mean age: 10.6, mean days after injury: 37). 63% experienced a loss of consciousness (LOC). 61% had findings on neuroimaging. Per parent report, 14% had learning disabilities, 15% had ADHD, 31% had behavioral problems and 21% had mood symptoms pre-injury. Parents were asked to rate behavior and executive functioning on the BRIEF and BASC-2 for both pre and post-injury.

Results: Parent ratings suggested significant concern with executive functioning on the BRIEF post-injury (21% of children in clinical range), with the Working Memory scale most commonly elevated (28%). Parents rated a significant increase in executive dysfunction from pre- to post-injury ($p < .01$). In contrast, only 4% were rated as having significant behavioral problems on the BASC-2 post-injury, though parent rating suggested a significant increase in symptoms from pre- to post-injury ($p < .05$). Post-injury ratings were not associated with medical factors (GCS, LOC, neuroimaging findings), but were significantly associated with pre-injury diagnoses.

Conclusions: This study supports the need for follow-up after pediatric TBI, even for those who are discharged home after short acute care stays. Pre-injury factors are particularly important when considering outcome in this group of children.

Correspondence: *Cynthia Salorio, Ph.D., Kennedy Krieger Institute, 707 North Broadway, Baltimore, MD 21205. E-mail: salorio@kennedykrieger.org*

S.J. SUSKAUER, E.J. DEMATT, B.S. SLOMINE, C.F. SALORIO & S.H. MOSTOFSKY. Laboratory Predictors of Parent Report of Inhibitory Control in Children with History of Traumatic Brain Injury.

Objective: Decreased inhibitory control is a common finding after childhood traumatic brain injury (TBI) and can significantly impact daily function. A simple bedside evaluation which is predictive of real-world inhibitory control would be clinically useful. The purpose of this pilot study was to identify simple laboratory measures associated with parent-report of real-world inhibitory control in children with a history of TBI.

Participants and Methods: Twelve right-handed children with a history of moderate or severe TBI participated in laboratory evaluation of inhibitory control including completion of a simplified Go/No-go task ($n=12$, ages 8-17 years) and the Physical and Neurological Examination for Soft Signs (PANESS, $n=8$, ages 13-17). A parent of each child completed the Behavior Rating Inventory Executive Function (BRIEF). Spearman rank-order correlations were used to evaluate relationships between laboratory and parent-report data.

Results: Sum of overflow movements observed during PANESS right-sided timed maneuvers of the hands and feet was strongly correlated with T-scores for the BRIEF Inhibit domain ($r=.80$, $p=.018$). Intra-individual coefficient of variability (ICV) on the Go/No-go task also correlated with T-scores for Inhibit ($r=.58$, $p=.049$). There was a trend for correlation between commission errors on the Go/No-go task and T-scores for Emotional Control ($r=.53$, $p=.076$). Visual inspection of the relationship between commission errors and Inhibit and Emotional Control scores revealed a subset of children with low commission errors but elevated T-scores.

Conclusions: Motor overflow during right sided tasks is a candidate marker for impaired real-world inhibitory control in right-handed teenagers with TBI and merits further evaluation. Intra-individual variability in reaction time may be another marker for real-world function. Ongoing evaluation of markers for real-life function will improve understanding of contributions to impairments in inhibitory control and may suggest novel targets for intervention.

Correspondence: *Stacy J. Suskauer, MD, Pediatric Rehabilitation, Kennedy Krieger Institute and Johns Hopkins University School of Medicine, 707 N Broadway, Baltimore, MD 21205. E-mail: suskauer@kennedykrieger.org*

C. VAUGHAN, G.A. GIOIA, E. GERST & P.K. ISQUITH. Utility of Standardized Regression Based (SRB) Change Methodology for Examining Within Task Differences in Performance on Pediatric ImPACT.

Objective: Standardized regression-based (SRB) change methods are increasingly utilized to understand individual change in test performance over time. We applied these metrics to measuring change in performance within a test battery designed to be sensitive to the effects of concussion in children. Children with recent concussions may be expected to show atypical declines in response speed reflecting fatigue, in accuracy of recall, or in efficiency of recognition memory even within a lengthy assessment battery.

Participants and Methods: Ninety children aged 5 to 12 ($M = 9.40$, $SD = 2.18$, 69% male) completed Pediatric ImPACT within 7 days of sustaining a concussion along with age and gender matched non-injured children. The proportion of children with concussion who exhibited a decline in performance on response speed, memory accuracy and efficiency was compared with the matched normative sample.

Results: Children with recent concussions were more likely to significantly decline in response speed on a speed click task ("Catch the Animals!", 18.9%) than members of the normative group (5.6%), $X^2(1, N = 180) = 7.46$, $p < .01$, $\phi = .20$. They also showed trends for greater decline in learning/ memory accuracy and accuracy/speed efficiency, although these findings were not statistically significant in this sample ($p = .178$ and $p = .073$, respectively).

Conclusions: The novel application of SRB change methodology for capturing change in performance within a test battery showed slowed response speed from the beginning to end of the battery. This methodology may be useful for capturing decline in performance, possibly associated with fatigue effects, as the result of a recent concussion.

Correspondence: *Chris Vaughan, Psy.D., Division of Pediatric Neuropsychology, Childrens National Medical Center, 15245 Shady Grove Rd, Suite 350, Rockville, MD 20850. E-mail: cvaughan@cnmc.org*

C. VAUGHAN, M. SADY, E. GERST & G.A. GIOIA. Relative Contribution of Parent and Child Post-Concussion Symptom Report to Classification of Injury Status.

Objective: Post-concussion evaluation in children relies on reliable and valid report of symptoms. The relative role of parent compared to child report of symptoms was examined.

Participants and Methods: 190 uninjured children ages 5 to 12 (68% male) and their parents completed the Post-Concussion Symptom Inventory (PCSI). 166 children (69% male) within 40 days of sustaining a concussion participated. Regression was employed to examine the relative contribution of parent vs. child total and subscale symptom scores (physical, fatigue, emotional and cognitive) in predicting concussed versus uninjured status for age 5-7 year-olds ($n=78$; 62% male) and 8-12 year-olds ($n=278$; 71% male).

Results: Parent and child total symptom scores were unique significant predictors of group membership (Child Total Symptom $R^2 = 7\%$, Parent Total Symptom $R^2 = 27\%$). Among the specific symptom categories, parent report of physical, fatigue, and emotional symptoms contributed most to the predictive model. When analyzing age groups separately, parent total symptoms demonstrated a stronger relation to injury status than child symptom reporting in both age groups. Total child symptom score contributed to injury status in the older age group. In examining symptom subscales, parent report of physical symptoms was significant in classifying the younger children. Parent report of physical, fatigue, and emotional symptoms along with the child's report of cognitive and emotional symptoms were significant predictors of injury status in the older age group.

Conclusions: Parent symptom report best differentiates injured from non-injured children. The older child's symptom report remains, however, relevant. Examining specific symptom subscales may aid in diagnostic classification. These findings strengthen the recommendation that the concussion evaluation of younger children should include parent symptom report in addition to the child symptom report, with consideration given to their relative contributions.

Correspondence: *Chris Vaughan, Psy.D., Division of Pediatric Neuropsychology, Childrens National Medical Center, 15245 Shady Grove Rd, Suite 350, Rockville, MD 20850. E-mail: cvaughan@cnmc.org*

A.D. VERBALIS, N.C. WALZ, S.L. WADE, T. STANCIN, H. TAYLOR & K.O. YEATES. Relationship Between Executive Functioning and Theory of Mind in Young Children 18 Months After Traumatic Brain Injury.

Objective: Theoretically and empirically, developmental psychologists have proposed links between theory of mind (ToM) and executive functioning (EF) as related social cognitive abilities. However, the relationship between ToM and EF has not been investigated following pediatric TBI. The current study examined whether EF skills were correlated with ToM performance in children with a history of early childhood TBI or OI.

Participants and Methods: Participants were young children (5-7 years) who experienced TBI ($n = 43$) or OI ($n = 64$) approximately 18 months prior to the assessment. Children completed lab-based measures of EF (Shape School) and a battery of ToM tasks as part of a comprehensive evaluation of the child and family 18 months post-injury.

Results: The TBI group performed significantly worse on tasks of both ToM ($t(105) = 2.24, p < .05$) and inhibitory control ($t(105) = 2.43, p < .05$), but not on mental flexibility ($t(103) = 0.49, p = ns$). However, controlling for group membership and age at assessment, partial correlations indicated that ToM performance was related to both inhibitory control ($r = 0.35, p < .001$) and mental flexibility ($r = 0.23, p < .05$).

Conclusions: These data suggest that ToM is related to EF in both the TBI and OI groups, consistent with general research connecting these skills in typically developing children. This relationship remained significant even after controlling for age and injury group, suggesting that these skills remain closely related despite observed impairments following TBI.

Correspondence: *Alyssa D. Verbalis, Ph.D., Behavioral Medicine and Clinical Psychology, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, MLC 3015, Cincinnati, OH 45229. E-mail: alyssa.verbalis@cchmc.org*

W.J. WARZAK & L.F. MORALES KNIGHT. Concussion Recovery and Energy Exertion: The Missing Link.

Objective: The 3rd International Conference on Concussion in Sport (2008) has emphasized the effects of exertion as a major obstacle to recovery from concussion. We document an approach to assessment that evaluates the relationship between physical exertion and multiple daily recordings of subjective symptoms.

Participants and Methods: Our case involved a 13 yo boy who fell from a choir riser, striking his chin on the riser and the back of his head on the floor; two days later, he struck his forehead on a door frame. At intake, he had experienced multiple symptoms, including headache, balance problems, nausea and sleep disturbance, for three months. He was provided a body-worn accelerometer. He reported subjective symptoms thrice daily for four weeks.

Results: Repeated-measures analyses suggest that his symptoms worsen over the course of the day (repeated-measures $F(2, 42) = 8.10, p = .001$). Regression analyses resulted in trend-level effects suggesting that steps taken in the morning, more than energy expenditure in general, may predict symptom severity in the morning and evening, perhaps by exacerbating dizziness and balance problems. Further, increased symptoms in the morning may lead to reduced activity through the day, and may predict increased symptoms in the late evening.

Conclusions: The balance of the evidence suggests that controlling symptoms in the morning may be a critical part of this boy's recovery strategy. We argue that in a single-case design, trend-level effects can meaningfully inform treatment hypotheses. Direct measurement of exertion appears to have promise for the assessment and monitoring of concussion recovery.

Correspondence: *Luis F. Morales Knight, M.A., Psychology, University of Nebraska—Lincoln, 238 Burnett Hall, Lincoln, NE 68588-0308. E-mail: morales.knight@gmail.com*

**Invited Address:
Hemispheric Differences in Learning and Memory:
Insights from Deficit Patterns and from Functional
Neuroimaging**

Speaker: Marilyn Jones-Gotman

10:30–11:30 a.m.

M. JONES-GOTMAN. Hemispheric Differences in Learning and Memory: Insights from Deficit Patterns and from Functional Neuroimaging.

The importance of understanding memory disturbance in clinical neuropsychology cannot be overstated. Diminishing memory is a growing problem in our aging population and is among the most common complaints of patients with brain injury. In 40 years of working with patients with temporal lobe (TL) epilepsy, I have designed several memory tests that are sensitive to specific memory deficits and that have refined my way of viewing hemispheric specialization.

Using these learning/memory tasks, we have gone beyond the simple distinctions between verbal and nonverbal memory as they relate to dominant or nondominant TL function, now separating learning from retention deficits within the verbal-nonverbal dichotomy. Our tasks reveal that the primary deficit in dominant TL dysfunction is in RETENTION of verbal material, whereas in nondominant TL dysfunction the LEARNING of nonverbal material is impaired. This distinction was missed before because learning paradigms were not used in nonverbal tasks. The sensitivity of our tasks to the nondominant TL, contrary to the reported insensitivity of others, is also attributable to the learning paradigm.

We adapted two of our tasks for an fMRI paradigm to determine which brain regions show the most change in activation during different phases of the tasks and to verify the lateralization findings that we observe in clinical testing. Studying healthy individuals, we found increases in activation in the left hippocampus compared to baseline during verbal, and in the right hippocampus during nonverbal components of the tasks. In TL epilepsy patients we also found that the magnitude of these activation changes correlated with performance in material specific tasks done in clinic.

In my talk I will describe the patterns of learning and memory deficits that can be elucidated with appropriate neuropsychological tests, and I will present fMRI data that relates the clinical behavioral data with brain activations obtained from the same tasks.

Correspondence: *Marilyn Jones-Gotman, Montreal Neurological Institute, McGill University, 3801 University Street, Montreal, QC H3A 2B4, Canada. E-mail: marilyn.jonesgotman@mcgill.ca*

**Paper Session 5:
Mild Cognitive Impairment**

Moderator: Mark Bondi

10:45 a.m.–12:15 p.m.

K.J. BANGEN, S.F. SORG, N. LUC, L. DELANO-WOOD, C.E. WIERENGA, A.J. JAK & M.W. BONDI. Structural and Arterial Spin Labeling MRI Biomarkers for Mild Cognitive Impairment.

Objective: Individuals with mild cognitive impairment (MCI) demonstrate changes in brain structure and function and are at increased risk for the development of dementia including Alzheimer's disease (AD). We examined the influence of MCI status on volumetric and cortical thickness measures and resting cerebral blood flow (CBF) to further characterize subtle changes in MCI.

Participants and Methods: High-resolution anatomical and resting state arterial spin labeling (ASL) MRI scans were acquired for 41 nondemented older adults (mean age = 75). Structural scans were processed using FreeSurfer. Twenty-seven individuals were classified as cognitively normal and 14 met criteria for MCI. Cognitive status groups were equivalent in terms of age, education, and apolipoprotein E (APOE) genotype and sex distributions.

Results: MCI participants demonstrated significant thinning in entorhinal, parahippocampal, and precuneus cortices relative to their cognitively normal counterparts. After adjusting for total intracranial volume, MCI participants showed reduced left hippocampal volume and increased left lateral ventricular volume. The MCI group also demonstrated reduced resting state medial temporal lobe (MTL) CBF. Among the MCI participants, better memory performance was associated with greater hippocampal volume and CBF. Logistic regression demonstrated that structural measures and CBF predicted cognitive status.

Conclusions: Findings provide support for differences in patterns of cortical atrophy and resting CBF between individuals with MCI and cognitively normal older adults. Results suggest that structural and perfusion imaging yield measures that may be especially useful for identifying individuals at risk for dementia, and they hold promise as noninvasive techniques that can be used to assess and monitor changes due to advancing neuropathology.

Correspondence: *Katherine Bangen, University of California, San Diego, 9500 Gilman Drive, #9151B, La Jolla, CA 92093-9151B. E-mail: kbangen@ucsd.edu*

C.E. WIERENGA, S. DEV, D.D. SHIN, L.R. CLARK, A.J. JAK, R.A. RISSMAN, T.T. LIU, D.P. SALMON & M.W. BONDI. Effect of mild cognitive impairment and APOE genotype on resting cerebral blood flow and its association with cognition.

Objective: We investigated the impact of genetic (APOE $\epsilon 4$ isoform) and cognitive (mild cognitive impairment; MCI) risk for Alzheimer's disease on resting gray matter cerebral blood flow (CBF) and its associations with neuropsychological performance.

Participants and Methods: Using pulsed arterial spin labeling MR imaging, CBF was measured in 20 MCI (11 $\epsilon 3$, 9 $\epsilon 4$) and 40 cognitively normal (CN; 27 $\epsilon 3$, 13 $\epsilon 4$) demographically-matched participants. Quantified CBF corrected for partial volume effects was compared using a 2 group (CN, MCI) x 2 APOE ($\epsilon 3$, $\epsilon 4$) voxel-wise ANOVA. Associations between CBF in activated clusters and neuropsychological composite scores were then examined.

Results: APOE genotype interacted with cognitive status in the left parahippocampal gyrus (PHG), right middle frontal gyrus, and left medial frontal gyrus ($p < .05$). In the PHG, CBF was elevated for CN $\epsilon 4$ carriers but decreased for MCI $\epsilon 4$ carriers. The opposite pattern was seen in frontal regions: CBF was decreased for CN $\epsilon 4$ carriers but increased for MCI $\epsilon 4$ carriers. Increased CBF in the PHG was correlated with verbal memory for CN $\epsilon 4$ adults ($r = .67$, $p = .01$) and accounted for a significant amount of the variance above age, education, and DRS score ($\Delta R^2 = .496$, $\beta = .718$, $p = .01$). Increased CBF in the left medial frontal gyrus was correlated with verbal memory for MCI $\epsilon 4$ adults ($r = .70$, $p = .05$).

Conclusions: Cognitive status and APOE genotype have interactive effects on resting CBF. Correlations between CBF and verbal memory suggest a neurovascular compensatory response that shifts from posterior to anterior cortices with cognitive decline in $\epsilon 4$ adults.

Correspondence: *Christina E. Wierenga, Ph.D., Psychiatry, UCSD, 3350 La Jolla Village Drive, 151B, San Diego, CA 92161. E-mail: cwierenga@ucsd.edu*

J. PINEAULT, S. GRIMAUULT, P. BERMUDEZ, J. LACOMBE, Y. POTIEZ, P. JOLICOEUR & S. JOUBERT. Evidence of Altered Neural Networks Underlying Semantic Processing in Amnesic Mild Cognitive Impairment: A MEG Study.

Objective: Semantic memory impairment has been documented in elderly individuals with amnesic mild cognitive impairment (aMCI), who

are at risk of developing Alzheimer's disease (AD). Very little is known, however, about the neural substrates of these deficits. Our main objective was to investigate the brain mechanisms associated with impaired semantic processing in the prodromal stage of AD. A group of aMCI patients and a group of healthy seniors participated in a magnetoencephalography (MEG) study where they completed a semantic decision task. The main hypotheses were that: (i) semantic processing should be compromised for aMCI patients, and (ii) these deficits should be associated with cortical dysfunctions within specific areas of the semantic network.

Participants and Methods: Fifteen aMCI patients and 15 healthy controls participated in a semantic decision task. Stimuli consisted of 192 famous faces belonging to four different semantic categories (athletes, singers, actors, or political figures). At the beginning of each block, the written name of a category appeared on the screen and the subject had to determine if each stimulus presented subsequently (e.g., athlete – George Bush) belonged to that category.

Results: Behavioral results showed that the aMCI group was significantly slower and less accurate than the control group, confirming previous reports (Joubert et al., 2010). In addition, MEG analyses uncovered differences in cortical activation between the aMCI group and the control group. We observed greater activation in the aMCI group in the right anterior and inferior temporal lobe, as well as in the right inferior prefrontal cortex, key regions of the semantic network.

Conclusions: Abnormal cortical activation patterns within key areas of the semantic network, extending beyond classic medial temporal lobe structures affected early in AD, were found in aMCI patients while they performed a semantic decision task, suggesting that these structures may be functionally compromised early in the disease process.

Correspondence: *Jessica Pineault, Université de Montréal, 90, ave. Vincent-d'Indy, Montréal, QC H2V 2S9, Canada. E-mail: jessica.pineault@umontreal.ca*

A.L. JEFFERSON, J. SPARLING, K. GIFFORD, N. CANTWELL, B. MARTIN & Y. TRIPODIS. An Elevated Vascular Health Index is Related to Worse Cognitive Performance in Individuals with Mild Cognitive Impairment.

Objective: Systemic vascular disease is associated with an increased risk of incident Alzheimer's disease (AD). We cross-sectionally related an index of vascular health to neuropsychological performances among individuals with mild cognitive impairment (MCI), a purported precursor to AD.

Participants and Methods: Participants included 3335 individuals with MCI from the National Alzheimer's Coordinating Center Uniform Dataset (74±8 years, 57% female). An index of vascular health was calculated using a modified Framingham Stroke Risk Profile (mFSRP) score, including age, systolic blood pressure, anti-hypertensive medication usage, diabetes, cigarette smoking status, and history of prevalent cardiovascular disease. General linear models cross-sectionally related mFSRP quartiles to cognitive performances, adjusting for age, sex, race, and education.

Results: Results suggest that mFSRP quartiles are associated with Trail Making Test (TMT) Part A ($F(3,2635) = 5.3$, $p = 0.001$) and TMT Part B performances ($F(3,2635) = 4.0$, $p = 0.008$), but not performances on measures assessing global cognition, language, or memory systems. Pairwise comparisons suggest that participants in the highest mFSRP quartile performed worse than participants in all three of the lower mFSRP quartiles for both TMT Part A (p -values < 0.003) and Part B (p -values < 0.008).

Conclusions: Our cross-sectional analyses suggest an elevated index of vascular health is related to worse cognitive function, including slower information processing speed and executive dysfunction, among individuals with MCI. Future studies are needed to better understand how proper management of systemic vascular health affects cognitive trajectory and diagnostic conversion in older adults at risk for dementia. Supported by: AG030962, IIRG-08-88733, AG13846, AG034962, AG036697, AG016976, American Federation for Aging Research

Correspondence: *Angela L. Jefferson, PhD, Boston University School of Medicine, 72 East Concord Street, B-7800, Boston, MA 02118. E-mail: angelaj@bu.edu*

K.R. THOMAS, M. MARSISKE & F.W. UNVERZAGT. Verbal Prompting as a Method for Improving Everyday Cognition in MCI and Unimpaired Older Adults.

Objective: We investigated the effect of verbal prompting on elders' 5-year longitudinal change in everyday cognition. Differential effects of prompting associated with impaired cognitive status (amnesic/non-amnesic) were also examined.

Participants and Methods: 2,802 participants (mean age= 73.6 years, mean education= 13.5 years, 26% African American, MMSE > 23) from the ACTIVE clinical trial of cognitive training were given the Observed Tasks of Daily Living (OTDL; a behavioral measure with tasks like change making, phone dialing) at baseline (BL) and at 1-, 2-, 3- and 5-year follow-ups. Items with "don't know" or non-responses received a standardized verbal prompt. At each occasion, unprompted (sum of items correct without prompting) and prompted (sum of items correct including those that were prompted) scores were derived for each participant.

Results: After adjusting for demographics/health/training group, linear mixed effects modeling found a quadratic time pattern of initial gain followed by decline in later years across participants. The prompted score was higher at all occasions and showed a flatter five-year trajectory than the unprompted. Cognitive impairment was associated with poorer OTDL performance (amnesic < non-amnesic < unimpaired). Prompting interacted with impairment status; the largest benefit was observed for the most impaired participants. Regardless of prompting, five-year patterns differed by cognitive group, with amnesic persons showing less gain during early years and more decline during later years of the study.

Conclusions: Brief verbal prompts boosted everyday cognitive performance, particularly in more impaired (amnesic) elders. Prompted scores were more resistant to five-year decline. Discussion focuses on how prompting might be incorporated into elders' daily lives.

Correspondence: *Kelsey R. Thomas, B.S., Clinical and Health Psychology, University of Florida, 4700 SW Archer Rd, J69, Gainesville, FL 32608. E-mail: krthomas@phhp.ufl.edu*

**Paper Session 6:
ADHD and Learning Disabilities**

Moderator: Jill Aloia

10:45 a.m.–12:15 p.m.

V.V. KERNE, N.L. NUSSBAUM, A.R. SHERRY, M. BUNNER & E. WEIZENBAUM. Social Functioning, Social Cognition, and Executive Functioning Differences Associated with ADHD Subtypes.

Objective: The current study focused on social cognition (i.e., affect recognition, emotion matching, and theory of mind) in children diagnosed with ADHD, and evaluated its associations with social and executive functioning skills. This study also compared the neuropsychological profiles of children with different ADHD subtypes in the areas of working memory, inhibition, vigilance, and processing speed. It was hypothesized that the subtypes of ADHD would differ in their patterns of social impairment, social cognition, and executive functioning.

Participants and Methods: Participants were 79 children (52 boys, 27 girls) aged 7-15 years, including 44 children with ADHD, predominantly inattentive type (PI) and 35 with combined type (CT). Participants and their parents completed behavioral, social cognition, and executive functioning measures during a comprehensive neuropsychological evaluation.

Results: ADHD subtypes demonstrated social impairment as evidenced by parent ratings, but they differed in their behavior domains. For example, Descriptive Discriminant Analyses (DDA) indicated children with ADHD, CT engage in more aggressive and rule-breaking behavior than

children with ADHD, PI. Group comparisons also revealed both ADHD subtypes were not significantly impaired on the social cognition measures, and social cognition performance did not discriminate between subtypes. DDA did indicate children with ADHD, CT have more difficulty with inhibition and emotion regulation than children with ADHD, PI. A Canonical Correlation Analysis (CCA) demonstrated that deficits in working memory, planning, and shifting were predictive of anxious and withdrawn behaviors, whereas impaired emotional control and initiative were predictive of aggressive behavior.

Conclusions: Understanding the differences between ADHD subtypes may offer treatment providers additional insight into specific interventions for improving social functioning and metacognitive abilities related to decision making and problem solving in children with ADHD. Correspondence: *Valerie V. Kerne, M.A., Counseling Psychology, The University of Texas at Austin, 1 University Station D5800, Austin, TX 78712-0383. E-mail: vanhorkerne@mail.utexas.edu*

S.L. KARALUNAS & C.L. HUANG-POLLOCK. More than the Mean: Mechanisms Underlying Group Differences in Reaction Times in ADHD.

Objective: Children with ADHD often demonstrate slower mean reaction times (MRTs) than non-ADHD controls on executive and non-executive tests. However, because MRTs result from multiple processes, interpreting group differences is challenging. Research on RTs remains largely descriptive, with presence and magnitude of differences being documented but contributions of sub-process rarely explored. Within ADHD, slow MRTs have been variously attributed to slow/inefficient cognitive processing, poor motor activation, or deficits in cognitive-energetic resources (Kalf et al., 2005; Carte et al., 1996; van Meel et al., 2005; Sergeant, 2000). Diffusion modeling (DM; Ratcliff, 1978) is a well-validated statistical approach that partitions RTs into 1) boundary separation (a), or how "sure" someone needs to be before responding; 2) drift rate (v), a measure of speed/efficiency of information processing; and 3) non-decision time (t_0), which includes motor speed. Thus, use of DM as opposed to traditional RT variables (MRT, standard deviation of RT), will better clarify processes underlying group differences and help to differentiate between competing theories.

Participants and Methods: We report on 137 children ($N_{\text{Control}} = 57$; $N_{\text{ADHD}} = 80$) who completed a stop task. DM analyses were applied to distributions of correct and incorrect go-trial RTs using the fast-DM program (Voss & Voss, 2004).

Results: Although ADHD and control groups' MRTs did not differ ($\eta^2 = .03$), DM analyses indicated that ADHD children had slower v than controls ($\eta^2 = .10$). Groups did not differ on other DM parameters, and v uniquely predicted stopping efficiency ($\beta = .20$).

Conclusions: In terms of prominent theories of ADHD, results are consistent with deficits in management of an executive Effort pool described in the cognitive-energetic model (Sergeant, 2000), but are not consistent with deficits in motor activation or other energetic pools. Group differences in v are also consistent with deficits in resting-state activation that negatively impact cognitive efficiency.

Correspondence: *Sarah L. Karalunas, PhD, Psychiatry, Oregon Health Sciences University, ADHD Research Study UHNS0R1, 3151 SW Sam Jackson Park Rd, Portland, OR 97239-9979. E-mail: karaluna@ohsu.edu*

T. MCAULEY. Persistence of Cognitive Deficits Point to Underlying Genetic Risk in ADHD.

Objective: The aim of this study was to determine whether deficits in response variability, response inhibition, and working memory persist in individuals diagnosed with ADHD irrespective of changes they experience in the overt manifestations of the disorder.

Participants and Methods: Participants were recruited from an outpatient clinic and from the community. Information regarding mental health concerns was obtained from parents, teachers, and children using semi-structured clinical interviews. Information regarding impairment was collected from all available sources and integrated into a sum-

mary score. Diagnoses were made by a registered clinician as per criteria outlined in the DSM-IV. The sample included 130 children with ADHD who were seen at baseline and follow-up (“ADHD youth”) and 68 age-matched control children who were seen at one time point (“TD controls”). The cognitive battery administered at baseline and follow-up included measures of response variability (stop signal GoRTSD), response inhibition (stop signal SSRT), verbal working memory (digit span backward), and spatial working memory (spatial span backward). **Results:** At baseline, ADHD youth performed more poorly than TD controls on measures of response variability, response inhibition, and working memory (all p s < .05) – though only group differences in response inhibition remained significant at follow-up (p < .05). Repeated measures ANOVAs with ADHD youth revealed significant main effects of time for all cognitive measures (all p s < .001); however, there were no significant differences amongst subgroups of ADHD youth who had persistent, remittent, and intermediate forms of the disorder (all p s > .05) nor were there any significant time x subgroup interactions (all p s > .05). **Conclusions:** The persistence of a deficit in response inhibition, irrespective of change in the overt ADHD phenotype, is consistent with the view that this aspect of cognition is a marker of underlying genetic susceptibility to the disorder (i.e., an endophenotype).

Correspondence: *Tara McAuley, Ph.D., Psychology, University of Waterloo, 200 University Ave West, Waterloo, ON N2L 3G1, Canada. E-mail: tmcauley@uwaterloo.ca*

A.R. BORKOWSKA, P. FRANCUZ, M. ORZECZOWSKI, P. SOLUCH & T. WOLAK. In search of the neurological basis of spelling problems. fMRI study.

Objective: The purpose of the study was to identify differences between adolescents with and without spelling problems in brain activation in tasks of assessment of the correctness of words’ visual (orthographical) form.

Participants and Methods: MR imaging was performed on a 3T MR scanner (Achieva 3T TX, Quasar Dual gradients, Philips, Best) with a BOLD Specialist Package, using 8-channel Sense Head Coil. A single-shot gradient echo, echo planar sequence was used for fMRI acquisition. Twenty healthy teenagers (10 with spelling problems, 10 controls), mean age: 15 years, all right handed participated in the experiment. The paradigm was divided into two parts: each series consisted of a pair of the words (with and without misspelling), non-pronounceable letter strings pair (the same or different). The pairs were presented for 6 s, with no interstimulus interval. The cross, a standard baseline, was presented before conditions, between the blocks and at the end of the series. The participants were asked to answer whether the words are spelled correctly, and whether non-words are identical in each pairs. Volunteers had a dominant hand to press a button when the answer was affirmative and non-dominant when the answer was negative.

Results: Analysis of the results obtained during the fMRI study was performed using SPM8 package (Statistical Parametric Mapping). A two-way ANOVA was conducted. The main difference was in left inferior frontal gyrus (BA47) (language functions - semantic processing, semantic encoding, phonological processing and single word reading), in left anterior cingulate gyrus (BA24) (high-level aspects of executive attention) and right cerebellum.

Conclusions: These structures probably are essential in formation of symptoms of spelling problems. The study was supported by Ministry of Science and Higher Education Grant 0400/B/H03/2010/38.

Correspondence: *Aneta R. Borkowska, Ph.D., Department of Clinical Psychology and Neuropsychology, University of M. Skłodowska-Curie, Pl. Litewski 5, Lublin 20-050, Poland. E-mail: aneta.borkowska@autograf.pl*

S. RANE, A. FALL, G. ROBERTS, S. VAUGHN & J. FLETCHER. The impact of a longitudinal intervention for reading on level of attention in middle school students.

Objective: Children who are diagnosed with a reading disorder (RD) often display problems in paying attention. To explain this comorbid-

ity Hinshaw (1992) outlined four models, one of which proposed that reading difficulties lead to problems with attention. Support for this model can come from longitudinal intervention studies that focus on reading problems and assess whether it leads to improvement in attention. However, we do not know of any such prior studies. To address this, we used data from a longitudinal reading intervention study that assessed both reading ability and attention. The aims of this study were twofold: first, to investigate growth trajectories and treatment effects for reading ability and attention; and second, to examine association between reading ability and attention.

Participants and Methods: Participants were part of the NIH-funded Texas Center for Learning Disabilities project that followed students from sixth to eighth grade. Struggling readers in the 6th grade were randomly assigned within school in a 2:1 ratio to intervention ($n=278$), or to a business as usual comparison condition ($n=141$).

Results: Findings from a multiple indicator multilevel growth model suggested an effect for treatment in the growth trajectory of attention and reading ability across the three-year span. Results from the parallel process model indicated that greater increase in reading ability over time is associated with greater increase in attention.

Conclusions: Our findings indicate that students who receive intervention for reading show improvement in their level of attention, thus indicating that our intervention can be targeted for both reading and attention problems simultaneously.

Correspondence: *Shruti Rane, Ph.D., The University of Texas at Austin, 4504 Hibiscus Valley Dr, Austin, TX 78739. E-mail: shruti.rane@gmail.com*

**Poster Session 7:
Executive and Frontal Lobe Functions/Malingering
and Effort**

11:00 a.m.–12:30 p.m.

Executive Functions/Frontal Lobes

M. ABECASSIS, R.M. ROTH & P.R. GIANCOLA. Retrospective Report of Childhood Trauma Predicts Executive functioning in Current Everyday Life.

Objective: Trauma in childhood has been associated with negative sequelae in adulthood such as disruptions in socio-emotional functioning, psychological adjustment, and some aspects of cognitive functioning. The impact of trauma on executive functioning, however, has received limited attention. We examined whether childhood trauma predicts executive functioning in adulthood.

Participants and Methods: Participants were a non-clinical sample of 524 (51% women) adults between 21-35 years of age, who completed the Childhood Trauma Questionnaire (CTQ), designed to assess retrospective reports of physical, sexual, and emotional abuse, as well as emotional and physical neglect; Behavior Rating Inventory of Executive Function – Adult version (BRIEF-A); Beck Depression Inventory-II (BDI-II); and Trait scale from the State Trait Anxiety Inventory (STAI).

Results: Hierarchical Regression modeling was used to determine whether BRIEF-A scores predict the CTQ subscales. Greater difficulty with executive functions was associated with a history of childhood trauma, even after controlling for mood and minimization/denial of trauma symptoms. This relation was seen with several BRIEF-A scales for both emotional and physical abuse, while sexual and physical neglect were related to only a single aspect of executive functioning each.

Conclusions: A history of childhood trauma was found to predict poorer executive functions in adulthood. Differential patterns of disruption in executive functioning were observed depending on the type of abuse. The particularly prominent association with emotional and physical abuse may reflect how disrupted early attachment could impede the development of executive functions.

Correspondence: *Maurissa Abecassis, Ph.D., Colby-Sawyer College, 541 Main Street, New London, NH 03257. E-mail: m.abecassis1@gmail.com*

M. ABECASSIS, R.M. ROTH, P.K. ISQUITH & G.A. GIOIA. Relationship between Family Functioning and Executive Control in a Mixed Pediatric Clinical Sample.

Objective: Behavioral and cognitive problems in children have been associated with parental distress and poorer family functioning. Several studies have observed a relationship between family functioning and executive dysfunction as assessed using performance-based and parent report measures. In the present study, we evaluated the relationship between family functioning and performance on a computer administered set of tasks manipulating working memory load and inhibitory control demand in a mixed pediatric clinical sample.

Participants and Methods: A mixed clinical sample of 59 children and adolescents (Mean age = 12.1 yrs, SD = 3.1) completed the Tasks of Executive Control (TEC) which integrates an n-back to parametrically increase working memory load (0-, 1-, and 2-back) with a go/no-go task to manipulate inhibitory control demand. A parent completed the Family Assessment Device (FAD) to measure general family functioning. Correlation analysis was used to examine the relationship between scores on the FAD and TEC.

Results: Several significant associations were noted between FAD overall and subscale scores and TEC performance. The most prominent association was between greater difficulty on the FAD Role scale (fulfilling expected roles and obligations, needing to be checked up on to make sure tasks are done) and poorer accuracy, speed and consistency of responses on the TEC.

Conclusions: Consistent with prior research, poorer executive control as measured by the TEC was associated with worse family functioning. These findings provide further support for the importance of attending to the impact of executive dysfunction on family dynamics and distress. Correspondence: *Maurissa Abecassis, Ph.D., Colby-Sawyer College, 541 Main Street, New London, NH 03257. E-mail: m.abecassis1@gmail.com*

G. ARAUJO, V. MANDOSKE & D. WHITE. The Normative Development of Response Monitoring.

Objective: Response monitoring research among adults has shown that behavioral adjustments in reaction time occur during speeded tasks on trials immediately following trials on which conflict occurs. Conflict occurs when competition is present between incompatible response tendencies. Post-conflict behavioral adjustments reflect compensations to minimize errors following conflict detection, and are subserved by anterior cingulate and prefrontal cortices. To extend our understanding of the development of response monitoring, we examined age-effects on post-conflict behavioral adjustments.

Participants and Methods: Eighty-nine typically-developing individuals (36 male, 53 female) from 4-24 years of age completed go/no-go and Simon tasks. In the go/no-go task, children pressed a key following presentation of three specified colors, but inhibited key presses in response to a fourth specified color. In the Simon task, an arrow was presented to the left or right of central fixation. Children pressed a key to the left when the arrow pointed to the left and a key to the right when the arrow pointed to the right. The execution of same-sided responses needed to be inhibited when opposite-sided responses were required.

Results: Regression analyses revealed a linear relationship and a trend toward a linear relationship between age and post-conflict behavioral adjustments in the Simon ($R^2 = .002, p < .05$) and go/no-go tasks ($R^2 = .003, p = .09$), respectively.

Conclusions: Findings indicate that post-conflict behavioral adjustments decrease with increasing age continuously (i.e., linearly) into young adulthood. These age-related changes likely reflect maturation of frontal brain regions that subserve conflict detection and the subsequent allocation of cognitive control.

Correspondence: *Gabriel Araujo, Ph.D., Psychology, Nationwide Children's Hospital, 615 Rombach Ave., Apt. 2, Wilmington, OH 45177. E-mail: gabriel.araujo@nationwidechildrens.org*

G. ÅRDAL, A. LUND & ÅSA. HAMMAR. Depression and the association between cognitive inhibition and general functioning - a study of patients in remission.

Objective: The aim of the present study was to investigate the relation between cognitive functioning and general functioning in patients in remission from recurrent depressive episodes.

Participants and Methods: Twenty nine patients meeting the DSM-IV criteria for recurrent unipolar depression, and twenty nine healthy matched controls were included in the study. Both groups underwent neuropsychological testing (Stroop paradigm) and fulfilled the Short Form 36 health survey.

Results: The results confirm previous findings, showing that the cognitive impairment in inhibition during remission is still present. Further, the patient group reported a serious disability in general functioning as measured by the Short Form 36 health survey questionnaire. An association between severe impairment in cognitive inhibition and poor general functioning was found for the physical functioning dimension. There were no association between depression severity and cognitive or general functioning.

Conclusions: In conclusion, the results show that general functioning in former depressive patients is not comparable to healthy controls despite remission; further research should clarify how living with cognitive difficulties affects general functioning when depression is in remission.

Correspondence: *Guro Årdal, PhD student, University of Bergen, Natlandsveien 7, Bergen 5093, Norway; E-mail: guro.ardal@psybp.uib.no*

D.W. BEEBE, M.K. STERN, A.M. DESAI & L.E. MILLER. Impact of Multi-Night Experimental Sleep Restriction on Adolescent Executive Functioning.

Objective: Chronic sleep restriction is endemic among adolescents, but studies of the impact of such sleep restriction on executive functioning (EF) have been few. We have reported that adolescents with sleep-disordered breathing do not differ from their peers in "cool" EF (dispassionate conceptual thought, e.g., Wisconsin Card Sorting Test; WCST), but show deficits in "hot" EF (emotional decision-making/risk assessment, e.g., Iowa Gambling Task; IGT). We hypothesized that experimental sleep restriction has a similar effect in healthy adolescents.

Participants and Methods: 49 healthy 14-17 year-olds successfully completed an experimental protocol that included a baseline week followed by a sleep-restricted week (6.5 hours in bed Monday-Friday nights) and an extended sleep week (10 hours Monday-Friday nights), with a two-night "washout" before each condition. The computerized WCST was administered on the Saturday morning following one experimental sleep condition (randomly assigned) and the IGT following the other. ANCOVAs compared the IGT Total Score and the WCST Perseverative Errors and Conceptual Responses standard scores across conditions after covarying for pre-manipulation IQ and age (IGT only).

Results: Objective actigraphy confirmed a mean of 2.4 (sd=0.6) hours of additional sleep each night during the extended sleep condition compared to the short sleep condition. Manipulation effects were evident on the IGT ($p < .05$), but not the WCST ($p > .25$). Inspection of block scores on the IGT indicated that well-rested participants made the expected gains in performance across trials, but sleep-restricted teens did not.

Conclusions: Even in healthy adolescents, chronic sleep restriction can cause deficits in "hot" EF that may not be evident on traditional measures of "cool" EF. Given that emotional decision-making skills are in flux during adolescence—and that failures in such decisions can result in long-term consequences—the chronic sleep restriction commonly experienced by adolescents on school nights may be far from benign.

Correspondence: *Dean W. Beebe, Ph.D., Psychology, Cincinnati Children's Hospital Medical Center, MLC 3015, 3333 Burnet Avenue, Cincinnati, OH 45230. E-mail: dean.beebe@cchmc.org*

K.M. BEITZ, H.P. DAVIS & S.M. HORNING. Strategic Decision Making on the Iowa Gambling Task in Children, Adolescents, and Adults.

Objective: Several studies have reported that children and adolescents are unable to make advantageous decisions through understanding of

net gain on the IGT. Specifically, it has been shown that a basic frequency selection strategy in children is built upon in adolescence and adulthood to include selection by net gain. Furthermore, adults are better able to learn deck characteristics because they do not shift deck selections impulsively. The objective of the current study is to reexamine these findings in a more complete analysis on the computerized IGT.

Participants and Methods: The current study further explores decision making in children through adults ($N = 670$) on the computerized IGT by examining selection by specific deck characteristics and trial-by-trial strategic adjustment: The probability of staying or shifting after a win or loss.

Results: A 5 (blocks of trials) \times 2 (high and low loss frequency) \times 2 (net gain and net loss) \times 3 (age group: 5-9; 10-16; 17-24) mixed factorial ANOVA was completed to compare the age groups on learning and selection preference. Similar ANOVAs were completed for strategic adjustment. The results demonstrated a three-way interaction between net gain, frequency, and age group on deck preference that suggested better decision making on multiple dimensions with increased age. For strategic adjustment, increased age resulted in higher likelihood of staying with a deck after a win, and decreased likelihood of shifting after a win or a loss. Finally, the relationship between cognitive predictors and strategic adjustment was explored, and higher fluid intelligence was found to relate to decreased shifting and increased staying after wins.

Conclusions: Previous findings regarding decision making on the IGT were supported. Additionally, the current study suggests that a complex interaction occurs between deck characteristics, shifting strategy, and deck preferences on the IGT.

Correspondence: *Kevin M. Beitz, B.A., Psychology, University of Colorado at Colorado Springs, 1420 Austin Bluffs Pkwy, Colorado Springs, CO 80918. E-mail: kbeitz@uccs.edu*

J. BORRANI, M. FRIAS, X. ORTIZ, N. ALEJOS & P. VALDEZ. Cognitive Flexibility in Juvenile Delinquents.

Objective: It has been proposed that juvenile delinquents have difficulties in executive functions. One component of executive functions is cognitive flexibility. The aim of this study was to analyze cognitive flexibility in juvenile delinquents, compared to a group of adolescents paired by age and education.

Participants and Methods: Participants were 60 males, 30 juvenile delinquents and 30 adolescents with no criminal records, paired by age (range: 14-21 years, Delinquents: 17.55 ± 1.53 years; Controls: 17.38 ± 1.57 years; $t = 0.43$; NS) and years of education (Delinquents: 7.70 ± 1.26 years; Controls: 7.73 ± 1.57 years; $t = -0.10$; NS). Cognitive flexibility was analyzed using the perseverative responses score from the Wisconsin Card Sorting Test.

Results: There were no differences between juvenile delinquents and controls in the number of perseverative responses (Delinquents: 27.10 ± 18.71 responses; Controls: 23.0 ± 10.41 responses; $t = 1.05$; NS). Both groups performed below the norm for this measure.

Conclusions: Juvenile delinquents and other adolescents with low education have an equal level of cognitive flexibility, nevertheless, this cognitive process is at a lower level than the one expected for adolescents with normal education, probably due to a developmental delay in the acquisition of frontal functions. This low level of cognitive flexibility interferes with problem solving. Difficulties in problem solving may lower school performance, therefore increasing the probability for school dropout, which is a risk factor for juvenile delinquency.

Correspondence: *Jorge Borrani, Laboratory of Psychophysiology, Universidad Autonoma de Nuevo Leon, Mutualismo 110, Col. Mitras Centro, Monterrey 64460, Mexico. E-mail: jorgeborrani@yahoo.com.mx*

M.T. BUELOW & J.A. SUHR. Personality Characteristics and State Mood Influence Deck Selections on the Iowa Gambling Task (IGT).

Objective: Personality characteristics, such as impulsivity and behavioral activation (BAS) and inhibition (BIS) systems, as well as negative mood, affect performance on the IGT. Each deck has differing patterns

of frequency of wins/losses and long-term outcomes. Although Decks A and B are both disadvantageous, Deck A is avoided by most "healthy" individuals while Deck B is preferred by many controls. The present study sought to examine how personality and mood affect deck selections on the IGT.

Participants and Methods: Participants were 105 undergraduate students (36 males; mean age 19.19 [SD = 2.01]). All participants completed the Impulsive Sensation Seeking subscale of the Zuckerman-Kuhlman Personality Questionnaire, the BIS/BAS scale, the Positive and Negative Affect Schedule (current ratings), and the IGT. Performance on the IGT was broken into percentage of selections from each of the four decks (A, B, C, D) across Trials 41-100, which assess decision making under risk.

Results: High reward responsiveness was associated with greater selections from Deck A (net gain on 50% of trials, overall long-term negative outcomes) but fewer selections from Deck D (net gain on 90% of trials, overall long-term positive outcomes). Individuals reporting a negative mood selected more from Deck B than those reporting a more positive mood. More impulsive individuals selected more cards from Deck C, an advantageous deck with more frequent but smaller losses, than less impulsive individuals.

Conclusions: The results provide evidence that personality characteristics and state mood affect risky decision making on the IGT at the individual deck level.

Correspondence: *Melissa T. Buelow, Ph.D., Psychology, The Ohio State University Newark, 1179 University Drive, Newark, OH 43055. E-mail: buelow.11@osu.edu*

M.T. BUELOW, L. FRAKEY, J. GRACE & J. FRIEDMAN. Parkinson's Disease, Apathy, and Risky Decision Making.

Objective: Previous studies of the Iowa Gambling Task (IGT) in Parkinson's disease (PD) have been mixed, with some finding no differences and others finding differences between PD and control groups. The present study had two aims: 1) investigate the influence of apathy on decision making, and 2) investigate the hypothesis of a slowed learning curve.

Participants and Methods: Participants were 22 adults (13 male; mean age 67.73 [SD = 8.11]) with a diagnosis of idiopathic PD. Nine participants endorsed a clinically significant level of apathy on the Frontal Systems Behavior Scale (FrSBe). Twelve healthy controls also participated. Participants completed the FrSBe and a 200-trial version of the IGT as part of a larger study. IGT responses were calculated for the number of advantageous minus disadvantageous selections across the ten, 20-card blocks of trials.

Results: Individuals in the combined PD group chose more disadvantageously on Block 5 than controls. Although apathy was significantly correlated with performance on Block 3, there was not a significant group by block interaction effect. On the additional 100 trials, apathy was significantly correlated with performance on Block 9 (Trials 161-180). Collectively, all three groups (controls, PD with apathy, PD without apathy) chose more advantageously as the second half of the IGT progressed (Blocks 6-10).

Conclusions: Apathy was correlated with performance on the IGT. With additional trials, individuals with PD, with and without apathy, were able to achieve similar performance to healthy controls, suggestive of a slower learning curve on this task.

Correspondence: *Melissa T. Buelow, Ph.D., Psychology, The Ohio State University Newark, 1179 University Drive, Newark, OH 43055. E-mail: buelow.11@osu.edu*

M.T. BUELOW, L. FRAKEY, J. GRACE & J. FRIEDMAN. Balloon Analogue Risk Task (BART) Performance in Parkinson's Disease with and without Apathy.

Objective: The BART has been used to assess risk-taking behavior and decision making in various clinical and non-clinical populations. The present study sought to expand this line of research by investigating whether individuals with Parkinson's disease, with or without symptoms of apathy, show impaired performance on this task.

Participants and Methods: Participants were 22 adults (13 male; mean age 67.73 [SD = 8.11]) with a diagnosis of idiopathic Parkinson's disease. Nine participants either self-reported, or an informant reported, a clinically significant level of apathy on the Frontal Systems Behavior Scale (FrSBe). Twelve healthy controls also participated. Participants completed the FrSBe and the BART as part of a larger study. BART variables used in the present study included the average number of pumps per balloon adjusted for only unexploded balloons, number of explosions, and total money earned.

Results: Collapsing across level of apathy, individuals with PD made fewer pumps per balloon than controls. Those in the PD group also earned significantly less money than those in the control group. Although level of apathy was significantly correlated with adjusted average number of pumps and number of explosions, the between-groups differences were only marginally significant.

Conclusions: The present findings provide some evidence of risk aversion on a computerized decision making task in a Parkinson's disease sample. Future research should further investigate the relationship of apathy to risk aversion in Parkinson's disease.

Correspondence: *Melissa T. Buelow, Ph.D., Psychology, The Ohio State University Newark, 1179 University Drive, Newark, OH 43055. E-mail: buelow.11@osu.edu*

R.C. CHAN, H. LI, Q. ZHAO & Y. WANG. Neurological soft signs in healthy elder people: Prevalence and relationships to neurocognitive functioning.

Objective: Neurological abnormalities are commonly reported in neuropsychiatric disorders and healthy elderly. It is particularly true for the elderly because neurological signs vary with advancing age. However, most of the neurological signs were limited to hard signs and very little is known about the prevalence of soft signs in healthy elderly.

Objective: The purpose of the current study was to explore the prevalence of neurological soft signs in a group of healthy elderly and their relationships to neurocognitive functioning.

Participants and Methods: 128 healthy elderly participated in the current study. Neurological soft signs were evaluated with the subscales of Cambridge Neurological Inventory. A set of neurocognitive tests was also administered to all the participants.

Results: The healthy elder people demonstrated a sizable prevalence of neurological soft signs. However, people with cognitively impairment exhibited significantly more motor coordination signs and total neurological soft signs than those with cognitively intact people. Moreover, neurological soft signs were significantly associated with neurocognitive functioning.

Conclusions: The current findings suggest that healthy elder people have demonstrated certain extent of neurological abnormalities and there were significant association between soft signs and neurocognitive impairments. The implication of these findings may serve as a potential neurological marker for the early detection of pathological aging diseases or related mental status such as mild cognitive impairment and Alzheimer's disease.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan@psych.ac.cn*

L. SONG, K. WANG & R.C. CHAN. Do patients with bipolar disorders and schizophrenia share similar deficits in semantic inhibition? A meta-analysis of Hayling Sentence Completion Test.

Objective: The current meta-analysis compares the different measures of a theory-based test for the semantic inhibition, the Hayling Sentence Completion Test, in patients with schizophrenia, bipolar disorder and healthy controls, and whether these executive functions are symptoms of the disorder or secondary to the underlying pathology.

Participants and Methods: The Comprehensive Meta-analysis Software package was used to calculate the mean effect sizes of deficits between the different measures of HSCCT. Fifteen studies met the inclusion criteria for the meta-analysis.

Results: The results yielded significant mean effect sizes of 0.718 in patients of schizophrenia and healthy controls for Total reaction time of Task A, 0.982 for Total error of Task B, 0.588 for Type A error of Task B and 0.641 for type B error of Task B. The results also showed significant mean effect sizes of 0.801 in patients of Bipolar and healthy controls for Total reaction time of Task A, 0.743 for Total reaction time of Task B and 0.965 for Total error of Task B. These results showed that patients with schizophrenia and bipolar patients have impairments in task initiation and task inhibition.

Conclusions: These results showed that patients with schizophrenia and bipolar patients have impairments in task initiation and task inhibition. Critically, their impairments are very similar in magnitude. The findings suggest that there is a similarity deficits in initiation and inhibition between patients with schizophrenia and bipolar disorder, therefore implying symptoms may be secondary to the pathology diagnosed as oppose to symptoms which are specific to the pathology itself.

Correspondence: *Raymond C. Chan, Ph.D., Institute of Psychology, Chinese Academy of Sciences, 4A Datun Road, Beijing 100101, China. E-mail: rckchan@psych.ac.cn*

A. CLARK, E. ROY & D. DAWSON. Characterizing the Impact of Executive Dysfunction on Everyday Life in Adults with Stroke.

Objective: Considering the extensive strategies available for assessing and rehabilitating the motor and language deficits that often accompany a stroke, few ecologically valid assessments of executive function exist. Furthermore, since clinicians and scientists alike find it challenging to discriminate normal errors of everyday life from ones associated with executive dysfunction, the development of tasks that dissociate healthy controls from those with pathology is especially important. The goal of this study was to determine if the Slip Induction Task (SIT) and the Baycrest Multiple Errands Test (BMET), both effective in dissociating those with traumatic brain injury from healthy controls, are also sensitive to the complex nature of executive dysfunction following stroke.

Participants and Methods: Five individuals (60 to 75 years) with executive dysfunction due to stroke and five healthy controls participated in this study. In addition to completing a neuropsychological assessment, participants also completed the SIT, a computer-based task, which induces errors by occasionally altering a routine action sequence, as well as the BMET, a naturalistic shopping task in which participants carry out a number of everyday tasks while following a set of rules.

Results: Numerous errors were made by all participants on both the BMET and the SIT. As such, our results demonstrate that simple accuracy on these tasks does not dissociate participants. However, more sensitive measures, like movement time on the SIT as well as rule breaks, task inefficiencies and timing on the BMET are sensitive to executive dysfunction associated with pathology.

Conclusions: The SIT and BMET appear to measure executive difficulties following stroke in a clinically relevant way and are able to capture the complexity associated with activities of daily life. This could inform rehabilitation, thus improving daily function and quality of life, by precisely targeting the difficulties that characterize executive impairment following stroke.

Correspondence: *Amanda Clark, Rotman Research Institute, Baycrest, 3560 Bathurst Street, Toronto, ON M6A 2E1, Canada. E-mail: aclark@rotman-baycrest.on.ca*

P.E. CLAYSON, J.L. HOSKIN, M.D. PRIMOSCH, S.W. BERGIN, A. CLAWSON, S.C. STEFFENSEN & M.J. LARSON. Effects of Dopamine Depletion on Neuropsychological Measures of Executive Functioning.

Objective: The objective of this study was to determine the effects of acute dopamine depletion on executive functions. To deplete the neurotransmitter dopamine, we administered a mixture of essential amino acids deficient in the dopamine precursors tyrosine and phenylalanine.

Considering previous research indicating dopamine modulates functional connectivity between the frontal lobes and basal ganglia, we hypothesized that individuals would be impaired on tests of executive function requiring response inhibition and set shifting during dopamine depletion, but not when taking a placebo.

Participants and Methods: Using a double-blind within-subjects design, 11 males were administered a balanced amino acid mixture (placebo) or an amino acid mixture deficient in tyrosine and phenylalanine on two separate occasions. Order of administration was randomly assigned. Three hours following mixture ingestion, participants completed the trail making, verbal fluency (VFT), design fluency (DFT), and color-word interference subtests from the Delis-Kaplan Executive Function System. Alternate forms were utilized when available. Statistical comparisons were conducted using within-subjects *t* tests between depletion and placebo conditions.

Results: For VFT, letter fluency vs. category fluency and category switching were significantly lower when dopamine was depleted relative to placebo. On the DFT, combined filled and empty dots scores were lower and response inhibition and switching costs were higher when dopamine was depleted compared to placebo condition. No other primary measures or contrasts were significant.

Conclusions: Findings indicate that processes largely dependent on frontostriatal functional connectivity, such as response inhibition and set shifting, are significantly decreased when dopamine is acutely depleted. Implications for pathology are presented.

Correspondence: *Peter E. Clayson, Psychology, University of California-Los Angeles, 3423A Franz Hall, 405 Hilgard Ave., Los Angeles, CA 90095. E-mail: pclayson@ucla.edu*

D. DRAKE, M.C. WELSH, W. FELMBAN, K. SMITH, N. KIHILTHAU, A. PINKHAM, D. WEISS & J. ALLEN. Predicting Self-Reported Risk Taking and Risk Perception Using Experimental Measures of Risky Decision Making and Executive Functions.

Objective: The current study examined the degree to which self-reported risk taking/perception can be predicted by three experimental measures of risk taking, as well as by executive function skills in everyday behaviors.

Participants and Methods: Seventy-seven male and female undergraduate students (18-22 yrs) were administered the following self-report measures: the Domain-Specific Risk Taking and Risk Perception scales (DOSPERT) and the Risk Propensity Scale (RPS). The experimental measures of risky decision-making included the Iowa Gambling Task (IGT), the Balloon Analogue Risk Task (BART), and the Driving Game. Self-reported executive function skills were assessed by the Behavior Rating Inventory of Executive Function (BRIEF).

Results: The correlations among the DOSPERT risk taking and risk perception scores and the RPS scores were significant and in the expected direction. Unexpectedly, the IGT did not correlate with the two other experimental measures of risky decision making, and the BART and Driving Game were only modestly correlated. In hierarchical multiple regressions predicting DOSPERT Risk Taking, neither gender nor the three experimental measures contributed significantly, but entering BRIEF scores did improve the model significantly, with the inhibit and task completion sub-scales and IGT total score as the best predictors. In contrast, the DOSPERT Risk Perception score was predicted by gender alone. Analysis of RPS scores did not result in a significant model.

Conclusions: The three experimental measures of risk taking did not inter-correlate at a level that would be expected if they were all converging on the same psychological construct, nor did they reliably predict the self-reports of risk. Instead, executive function skills, particularly inhibit and task completion, were better predictors of self-reported hypothetical risk taking as measured by the DOSPERT. Surprisingly, it appears different factors contribute to individual differences in hypothetical risk taking and risk perception.

Correspondence: *Douglass Drake, M.S., University of Northern Colorado, 2708 W 19th St Dr #23, Greeley, CO 80634. E-mail: drakeshovel@comcast.net*

M.F. DULAY, W.N. HAVINS, K.A. AGBAYANI, C. KARMONIK, A. VERMA, Z. XUE, M. KAWAI & R.G. GROSSMAN. Frontotemporal White Matter Fiber Tract Integrity and Impaired Executive Functions in Temporal Lobe Epilepsy.

Objective: Disturbances of memory and executive function (e.g., inhibiting undesirable responses, adapting to problems) have been found to be related to reduced frontotemporal white matter tract integrity. Some individuals with temporal lobe epilepsy (TLE) have unexpected executive functions, as well as expected memory impairments. We related the structural integrity of frontotemporal white matter tracts to executive functions in individuals with TLE.

Participants and Methods: Fifteen patients (mean age of 38 years; 8 females) diagnosed with intractable TLE (8 left-TLE; 15 year mean disease duration) underwent diffusion tensor imaging and neuropsychological testing. Fractional anisotropy [FA] was computed for unilateral uncinate fasciculus (UF), cingulum bundle (CB), superior longitudinal fasciculus (SLF) and superior, middle and inferior frontal lobe ROIs using TrackVis by manual tracings or automated ROI tracings using AFNI and the ICBM WM Atlas.

Results: ANOVA indicated that patients with impaired executive functions (*z*-score -1.32 below normative data) had lower mean FA values in UF, CB and SLF. For example, patients with significant perseveration had lower mean UF FA values compared to those without perseveration (impaired mean FA=0.48[SD=0.04]; intact mean FA=0.39[SD=0.03]; $F[1,14]=26.7$, $p < .001$). Controlling for age and disease duration, reduced mental flexibility was significantly correlated with lower FA values of the left CB ($r=-0.54$), the right CB ($r=-0.56$), the left SLF ($r=-0.75$), the right SLF ($r=-0.58$), the superior frontal ROI ($r=-0.54$), and the middle frontal ROI ($r=-0.54$; all *p* values <0.05). Impaired strategic verbal learning was correlated with decreased FA values of the left CB, left UF, left and right SLF, and middle and inferior frontal ROIs (*p*'s <0.05).

Conclusions: Results are consistent with previous studies that have found associations among frontotemporal white matter and cognition. Disruption of these tracts may partly explain the unexpected executive impairments found in some individuals with TLE.

Correspondence: *Mario F. Dulay, Ph.D., The Methodist Neurological Institute, 6560 Fannin, Suite 944, Houston, TX 77030. E-mail: mariodulay@aol.com*

S.W. DUVALL, S. ERICKSON, P. MACLEAN, J. LOWE & R.A. YEO. Executive Function in Full Term and Very Low Birth Weight (VLBW) preschoolers: A Principal Component Analysis Study.

Objective: Executive function (EF) differences have been shown between school age children born full term and preterm. However, the construct of EF is poorly understood in preschoolers and little research has been done on VLBW preschoolers' executive function.

Participants and Methods: The sample size included 99 children: 60 VLBW and 39 full term. EF performance measures were collected for both groups and included: Bear Dragon, Gift Touch, Gift Peek, and Progressive Executive Categorization Battery tasks. Parent ratings of EF from the Behavior Rating Inventory of Executive Function, Preschool Version (BRIEF-P) were also included.

Results: As expected, through independent samples *t*-tests, full term preschoolers were found to have higher EF scores than VLBW preschoolers on all four EF performance measures. Additionally, VLBW preschoolers had higher rates of parent reported executive dysfunction on the BRIEF-P in the following areas: Inhibit, Working Memory and Plan/Organize. Principal component analysis was used to assess the dimensionality of EF; components with eigenvalues greater than 1 were maintained. Only one factor emerged for both groups, both independently and combined, that included all four EF performance measures and excluded BRIEF-P scores. This single factor accounted for 68.24% of the variance in the combined group.

Conclusions: In this sample of VLBW and full term preschoolers, EF performance measures appear to co-occur in a one-dimensional construct. Parent reported EF may not be highly associated with EF performance measures at this age. These results are consistent with previous research showing disagreement between parent report of EF and performance on EF tasks at older ages.

Correspondence: *Susanne W. Duvall, MS, Psychology, University of New Mexico, 1 University of New Mexico, Logan Hall, Albuquerque, NM 87131. E-mail: sduvall@unm.edu*

J.P. EDIDIN, E. GUSTAFSON, N.S. KARNIK & S.J. HUNTER. Neurocognitive Functioning in Homeless Youth.

Objective: Each year, more than 26,000 youth are homeless in Chicago. They are at risk for academic underachievement and cognitive deficits; however, no studies have examined the impact of homelessness on executive development. Understanding this relationship is essential for the development of interventions that support adaptive and psychosocial functioning. The objective of this project was to characterize cognitive functioning in homeless youth in relationship to demographic risk factors.

Participants and Methods: Fifteen youth, recruited from two shelters in Chicago, were administered a neuropsychological battery including the WASI, WRAT-4, CVLT-II, DKEFS, WRAML, TOLDX, IGT, and BRIEF. Mean age was 19.5 years; 47% were female; all participants were African American.

Results: General cognitive ability and academic achievement fell in the low average range. Measures of sequencing, cognitive flexibility, and decision making fell in the low average range. Problem solving and concept formation fell in the borderline range. Verbal and visual memory fell in the low average range. While self-report was not indicative of significant executive dysfunction, analyses revealed a significant relationship between the number of lifetime episodes of homelessness and deficit scores on scales of shifting attention, organization, and emotional control. The number of homeless episodes in the last year was associated with deficient scores across scales of inhibition, shifting attention, initiation, planning, and organization.

Conclusions: Results indicate that homelessness during adolescence impacts multiple areas of cognitive functioning. Increased severity of homelessness, reflected by number of homeless episodes, is negatively related to cognitive functioning. The implications of these findings will be considered.

Correspondence: *Jennifer P. Edidin, Ph.D., Psychiatry, University of Chicago, 5841 S. Maryland Ave., MC 3077, Rm W410, Chicago, IL 60637. E-mail: jedidin@yoda.bsd.uchicago.edu*

J.A. FALKOWSKI, T. ATCHISON, M. DEBUTTE-SMITH & S. O'BRYANT. Executive Functioning and the Metabolic Syndrome: A Project FRONTIER Study.

Objective: Decrements in cognitive function have been linked with the Metabolic Syndrome (MetS), a risk factor for cardiovascular disease, defined by three of the following: elevated blood pressure, increased waist circumference, elevated blood glucose, elevated triglycerides, and low levels of high-density lipoprotein cholesterol. This study aimed to investigate the relationship between executive function (EF) and the MetS in a rural, multiethnic cohort.

Participants and Methods: 398 participants in Project FRONTIER, an ongoing epistemological research study, were assessed on 9 EF tasks. Participants were categorized based on the number of MetS components present according to National Heart Lung Blood Institute/ American Heart Association criteria. The EF measures were analyzed for dimensionality in principle components analysis, the resulting factor structure was entered as the dependent variable in a one-way ANOVA with 6 levels of the independent variable corresponding to the number of MetS components.

Results: The 9 EF measures loaded onto a single factor which accounted for 51.024% of variance across the tasks. The ANOVA was significant

($F(5,392)$, $p = .000$), post hoc comparison revealed the group with no MetS components scored significantly higher than all other groups. A comparison of those meeting criteria for the MetS with those who did not revealed a significantly higher EF score among those without the syndrome ($t = 4.519$, $df = 392$, $p = .000$).

Conclusions: Presence of the MetS was associated with decrements in EF in this multiethnic rural cohort, but there was no additive effect of its components.

Correspondence: *Jed A. Falkowski, M.A., Psychiatry, Division of Psychology, UT Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390. E-mail: jed.falkowski@utsouthwestern.edu*

A. FEDOR & J. GUNSTAD. Higher BMI is Associated with Reduced Cognitive Performance in Division I Athletes.

Objective: There is growing evidence that obesity is associated with neurological conditions like Alzheimer's disease and reduced cognitive function in otherwise healthy adults. Poor cardiovascular fitness has been implicated as a possible mechanism for obesity related cognitive decline, though no study has examined whether body mass index (BMI) is associated with poorer cognitive function in persons with excellent fitness levels.

Participants and Methods: The current study examined the relationship between BMI and cognitive function by the Immediate Post Concussion and Cognitive Test (ImPACT) in Division I collegiate athletes. Participants had an average age of 20.14 (± 1.78) years, were 31.3% female, and 53.9% football players. BMI ranged from 19.04 to 41.14 and averaged 26.72 (± 4.62).

Results: Regression analyses revealed that BMI incrementally predicted performance on verbal memory (R2 change = .004, $p = .260$), visual memory (R2 Change = .015, $p = .026$) and visual motor speed (R2 Change = .003, $p = .314$) composite scores above and beyond age, gender, sport, and number of concussions. Follow-up partial correlation analyses revealed small but significant negative correlations between BMI and verbal memory ($r = -.17$), visual memory ($r = -.16$), and visual motor speed ($r = -.12$), for the entire sample.

Conclusions: These results suggest that BMI is associated with cognitive function, even in a sample expected to have excellent levels of cardiovascular fitness. Further work is needed to better understand mechanisms for these associations.

Correspondence: *Andrew Fedor, Kent State University, 238 Kent Hall, Kent, OH 44224. E-mail: afedor1@kent.edu*

E.I. FRANCHOW, T. MEADOWCROFT, J. CHENEY, C. FITZPATRICK & Y. SUCHY. Self-Reported Burden of Affective Suppression Explains Executive Performance.

Objective: Experimentally induced affective suppression (AS) has been shown to deplete executive functions (EF) (Oaksford, Morris, Grainger, & Williams, 1996; Schmeichel, 2007). The current study investigated whether naturally-occurring AS (assessed via self-report) also explains variance in EF performance.

Participants and Methods: 38 healthy adults aged 18-37 (mean=23.97; 63% female) with 12-16 years of education (mean=14.37) completed Trail Making Letter Number Sequencing, Verbal Fluency, Design Fluency, and Color-Word Interference Inhibition subtests from the Delis-Kaplan Executive Functioning System (combined into an executive composite score). Participants also completed the Beck Depression Inventory (BDI-II) and the Burden of State Emotion Regulation Questionnaire (BSERQ), a new measure developed by the researchers. The BSERQ assesses the burden of AS on the day of testing relative to a participant's usual level.

Results: Hierarchical regression was run with the EF composite as the criterion variable, age, education, and sex as predictors on Step 1, BDI-II as a predictor on Step 2, and the BSERQ score as a predictor on Step 3. Results showed that BDI-II did not account for EF variance beyond demographics [$F_{change}(1,23) < 1.0$, $p > .05$]. However, the BSERQ accounted for an additional 18.9% of variance in EF above and beyond demographics and depression [$F_{change}(1,22) = 6.94$, $p = .015$], such that higher levels of suppression today relative to participants' usual levels were associated with poorer EF.

Conclusions: These results lend support to emerging evidence that AS is detrimental to optimum cognitive functioning and should be formally assessed in conjunction with EF.

Correspondence: *Emilie I. Franchow, BS, Psychology, University of Utah, 220 E. 3300 S., Apt. 136, Salt Lake City, UT 84115. E-mail: emilie.franchow@psych.utah.edu*

E.I. FRANCHOW, J. CHENEY, T. MEADOWCROFT, C. FITZPATRICK & Y. SUCHY. Clinical Significance of Affective Suppression in the Assessment of Executive Functioning.

Objective: Research shows that affective suppression (AS) deleteriously affects executive functioning (EF) and working memory (WM) performances (Inzlicht & Gutsell, 2007; Schmeichel, 2007). The current study investigated the clinical significance of these associations.

Participants and Methods: 30 healthy adults ages 18-37 (mean=23.88; 62% female) with 12-16 years of education (mean=14.31) completed tests of EF (Trail Making and Verbal Fluency from the Delis-Kaplan Executive Functioning System; DKEFS) and WM (Digit Span, Arithmetic, and Letter-Number Sequencing from the Wechsler Adult Intelligence Scale III; WAIS-III). Processing speed (PS) (Coding and Symbol Search from the WAIS-III, and nonexecutive Trail Making trials from the DKEFS) was used for discriminant validity. Participants also completed the Burden of State Emotion Regulation Questionnaire (BSERQ), a self-report measure that assesses the burden of AS on the day of testing relative to a participant's usual level. A median split separated the sample into those with higher and lower AS burden.

Results: Multivariate analyses of variance compared scaled score differences between the high and low AS groups on measures of (1) EF, (2) WM, and (3) PS. Results showed that higher AS burden was associated with overall poorer performances on WM (Wilks' Lambda = .593, $df=3,23$, $p=.007$) and a trend toward poorer performance on measures of EF (Wilks' Lambda = .636, $df=3,21$, $p=.051$). No differences were found for PS. Importantly, scaled scores showed that high AS was associated with generally low average to average performances, whereas low AS was associated with average to high average performances.

Conclusions: These results demonstrate the clinically significant impact of AS on WM and EF.

Correspondence: *Emilie I. Franchow, BS, Psychology, University of Utah, 220 E. 3300 S., Apt. 136, Salt Lake City, UT 84115. E-mail: emilie.franchow@psych.utah.edu*

J. GALBREATH & R. PERNA. Utility of the Wisconsin Card Sorting Test in Predicting Adaptive Living Skills.

Objective: Previous research has suggested that executive functioning is an important variable in community integration and adaptive functioning after acquired brain injury (ABI) (Reid-Arndt, Nehl, & Hinkebein, 2007). The Wisconsin Card Sorting Test (WCST) is a widely used instrument for the assessment of executive functioning abilities in individuals with ABI (Rabin, Borgos, & Saykin, 2008). The present study hypothesized that higher WCST scores would be associated with significantly greater adaptability as measured by the Mayo-Portland Adaptability Inventory (MPAI-4) in individuals with ABI.

Participants and Methods: Participants (N = 65) completed a neuropsychological evaluation and the MPAI-4. The average age of the participants was 43, the average years of education was 12.5, and the average full scale IQ was 85.8. The mean MPAI-4 total score was 43 (mild to moderate impairment in adaptability). Participants' WCST scores were bracketed into the following groups: < 79, 80-89, > 90.

Results: Sample means comparisons (ANOVA) found that different performances on the WCST did not correspond to significant differences in MPAI-4 total score. Differences in total categories achieved, perseverative responses, and failure to maintain set (FMS) were not associated with significant differences in total MPAI-4 scores. Correlations between WCST scores and MPAI-4 subscales showed weak correlations, except for a significant correlation between FMS on the WCST and Psychosocial Adjustment on the MPAI-4.

Conclusions: Test results suggest WCST scores are not predictive of adaptability after ABI, as executive functioning and adaptive functioning are complex constructs that require comprehensive assessment, not simply scores from one test.

Correspondence: *Jennifer Galbreath, MA, Argosy University Seattle, 115 Sherman St, #5, Portland, ME 04101. E-mail: jennifergalbreath@gmail.com*

M.G. GONZÁLEZ-OSORNIO & F. OSTROSKY. Developmental trends of Executive Functions in preschool age children.

Objective: To explore developmental trajectories and their relations in preschool age of the processes frequently postulated as Executive Functions (EFs): Working Memory, Flexibility, Inhibition and Planning.

Participants and Methods: 128 children from 3 to 6 years old attending preschool were studied. They were assessed individually with 17 executive function tasks adapted for pre-school children: digits backwards, Stroop task, Corsi blocks backwards, Go/NoGo tasks, adaptation of the WCST, delay gratification, conflict fist-index finger, puzzles, planning abilities with truck loading task, the Iowa Gambling task and a multi location search task. Statistical analyses included: (1) analyses of variance to examine developmental trends in individual EF tasks, (2) confirmatory factor analysis.

Results: The analyses of the variance showed different developmental trends in EFs. Two independent and related factors were identified; Working Memory and Inhibition ($\chi^2=5.37$; $P=0.61$; CFI=1.00; RMSEA=0.00).

Conclusions: Current results, showed that cognitive processes that underlie EF in preschoolers grouped in a different way from that reported in younger and older children and adult samples (Wiebe et al., 2011; Huizinga, Dolan & van der Molen, 2006; Miyake, 2002; Miyake et al, 2000). This may suggest that during preschool development, EF are more dependant of one another and as children develops and prefrontal areas mature, they become dissociable.

Correspondence: *María G. González-Osornio, Psychophysiology and Neuropsychology Laboratory, UNAM, University Avenue 3004, Building D, 2nd floor (Lab 11), Mexico 04510, Mexico. E-mail: lupytaz@hotmail.com*

M. GORLYN, J.G. KEILP, A.K. BURKE, M.O. OQUENDO & J.J. MANN. Decision-Making and Cognitive Abilities: Processing Speed is Integral to Iowa Gambling Task Performance.

Objective: The Iowa Gambling Test (IGT) is used to study clinically relevant decision-making, and thought to capture the contribution of emotional dysfunction to decision-making behavior. Performance was initially thought to be separable from other cognitive abilities, but subsequently found to be associated with a variety of neuropsychological measures, primarily those assessing higher-level and frontal-lobe functions. We examined associations between IGT and a comprehensive cognitive battery in healthy volunteers.

Participants and Methods: Subjects had no history of Axis I or II disorders. Correlations were computed between IGT and tests of intelligence, processing speed, sustained/selective attention, verbal/visual/working memory, language fluency, and executive function. Stepwise regressions were then used to predict IGT scores.

Results: IGT difference score correlated best with faster processing speed (Choice RT $r=-.43$, Digit Symbol $r=-.40$) and faster median IGT response time ($r=-.35$). Smaller IGT winnings and smaller losses (related to selection from more profitable decks) also correlated with faster processing speed. IGT performance was predicted efficiently by a combination of Digit Symbol and Wisconsin Card Sort perseverative errors (Betas=.39,.27, 24% variance); smaller winnings and smaller losses were predicted by Digit Symbol and Buschke SRT (for winnings Betas=-.31,-.28, 24% variance; for losses Betas=.52,.24, 44% variance).

Conclusions: Processing speed had the strongest relationship with IGT performance, with executive function contributing as well. Better pro-

cessing speed and memory were associated with a preference for more conservative payouts. Information processing rate is known to facilitate complex cognitive abilities such as reasoning and problem-solving, and evidently decision-making as well. Reduced processing speed may underlie impaired IGT performance in some clinical populations.

Correspondence: *Marianne Corlyn, PhD, Columbia University, Box 42, 1051 Riverside Drive, New York, NY 10032. E-mail: mg643@columbia.edu*

M. HATFIELD-ELDRED & R. SKEEL. The Effect of Working Memory Capacity, Probability of Loss, and Gender on Decision-Making.

Objective: Researchers have posited that individuals with limited working memory (WM) capacity have difficulty holding sufficient information in mind to make fully reasoned decisions, leading to risky decision-making. However, other researchers have suggested that insufficient WM capacity leads to random responding, not risky responding. Gender differences in decision-making have also been identified, with research suggesting males tend to make a higher proportion of risky decisions, though results have been mixed. The current study examined relationships between WM, gender, and decision-making under varying risk conditions. It was hypothesized that increased WM load would result in increased risky decisions across different risk conditions.

Participants and Methods: 120 college students (60 males) were randomly assigned to a WM load or control group and completed a decision-making task requiring rapid integration of information about probability of loss and progress toward a goal. The task utilized three different risk conditions. WM load participants completed the WM task and decision-making task concurrently.

Results: A split-plot 2 (WM condition) x2 (gender) x3 (risk level) ANOVA showed a significant interaction between WM condition and gender ($F(1,116) = 6.38, p = .01, \eta_p^2 = .05$) with males showing higher rates of risky decisions in the WM load condition, but females demonstrating no differences between WM conditions. There were significant main effects for probability of loss ($F(1,116) = 75.24, p < .001, \eta_p^2 = .39$) and gender ($F(1,116) = 5.03, p = .03, \eta_p^2 = .04$). There was also a main effect for WM condition for trials with maximum uncertainty ($F(1, 116) = 8.93, p = .003, \eta_p^2 = .07$).

Conclusions: Results support the claim that decreased WM capacity increases risky decision-making, though the effect was primarily only seen in males. There was no support for the theory that WM load increases random responding.

Correspondence: *Maegan Hatfield-Eldred, Ph.D., Central Michigan University, 19204 Baldwin Circle, Holly, MI 48442. E-mail: maegan.hatfield@gmail.com*

S.H. HUMES. Is There a Connection Between Quality of Life, Personality, and Frontal/Executive Functioning?: Implications for Cognitive Impairment and Preventative Measures.

Objective: Little research has examined how quality of life and personality interact with the frontal/executive domain of cognition in the older population. The current study examines the relationship between quality of life, mood, personality, and frontal/executive measures.

Participants and Methods: Two hundred and four adults (M age = 78.37) completed a neuropsychological battery. Quality of life variables included the Geriatric Depression Scale, Beck Anxiety Inventory, and a background questionnaire including items on exercise, sleep, leisure activities, and spiritual importance. Frontal-executive measures included select WAIS-III subtests, DKEFS Color-Word Interference, Trails A and B, and COWAT FAS. Participants completed the NEO-FFI to assess personality.

Results: A canonical analysis revealed a significant correlation between the set of frontal-executive variables and the set of personality and quality of life variables, $R(32) = .94, p < .05$. Subsequent bivariate correlations indicated numerous correlations between frontal-executive measures and personality and quality of life variables. In additions, those who experienced insomnia performed significantly worse on WAIS-III Digit Symbol than those who did not report insomnia, $t(50) = 2.15, p < .04$.

Conclusions: These findings suggest that the frontal/executive functions of older adults are strongly related to their quality of life and personality. Older adults who are more susceptible to neuroticism, anxiety, and depression have greater difficulty on frontal-executive tasks involving processing speed, divided attention, working memory, abstract reasoning, and filtering out distractions. In contrast, those who score higher on extroversion and openness, as well as partake in healthier lifestyle activities, have stronger processing speed, divided attention, and abstract reasoning. These results demonstrate the importance and degree to which lifestyle and personality impact cognition, as well as profile those that are prone to problems with frontal/executive functions.

Correspondence: *Sara H. Humes, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: shumes@westmont.edu*

S. ISKANDAR, A.D. BAIRD, R. GALE, L. KRASEAN & J. URLACHER. Obesity in Older Adulthood is Associated with Lower Performance on the Switching Component of Verbal Fluency.

Objective: Research on verbal fluency tasks has shown that examining clustering and switching patterns provides clinically pertinent information that cannot be elucidated through total scores alone (i.e., with switching being more related to executive functions, and clustering to memory functions). Because obesity is associated with adverse effects on executive functioning, it was hypothesized that overweight and obese adults (BMI ≥ 25) would have lower switching scores.

Participants and Methods: We examined data from 78 cognitively healthy older adults (53 females, 25 males, M age = 71.84, M education = 13.22). No participants were underweight, 29 were of normal weight (BMI = 18.5 - 24.9), 27 were overweight (BMI = 25 - 29.9), and 22 were obese (BMI ≥ 30). Participants were asked to name as many animals as possible in one minute.

Results: T-Tests were conducted on total number of words, mean cluster size, and mean number of switches as dependent variables and weight category as the independent variable, with statistical correction for redundancy. As expected, the only significant difference found was for mean number of switches, $T(76) = 2.427, p = .018$, Cohen's $d = 0.584$.

Conclusions: Results from the present study extend evidence that the processes underlying the clustering and switching aspects of performance on verbal fluency tasks are somewhat different, and add that being overweight or obese is associated with lower performance on the more executive aspect of the task among cognitively normal individuals. This association may result from subtle changes in vascular function or frank vascular disease. Further research is needed to elucidate whether these effects are multiplied with rapid weight gain, and whether or not these effects may be reversed with diet and exercise.

Correspondence: *Sam Iskandar, M.A., Psychology, University of Windsor, 309-3355 Sandwich St., Windsor, ON N9C1B2, Canada. E-mail: iskandas@uwindsor.ca*

L.M. JACOLA, P.K. SHEAR, K.L. MEDINA, S.R. HOWE & F. HICKEY. The Relationship between Executive Functioning and Maladaptive Behavior in Adolescents with Down Syndrome.

Objective: Individuals with Down syndrome (DS) have a higher lifetime risk of developing depression than others with intellectual disabilities, and adults with DS who have mood symptoms and executive functioning (EF) deficits may be at disproportionate risk for the dementia that is common in this population, making the link between EF and mood an important one to understand developmentally. This study was the first to examine the relationship between EF and maladaptive behavior in adolescents with DS. Consistent with the existing adult literature, we hypothesized that EF performance would relate to maladaptive behavior in this adolescent group.

Participants and Methods: Fifty-two adolescents (ages of 12-18; 24 males) completed EF tasks that measured working memory, inhibition, problem solving, attention, and verbal fluency. Caregivers rated maladaptive internalizing and externalizing behaviors (CBCL and BASC-II).

Results: Poorer working memory was a significant independent predictor of externalizing behavior after accounting for internalizing symptoms ($p=.013$). Semantic fluency was a unique predictor of internalizing behaviors after accounting for externalizing symptoms ($p=.001$). More errors in inhibition were associated with greater maladaptive behavior ($p=.04$).

Conclusions: These findings extend those of several studies conducted in adults with DS in suggesting a relationship between maladaptive behavioral symptoms and cognition in adolescence. Our results have direct implications for the design of future studies in DS, as little information is available about measures that have adequate psychometric properties in this population. These results are also clinically and theoretically important as they provide data regarding specific EF measures that may be used to document cognitive development.

Correspondence: *Lisa M. Jacola, M.S., University of Cincinnati, PO Box 0376, Cincinnati, OH 45221. E-mail: lisa.jacola@gmail.com*

J.E. KARR, T.R. GRINDSTAFF & J.E. ALEXANDER. Omega-3 Polyunsaturated Fatty Acids and Cognition in a College-Aged Population.

Objective: Although growing in popularity, the cognitive benefits of omega-3 polyunsaturated fatty acids (n-3 PUFA) remain unclear across different age groups. Recent research describes n-3 PUFA as cognitively beneficial during prenatal neurodevelopment and neuroprotective at later age. Relatively few researchers have investigated n-3 PUFA and cognition among children and young adults. To clarify the influence of n-3 PUFA during young adulthood, the current study supplemented college students with n-3 PUFA, hypothesizing a benefit of n-3 PUFA over placebo on inhibition, attention, task-switching, learning and working memory.

Participants and Methods: College-aged participants ($N=41$) were randomized between active ($n=20$; 25% male; Age: $M=19.9$, $SD=1.8$) and placebo treatments ($n=21$; 33.33% male; Age: $M=20.4$, $SD=1.6$). Supplementation lasted four weeks, with the active treatment receiving fish oil (480mg DHA/720mg EPA) and the placebo treatment receiving coconut oil. Cognitive assessments occurred at baseline and post-treatment, including the Rey Auditory Verbal Learning Test (RAVLT), Stroop Test and Trail Making Test (TMT).

Results: Repeated measure analyses indicated no effect of fish oil on the Stroop Test or RAVLT Stages I to V ($p>.05$). An interaction occurred between condition and performance on RAVLT Stages VI, $F(1,39)=4.45$, $p=.04$, and VII, $F(1,39)=5.65$, $p=.02$. Placebo intake significantly improved TMT performance over fish oil, $F(1,38)=5.92$, $p=.02$.

Conclusions: Fish oil benefits on RAVLT performance derived more from depreciation of placebo performance than improvement through fish oil. The placebo advantage on the TMT possibly derived from a learning effect. Cumulatively, these results indicate little cognitive effect of n-3 PUFA among college students; however, the treatment may have been sub-therapeutic and a larger sample is necessary to generalize these results.

Correspondence: *Justin E. Karr, University of Victoria, 4169 Bracken Ave. Lower, Victoria, BC V8X 3P1, Canada. E-mail: jkarr@uvic.ca*

K. KASZYNSKI, C. HINKLE, J. EDIDIN, N. KARNIK & S. HUNTER. Executive Dysfunction and Social-Emotional Adjustment in Homeless Youth.

Objective: Homeless youth are at risk for cognitive, behavioral, social, and emotional problems, due in part to the stressful circumstances they experience on a daily basis. Whereas research on adults highlights executive and social-emotional dysfunction, research on youth has not considered neuropsychological deficits in relation to adjustment. Executive dysfunction is suspected, given risks regarding substance abuse and decision making. Knowledge regarding the relationship between neuropsychological functioning and social-emotional status is necessary to inform interventions targeting psychological disorders and general welfare. This project examines executive functions and trait-based social-emotional adjustment in homeless youth, to understand potential risks and resilience.

Participants and Methods: Fifteen youth, recruited from two homeless shelters in Chicago, were administered a battery comprised of neuropsychological measures (D-KEFS Trail Making, Sort, and Color-Word Identification tests, and Tower of London) and social-emotional adjustment questionnaires (WAI). Mean age was 19.5 years and gender was approximately evenly split. All participants were African American.

Results: Analyses revealed significant relations between performances on the Trail Making tasks and trait measures of affect, self-restraint, and defensiveness. Specifically, rapid letter sequencing was negatively correlated with negative affect. Letter sequencing was positively related to repressive defensiveness. Motor speed was significantly correlated with happiness. Rapid visual scanning was significantly correlated with self-restraint.

Conclusions: Results indicate a pattern of executive dysfunction among homeless youth who endorse social and emotional maladjustment. Specifically, individuals characterized as developmentally immature, impulsive, inconsiderate of others, irresponsible, angry, anxious, and depressed demonstrated deficits across EF based neuropsychological tasks. Implications of these findings will be discussed.

Correspondence: *Katie Kaszynski, M.S., Illinois Institute of Technology, 3300 S Federal St, Chicago, IL 60616. E-mail: katiekaz@gmail.com*

M. KAWAMURA, H. FUJIMOTO, Y. KOBAYASHI & S. MORIOKA. The Relationship of Word Generation Mechanism and Individual Differences in Working Memory Capacity.

Objective: To examine how Working Memory Capacity (WMC) difference influences word-generation by using Word Fluency Task (WFT) with different strategies.

Participants and Methods: The participants: 28 Japanese healthy normal adults with right-handedness (22.46 ± 3.26 year olds) divided into three groups of WMC by Japanese Reading Span Test (Osaka, 1994): High Span Group (HSG), Middle Span Group and Low Span Group (LSG). The test used: WFT consisting of three fluencies with different strategies (Category, Letter and Verb generation). The limited time: 60 seconds per one trial with 4 trials in each fluency.

Results: The two-way ANOVA and the analysis by Tukey's Post Hoc Test about the generating words indicate the main effects in group and fluency factors; the significant difference is noticed between HSG and LSG in letter fluency ($p<.05$) and also between HSG and the other groups in verb-generation fluency ($p<.001$). The two-way ANOVA and Tukey's Post Hoc Test about the generated-word number ratio /15 seconds indicate an interaction between group and time factors; in 0~15 seconds, LSG is superior in word-generation ratio to any other group ($p<.001$) and in 45~60 seconds, LSG is inferior to any other group ($p<.001$).

Conclusions: It becomes clear that HSG is superior in word fluency function to any other group and that especially the letter fluency and verb-generation (both deeply related with frontal lobe function) are strongly influenced by individual WMC difference. Moreover, the result of the generated-word number /15 seconds suggests that LSG is inferior in cognitive flexibility and emergence to the other groups.

Correspondence: *Mimpei Kawamura, Health Science MS, Speech-Language-Hearing Therapy, Fukui College of Health Sciences, 55 Egami-cho 13-1, Fukui 910-3190, Japan. E-mail: mimpeijp@yahoo.co.jp*

E. KEIFER & D. TRANEL. Does the Delis-Kaplan Executive Function System Measure Frontal Lobe Dysfunction? A Study in Patients with Focal Frontal Lesions.

Objective: Executive functioning (EF) is a multidimensional concept encompassing higher-order adaptive abilities, such as mental flexibility and judgment. Disruption in EF has been associated with frontal lobe dysfunction. The Delis-Kaplan Executive Function System (D-KEFS; Delis, Kaplan, & Kramer, 2001) is a comprehensive battery of nine tests mostly adapted from existing procedures to measure a wide spectrum of EF. Few studies have examined how performance on the D-KEFS is affected by focal damage to various sectors of the prefrontal cortex, and the sensitivity and specificity of the D-KEFS to frontal lobe damage and executive dysfunction remain largely unknown.

Participants and Methods: To address this, we studied participants with focal, stable, chronic ventromedial prefrontal (vmPFC, $n=14$), dorsolateral prefrontal (dlPFC, $n=14$) and non-frontal lesions (nonPFC, $n=18$).

Results: There were no statistically significant group differences on D-KEFS measures, but the dlPFC lesion group had the lowest performances on virtually every measure. All mean scaled scores in the vmPFC and nonPFC groups were above a scaled score of nine, while mean scores of the dlPFC group fell below a scaled score of eight on three measures (Letter Fluency, Category Fluency, and Color-Word Inhibition).

Conclusions: The similarity of the vmPFC and nonPFC groups on all D-KEFS measures raises serious questions about the sensitivity and specificity of these measures in regard to vmPFC damage. Sensitivity and specificity for dlPFC damage are more encouraging. We are comparing the D-KEFS with more traditional EF measures (e.g., Wisconsin Card Sorting Test), to investigate the potential incremental value of the D-KEFS in assessing and characterizing EF impairments.

Correspondence: *Ekaterina Keifer, PhD, Behavioral Medicine and Psychiatry, West Virginia University, 930 Chestnut Rudge Road, Morgantown, WV 26505. E-mail: ekeifer@hsc.wvu.edu*

W.D. KILLGORE, M.R. WEINER & Z.J. SCHWAB. Daytime Sleepiness Affects Prefrontal Regulation of Food Intake.

Objective: Despite the alarming rate of obesity there has been minimal scientific progress in identifying and combating the causes of this epidemic. The prefrontal cortex is critical in the ability to modulate emotion and inhibit behavior. However, insufficient sleep is often associated with reduced metabolic activity within prefrontal regions. We tested whether daytime sleepiness would correlate with reduced prefrontal activation to appetizing high-calorie food images and whether this would predict difficulties modulating food intake.

Participants and Methods: Forty healthy adults (22 men) aged 18 to 45 underwent functional magnetic resonance imaging (fMRI) while viewing pictures of high- and low-calorie foods. Subjects completed the Epworth Sleepiness Scale (ESS) and provided a rating to the query "how often do you eat more than you intend to." In SPM5, contrast images comparing brain activation derived from the high- versus low-calorie conditions were correlated voxel-wise with scores from the ESS in a second-level regression model ($p<.001$, $k=10$).

Results: Daytime sleepiness correlated with reduced activation in the ventromedial prefrontal cortex during perception of high- versus low-calorie food images ($r=-.54$, $p<.001$). Moreover, activation within this cluster was related to the tendency to eat more than intended, but only for women ($r=-.47$, $p=.048$).

Conclusions: For participants viewing enticing high-calorie food images, greater daytime sleepiness was associated with decreased activation in the prefrontal cortex, a region implicated in emotional and behavioral modulation. Activation of this region was directly correlated with overeating in women. Findings suggest that normal fluctuations in sleepiness may be sufficient to affect brain regions important for regulating food intake.

Correspondence: *William D. Killgore, Ph.D., Psychiatry, Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

W.D. KILLGORE, Z.J. SCHWAB, M.R. WEINER, M. KIPMAN, S. DELDONNO & S.L. RAUCH. Overeating is Associated with Altered Cortico-Limbic Responses to Images of High Calorie Foods.

Objective: Developed countries are witnessing an alarming epidemic of obesity, yet the neurobiological underpinnings of excessive food intake remain poorly understood. Neuroimaging research has identified an important network of cortical and limbic regions that are activated by images of appetizing high calorie foods. Using whole brain functional magnetic resonance imaging (fMRI), we examined the correlation between self-reported difficulty modulating food in-

take and cortico-limbic responses to high-calorie food images. We hypothesized that the tendency to overeat would be associated with reduced activation of the prefrontal cortex, which is involved in behavioral inhibition, and increased responsiveness of limbic and paralimbic regions, which are involved in emotional and motivational processing.

Participants and Methods: During fMRI, 40 healthy adults (22 men) aged 18 to 45 viewed images of high- and low-calorie foods. Participants also completed several questions about dietary behavior. Contrast images comparing brain activation derived from the high- versus low-calorie conditions were correlated voxel-wise with responses to an excessive eating scale in a second-level regression model.

Results: When viewing high- versus low-calorie foods, the tendency to eat more than intended was correlated with reduced activation within several regions of the dorsolateral prefrontal cortex bilaterally ($p<.001$), and increased activation of the right amygdala ($p<.005$).

Conclusions: When confronted with images of appetizing foods, self-reported difficulty regulating food intake was associated with reduced activation within regions of the brain purported to mediate behavioral control and increased activation of limbic regions involved in ascribing salience to motivationally relevant stimuli. Findings highlight a functional neurocircuitry that may be relevant to excessive food consumption.

Correspondence: *William D. Killgore, Ph.D., Psychiatry, Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

G. LALONDE, M. HENRY, A. DROUIN-GERMAIN, P. NOLIN & M.H. BEAUCHAMP. The Link Between Traditional and Virtual Reality Neuropsychological Measures of Executive Functions.

Objective: Executive functions (EF) are higher order mental processes responsible for directing cognition, emotion, and behaviour. Virtual reality (VR) is an innovative tool for EF assessment which is comparable to paper-pencil tasks (Parsons et al., 2007; Moreau, 2006), but has the advantage of being more ecologically valid. However, it is unclear which traditional EF tasks are associated with performance on VR tasks of EF.

Participants and Methods: Thirty-eight typically developing adolescents (mean age=14.69, $SD=1.23$, males=18) completed two types of EF measures: 1) A VR 'Stroop' task (ClinicaVR:Classroom-Stroop), which monitors reaction time, commission and omission errors; 2) Five subtests of the Delis-Kaplan Executive Function System (D-KEFSTm): a) Trail Making (TM) measuring cognitive flexibility; b) Color-Word Interference (CWI) measuring inhibition; c) Verbal Fluency; 4) Twenty Questions measuring abstract thinking; d) Tower (TT) measuring spatial planning.

Results: Results indicate significant correlations between the VR task (commission errors) and three subtests of the DKEFS: 1) TM (Completion time; $r=.46$, $p=.006$.); 2) CWI (Completion time; $r=.60$, $p=.0001$.); 3) TT (Total rule violation; $r=.47$, $p=.005$.). Reaction time in VR was also associated with rule violations on the TT ($r=-.50$, $p=.003$.). When these three subtests were compared in their ability to predict performance in VR, only performances on the CWI and the TT contributed significantly: the number of errors in the CWI explained 13% ($\beta=1.47$, $SE=.57$, $t=2.57$, $p=.02$.) of the variance in the number of VR commission errors, whereas the number of rule violations on the TT explained 19% ($\beta=5.30$, $SE=1.65$, $t=3.2$, $p=.005$).

Conclusions: It appears that the VR Stroop task is most associated with traditional measures of inhibition and maintenance of instructional sets. Given the novelty of VR as a cognitive assessment tool, it is important to conduct research on its association with more traditional neuropsychological measures in order to determine its validity.

Correspondence: *Gabrielle Lalonde, Psychologie, Université de Montréal, 10524 st-urbain, Montréal, QC H3L 2V1, Canada. E-mail: gabrielle.lalonde@hotmail.com*

S.L. LEININGER, A. FREEDLAND, L. UMFLEET, N. SCHWAB, J. WARD, N. CORONADO, J. TANNER, P. NGUYEN, M.S. OKUN, D. BOWERS, D.J. LIBON & C.C. PRICE. Rey-Osterrieth Complex Figure Flowchart Organizational Approach as a Measure of Executive Functioning in Parkinson's Disease Patients.

Objective: We prospectively examined Rey-Osterrieth Complex Figure (ROCF) flowcharts as a measure of organizational approach and subsequent contribution to memory recall for individuals with Parkinson's disease (PD). We predicted that processing speed and executive functioning deficits would be reflected through increased directional shifts of drawn segments and negatively impact memory performance.

Participants and Methods: Right-handed, idiopathic non-demented PD ($n = 42$) and age and education matched controls ($n = 42$) completed a neuropsychological protocol that included ROCF copy, immediate, and delay trials with examiners recording time to completion and flow charts. Denman scoring criteria were used. The copy flows were examined with the following criteria: 1. left to right approach; 2. completion of large rectangle ≤ 7 segments.

Results: PD had slower ROCF copy times, worse immediate and delayed memory scores, and poorer copy trial planning, $t(2.43)$, $p < .05$. For both groups, copy time correlated with drawing the large rectangle > 7 segments. For PD, copy time related to worse copy scores ($r = -.37$), immediate recall ($r = -.39$), and delayed memory ($r = -.33$). Controlling for copy time, drawing the rectangle in < 7 segments during copy positively associated with copy scores among controls ($r = .42$), and immediate recall for PD ($r = .32$). Copy trial planning associated with traditional measures of frontal function (e.g., WCST; D-KEFS Tower Test Achievement, both $r = .37$).

Conclusions: Results suggest that slower copy times and poorer ROCF copy planning approach in the PD group reflect deficits in processing speed and executive dysfunction that may negatively impact memory encoding.

Supported by NINDS K23NS060660(CP)

Correspondence: *Shelley L. Leininger, Ph.D., Mary Free Bed Rehabilitation Hospital, 235 Wealthy SE, Grand Rapids, MI 49503. E-mail: Shelley.Leininger@hotmail.com*

A. LUNDEQUIST, B. BÖHM, H. FORSSBERG & A. SMEDLER. Born too early. Cognitive outcome in prematurely born adolescents, in relation to gestational age.

Objective: Research has shown that premature birth poses a risk for later cognitive development, particularly in the executive domain, but few studies extend beyond the early school years. Adolescence is a critical period for cognitive maturation, and this study investigated the cognitive outcome in a Swedish cohort of prematurely born 18-year olds, in relation to gestational age at birth and medical risks in the perinatal period.

Participants and Methods: As part of Stockholm Neonatal Project, 135 adolescents born preterm with very low birth weight ($< 1500g$) and 94 matched controls born at term, participated in a follow-up study at age 18. General intelligence, as well as executive, memory, language and visual motor functions were measured by WISC-III, D-KEFS, naming tests, Rey Auditory Learning Test, face recognition, and VMI.

Results: Extremely preterm adolescents (EPT, GA 23-27, $n=74$) performed worse than adolescents born either very preterm or at term, on all cognitive tasks and particularly on executive measures. 50% of the EPT group had suffered perinatal medical complications, and had more pervasive cognitive deficits than EPTs with low medical risk. By contrast, very preterm adolescents (GA 28-31; $n=36$) performed consistently at par with the controls. Moderately preterm with very low birth weight (GA 32-36; $n=25$), who had experienced varying degrees of intrauterine growth retardation, tended to score lower than very preterm and control adolescents, particularly on complex cognitive measures.

Conclusions: Extremely preterm birth per se poses a risk for long-term cognitive outcome, particularly in executive functions. These risks may be exacerbated by medical complications. Children born after 28 weeks of gestation or later, with normal birth weight and no perinatal complications, do not have an elevated risk for cognitive deficits at age 18.

Correspondence: *Aiko Lundequist, Ph.D student, Stockholm university, Astrid Lindgrens child hospital, Stockholm 106 91, Sweden. E-mail: aiko.lundequist@ki.se*

M. KRISHAN & E. MOES. Cognitive Correlates of Mindfulness Meditation.

Objective: A number of studies have examined the relationship between meditation and attention and executive functions, with varying results. Unlike previous studies, this study compared experienced meditators with closely matched non-meditators on measures of sustained attention, the ability to deal with the unexpected, set shifting and inhibition. Further, we examined the construct validity of self-reported mindfulness.

Participants and Methods: Ten experienced mindfulness meditators (MM, formally trained, with 30 minutes daily practice for at least a year, average 17 years meditation practice) were recruited from meditation training centers, and compared to 20 meditation-naïve controls (C) on a continuous performance test (Vigil), the Wilkins Counting Test (WCT), the D-KEFS Color-Word Interference Test (CWI), the WRAT-3 Arithmetic subtest (for discriminant validity), and two self-rating scales of mindfulness, the MAAS and the KIMS. Exclusionary criteria included IQ < 80 , and any diagnosis or treatment for neurological, psychiatric or learning disorder. Participants were matched on age, IQ, education, and gender, as well as number of hours slept the previous night.

Results: The MM group reported higher levels of mindfulness on the self-report scales than the C group. No differences were found in RT, errors, or performance over time on Vigil, or on the first two conditions of the WCT requiring sustained attention. A significant effect was obtained on the third, unexpected condition, with the MM group more accurate than the C group. No differences were found in ability to inhibit or time to switch set on the CWI, although MM made significantly fewer errors when required to switch. As expected, no group differences were found on the Arithmetic subtest.

Conclusions: Mindfulness meditation enhances the ability to deal with the unexpected, possibly by processing stimuli more fully, without significant cost to response time. Construct validity for the MAAS and KIMS was supported.

Correspondence: *Elisabeth Moes, Ph.D., Psychology, Suffolk University, Donahue 619, 41 Temple Street, Boston, MA 02108. E-mail: elisabethmoes@yahoo.com*

A.E. MOLNAR & M.Y. KIBBY. Convergent and Divergent Executive Functioning Skills on the BRIEF in School-Age Children with ADHD-C, ADHD-PI, or Dyslexia.

Objective: The purpose of this study was to test shared and unique behavioral executive functioning deficits in school-age children with ADHD-C, ADHD-PI, or dyslexia on the BRIEF—Parent Form.

Participants and Methods: Participants included 18 children with ADHD-C, 25 with ADHD-PI, 32 with dyslexia, and 48 controls. Parents were administered the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000) as part of a larger, funded study (NIH/NICHHD R03HD048752, R15HD065627). The BRIEF consists of eight subscales and 3 broader factors, including the Behavioral Regulation (BRI) and Metacognition (MI) Indices. Groups were comparable in intelligence, age, and maternal education ($p > .05$).

Results: When using MANOVA, the ADHD-C group had worse scores on the BRI compared to the other groups. ADHD-C and ADHD-PI groups had worse scores on the MI compared to the dyslexia group, which scored worse than controls. The ADHD-C group had unique deficits on Inhibit, Shift, and Emotional Control subscales. ADHD-C and ADHD-PI groups had deficits on Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor subscales. The dyslexia group was rated similarly to controls on all subscales.

Conclusions: Consistent with prior literature, our findings indicate that children with ADHD-C have worse inhibitory control than children with

ADHD-PI. However, children with ADHD-C and ADHD-PI have shared deficits in several cognitive executive skills, consistent with findings on the Inattention dimension of ADHD. Children with dyslexia may have mild cognitive executive dysfunction also, with executive dysfunction being a potential source of shared etiology between ADHD and dyslexia. Correspondence: *Andrew E. Molnar, M.A., Psychology, Southern Illinois University at Carbondale, 305 Hadley Street, Unit 4337, Houston, TX 77002. E-mail: aemolnar@gmail.com*

O.P. MORIN-MONCET. Occlusion of LTP by action observation: A neurophysiological TMS study.

Objective: It is well known that action observation recruits brain regions associated with motor execution including the primary motor cortex (M1). However it is not known whether action observation can modulate synaptic plasticity within M1.

Repetitive electrical stimulation of the median nerve paired with transcranial magnetic stimulation of the contralateral primary motor cortex at intervals of 25ms induces an increase in cortical excitability reflected by enhanced motor evoked potential. This effect is thought to reflect long-term potentiation (LTP), a synaptic process involved in learning. Interestingly, this LTP effect can be inhibited by prior motor learning.

Here, we investigated whether the mere observation of motor actions was sufficient to inhibit LTP, which would suggest that observation of repetitive actions has a similar effect on synaptic plasticity than actual execution.

Participants and Methods: 36 right-handed healthy adults.

PHASE 1. 20 TMS pulses were delivered over the left M1 before and after participants observed or executed repetitive thumb movements.

PHASE 2. Repetitive stimulation of the right median nerve paired with TMS stimulation (PAS) of the contralateral motor cortex at 25 ms intervals was applied to each participant. Two blocks of 20 TMS pulses were performed at 1 and 10 min after PAS.

Results: PHASE 1. A one-way ANOVA showed no significant between group effect of the task ($F = 1.740$; $p = 0.191$).

PHASE 2. A repeated measures ANOVA revealed a significant between-group effect ($F = 4.755$; $p < 0.05$). Post-hoc analysis revealed significant differences between the passive condition and both observation and execution conditions ($p < 0.05$; Tukey HSD).

Conclusions: We show for the first time that the repeated observation of motor actions can inhibit the subsequent effect of PAS, similarly to what is seen following action execution. This occlusion of LTP suggests the induction of synaptic plasticity during action observation.

Correspondence: *Olivier P. Morin-Moncet, B.Sc., Psychology, Université de Montréal, 2900 Van Horne #3, Montreal, QC H3S1R1, Canada. E-mail: olivier.morin-moncet@umontreal.ca*

B.E. MUNOZ OSPINA & G. ARTEAGA. Cognitive control mechanisms and Traumatic Brain Injury in patients with prefrontal lesions in the Wisconsin Card Sorting Test performance.

Objective: Characterize the differences that might explain the alteration of cognitive control mechanisms in patients compared with controls.

Participants and Methods: All subjects ($n=12$) 6 patients and 6 controls were matched in critical variables such as age, sex, handedness and educational level. All subjects were being treated in the Fundación Clínica Valle del Lili (Cali, Colombia). Criteria for inclusion were: age (+/- 2 years), sex (males), handedness, and educational level High School). Control cognitive mechanisms was measured with the Wisconsin Card Sorting Test (WCST) (Heaton, 1981).

The study is ex-post facto inter subjects.

Statistical Analysis were conducted using SPSS 17.0. An α level of .05 was used to determine significance. Significant group differences were analyzed with student t Test. Qualification grid was used for analyze the performance in the WCST with the categories previously created based on a pilot study.

Results: The obtained WCST scores produced by the participants groups resulted in three dependent measures (conceptual responses

($t(10)=2.240$; $p=0.049$), categories achieved ($t(10)=1.664$; $p=0.031$) and perseverative errors ($t(10)=2.327$; $p=0.042$). The qualitative analysis in the WCST performance produced by the participants groups resulted in executive attention ($t(10)=-2.460$; $p=0.034$), preparatory set ($t(10)=-2.891$; $p=0.016$) and action monitoring ($t(10)=-2.889$; $p=0.016$).

Conclusions: The operationalization of cognitive control in patients with TBI allow to analysis of these deficits based on interaction between variables and mechanisms underlying damage to the prefrontal areas.

The quantitative and qualitative analysis of behavior, enables an approach closest to the reality of the patient at a cognitive level and this measure allows an implementation of management strategies and programs rehabilitation.

The interaction between anatomical and cognitive variables could explain the difficulties exhibited in patients in relation to the organization and temporal regulation of cognitive activity.

Correspondence: *Beatriz E. Munoz Ospina, Magister, Fundación Valle del Lili, Carrera 9S # 18-49, Cali 00, Colombia. E-mail: vitrix@gmail.com*

S.E. PIGOTT. The Relationship Between the Informant Version of the BRIEF-A and Performance-based Measures of Executive Functioning in Adults with Moderate to Severe Traumatic Brain Injury.

Objective: Clinical neuropsychological assessment of executive functioning skills has traditionally focused on performance-based measures that are administered in an office setting. More recently, questionnaire measures, such as the Behavior Rating Inventory of Executive Functioning (BRIEF), have been utilized to assess such skills in daily living situations. The BRIEF was initially developed for use with pediatric populations and evaluated parental impressions of various aspects of Metacognition and Behavioral Regulation. Vriezen and Pigott (2002) found no correlation between the Index scores of the BRIEF and performance-based measures of executive functioning in children with traumatic brain injuries, suggesting that these measures tap different aspects of executive functioning. This investigation replicates and extends these findings to an adult population.

Participants and Methods: As part of a neuropsychological assessment, family members or rehabilitation workers of 37 individuals who had sustained moderate to severe brain injuries were asked to complete the informant version of the BRIEF-Adult questionnaire. The Metacognitive Index (MI) assessed the ability to problem solve using planning and organizational skills whilst sustaining task-completion efforts in working memory. The Behavioral Regulation Index (BRI) evaluated the ability to maintain regulatory control of behavior and emotional responses. Pearson or Spearman correlation coefficients were calculated with significance set at $p < 0.05$.

Results: Neither the MI nor BRI was significantly correlated with performance-based measures of executive function (the Wisconsin Card Sorting Test, Trail Making B, and Phonemic Verbal Fluency) nor were they correlated with the Full Scale IQ rating.

Conclusions: The lack of correlation between the BRIEF-A and performance-based measures reinforces the importance of incorporating questionnaires into clinical neuropsychological assessments in order to better assist with rehabilitation planning.

Correspondence: *Susan E. Pigott, PhD, Psychology, London Health Sciences Centre, 800 Commissioners Rd. E., London, ON N6A 5W9, Canada. E-mail: susan.pigott@gmail.com*

T.A. REAGAN, D. WHITESIDE & S. ASHE. Executive Function and Working Memory in Children: Developmental Considerations.

Objective: Previous research has investigated the relationship between cognitive abilities and executive functioning in adults (Salthouse, 2005), but less research has been conducted with children. This study examined executive functioning and working memory in children and adolescents, which were hypothesized to correlate significantly.

Participants and Methods: Participants were 984 children who took part in the National Institute of Health MRI Study of Normal Brain Development. Participants consisted of 47.4% males and 52.5% females, ages 5 to 18 years. Correlational analyses were performed on scores obtained on CANTAB Intradimensional/Extradimensional Shift and CANTAB Spatial Working Memory for each age group.

Results: Contrary to the hypothesis, the results indicated no significant correlations between executive functioning (CANTAB Intradimensional/Extradimensional Shift) and working memory (CANTAB Spatial Working Memory) in children ages 5 to 12. However, a significant correlation ($r = .34$, $p = .01$) was found in adolescents ages 13-15.

Conclusions: The results suggest that the relationship between executive functioning and working memory becomes stronger as children age. This is consistent with previous research suggesting that frontal lobe development occurs later in maturation (Anderson, Anderson, Northam, Jacobs, & Cotroppa, 2001) and that working memory accounts for more variance in executive functions as the central nervous system matures (Romine & Reynolds, 2005).

Correspondence: *Tara A. Reagan, Clinical Psychology, Argosy University, Seattle, 5037 Baker Ave NW, Seattle, WA 98107. E-mail: astaelreagan@gmail.com*

J. RECKOW, R. FERRARO & M. BUTLER. State/Trait Anxiety, Aviation, and the Frontal Lobe.

Objective: An individual's risky behavior has been linked to the frontal lobe and decision making (Spinella, 2005). The connection between risky behavior and anxiety is further highlighted in a study conducted by Hunter (2005), who found that a measure of anxiety was significantly correlated with risk perception and risk tolerance measures in pilots. The correlation between anxiety and risk perception has important implications in aviation. Involvement in dangerous aviation situations can be predicted by inaccurate risk perception (Hunter, 2006). State anxiety may indicate the degree of risky behavior a pilot may partake. If state anxiety does suggest a higher chance of aviation accidents than future training should incorporate instruction on preparing for state anxiety.

Participants and Methods: Thirty-four students with extensive aviation experience (A+) and 35 students without such experience (A-) completed tests designed to tap into the impact of frontal lobe function (Executive Function Index; Spinella, 2005) and State/Trait anxiety performance (Spielberger et al, 1980).

Results: Experienced Aviation students showed worsening executive function performance (motivation/drive, organization) with increases in State, but not Trait, anxiety. ($r_s > -.34$, $ps < .05$). Inexperienced aviation students showed the exact opposite; worsening executive function (motivation/drive, organization) with increases in Trait, but not State, anxiety ($r_s = -.41$, $ps < .05$).

Conclusions: We have demonstrated reliable effects based on type of anxiety and aviation experience across various domains of executive function. Given the vast importance of adequate executive functioning to many everyday cognitive activities, and given the impact of human error on aviation accident rates, these results suggest training potential aviation pilots in the identification and control of their reaction to state and trait anxiety situations may be helpful.

Correspondence: *Ric Ferraro, Ph.D., Psychology, Univ. North Dakota, Stop S380, Grand Forks, ND 58202. E-mail: f.richard.ferraro@email.und.edu*

S.A. ROGERS & D.A. LOWE. Is There a Relationship between Spirituality and Frontal-Temporal Functioning?

Objective: Previous studies have attempted to understand the neurological and biochemical processes involved in religious beliefs, including the role of the prefrontal and temporal lobes. However, little research has explored whether frontal and temporal functioning among older adults may be related to the importance that spirituality has in their lives.

Participants and Methods: One hundred and seven older adults (81 women; M age = 79.48) completed several frontal-executive and temporal measures. Participants also completed a Likert rating of the importance of their spirituality or religiousness.

Results: Spiritual importance was positively correlated with Stroop B, Trails B, and WMS-III Logical Memory I & II. These relationships persisted after hierarchical multiple regression analyses controlled for effects of age and education. Hierarchical multiple regression analyses also revealed a trend toward a positive relationship between spiritual importance and both Stroop A and CVLT Trials 1-5 Total. Subsequent canonical analyses showed that spiritual importance was positively related to the set of verbal measures, but not the set of nonverbal measures.

Conclusions: The importance that older adults ascribe to their spiritual orientation may be positively related to their performance on select frontal-executive and temporal measures. Even after controlling for age and education, older adults who endorse higher levels of spiritual importance show stronger language processing speed, divided attention, and verbal learning and memory for contextual information. Some of the frontal and temporal activity involved in older adults' spiritual importance may therefore be implicated in their executive and memory skills. Moreover, the importance that older adults give to their spirituality may particularly correspond to their level of left frontal and temporal functioning. This highlights how changes in spiritual importance may covary with changes in select aspects of frontal and temporal cognitive functioning.

Correspondence: *Steven A. Rogers, Ph.D., Psychology, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: sarogers@westmont.edu*

R.M. ROTH, P.K. ISQUITH, G.A. GIOIA & C.G. VAUGHAN. Evidence of Validity for Pediatric ImPACT Based on Convergence with the Tasks of Executive Control.

Objective: Pediatric ImPACT is a repeatable assessment battery for children 5-12 years that is sensitive to the effects of concussion. We examined evidence for validity based on convergent relationships with the Tasks of Executive Control (TEC), a performance measure of fundamental executive functions.

Participants and Methods: A sample of 44 typically developing girls and 100 boys aged 5 to 12 years ($M = 9.51$, $SD = 2.18$) completed both Pediatric ImPACT and the TEC in counterbalanced order. Pediatric ImPACT is composed of a child-report symptom rating scale, the Post-Concussion Symptom Inventory (PCSI), and a computer-administered battery of neurocognitive tests tapping response speed, learning and memory, and efficiency. The TEC integrates an n-back to parametrically increase working memory load with a go/no-go task to manipulate inhibitory demand.

Results: There were multiple modest correlations between the PCSI and TEC accuracy, speed, and variability. Pediatric ImPACT Neurocognitive test scores also correlated moderately with TEC scores. Faster response speed on Pediatric ImPACT was associated with better accuracy as well as faster and less variable response speed on the TEC. Better Learning & Memory Accuracy Composite scores were associated with greater accuracy but not response speed measures on the TEC, and greater Accuracy/Speed Efficiency Composite scores were associated with better accuracy and less variability on the TEC.

Conclusions: Greater symptom reports and poorer test performance on Pediatric ImPACT were associated with more problematic executive control on the TEC. Overall, the pattern of correlations between Pediatric ImPACT and the TEC offers convergent evidence of validity for Pediatric ImPACT. Correspondence: *Robert M. Roth, Ph.D., Psychiatry, Dartmouth Medical School, Department of Psychiatry, Dartmouth Medical School, Lebanon, NH 03756. E-mail: robert.m.roth@dartmouth.edu*

C.S. SANDOVAL OCAMPO, F. OSTROSKY SHEJET, B. CAMARENA & A. AGUILAR. Relationship of the gene COMT and Executive Function in Children.

Objective: Objective: We investigated the relationship between a functional polymorphism of the COMT gene and neuropsychological performance in healthy children.

Participants and Methods: Methods: The Val108/158Met polymorphism of the COMT gene was genotyped in 248 healthy children aged 3-6 years. Groups were divided according to polymorphism type Val/Val (n=83), Val/Met (n=76) and Met/Met (n=89). All children were tested with a neuropsychological battery of executive functions that depend on the PFC. Neuropsychological performance was compared across genotype groups using an analysis of variance ($p \leq .05$).

Results: Results: All children were similar with regard to developmental characteristics. Children carrying the Met/Met polymorphism performed significantly better on tasks related to working memory and sequential planning than children carrying Val/Val genotype.

Conclusions: Conclusions: These findings support that the COMT polymorphisms have a selective effect in the DA system of the PFC. Children carrying Met/Met polymorphism have better performance in working memory, inhibition and planning tasks, which has been reported in previous studies suggesting that DA levels in PFC play an important role for cognitive functions but some of them are more susceptible of this effect depending of the neural region involved. Furthermore the normal brain development in children is an important issue to consider since this process of maturation takes place from posterior regions to anterior regions, and this would explain how the inhibition processes related to the orbital frontal cortex are important for the development of more complex functions such as working memory and planning related to the dorsolateral cortex.

Correspondence: *Carla S. Sandoval Ocampo, Neuropsychology and Psychophysiology Lab, UNAM, 55 56 22 23 27, México 04510, Mexico. E-mail: susysand@gmail.com*

M.T. SCHMID & ÅSA. HAMMAR. Executive Functioning in patients with first episode Major Depressive Disorder.

Objective: Impaired performance in executive functioning (EF), especially in the cognitive functions of inhibition and semantic fluency, has been extensively documented in patients with recurrent Major Depressive Disorder (MDD). Further, studies have shown that these impairments persist despite symptom reduction, and that there is an association between cognitive impairment and number of depressive episodes. However, few studies have investigated EF in patients with a first episode of MDD.

Participants and Methods: The present study investigated the cognitive functions of inhibition, verbal fluency, problem solving and planning, and mental flexibility in a group of 30 patients, in the acute phase of illness, diagnosed with their first episode of MDD (FE). The FE group was compared to a matched control group. Four tests (Verbal fluency, Color- Word Interference, Trail making, Tower) from the Delis Kaplan Executive Function System (D-KEFS) was administered.

Results: The results show that the patient group performed significantly poorer compared to the control group on the EF measures of inhibition and semantic fluency. In addition, the patient group performed significantly poorer in visual scanning, colour naming and word reading, abilities that depend on processing speed. However, an interference score showed that processing speed could not alone be responsible for the poor performance in EF. The other measures were not significantly impaired in the patient group.

Conclusions: The results indicate that impairment in inhibition and semantic fluency are present early in the course of MDD. Further, a possible slowing in processing speed must be further investigated.

Correspondence: *Marit T. Schmid, Psychologist, Neuropsychology; University of Bergen, Norway; Jonas Liesvei 91, Bergen 5009, Norway. E-mail: marit.schmid@psybp.uib.no*

M.A. SEDO, G. GONZALEZ-ALEMAN & G. DE ERAUSQUIN. Neuropsychological Testing of Quechuan-Speaking Groups : Clinical Value of Speed and Errors.

Objective: The St-Louis Language-Independent Battery includes a) non-verbal measures; b) translated verbal measures; and c) UniNami-

ing Tests. UniNaming Tests consist of language-independent “pseudo-sentences” of 40-50 words that lack semantic or syntactic structure and can be named in other languages. Pseudosentences are produced at increasingly complex cognitive levels: automatic (decoding and describing); and executive (inhibiting and shifting).

Participants and Methods: In a preindustrial region of the Andes we tested 29 (genotypic) schizophrenics (virgin from medication), 29 (phenotypic) siblings and 29 healthy neighbours. A Factor Analysis and a Content Analysis were made.

Results: Scores defined three non-overlapping subgroups. Factor 1 (represented by both UniNaming tests) describe speeded motor, visual and oral-motor tasks that require prefrontal planning and self-control. All measures of language and memory correlated with these basic tasks. Raven Matrices correlated twice: with its score, and with its total working time. Factor II (amplitude of verbal attention) was represented by the words in the Wechsler list retained after one presentation. Factor III included the errors made at Factor I tasks.

Conclusions: Pattern of responses are consistent with the pre-conceptual (graphic-functional) pattern of cognition described by Luria. UniNaming Tests of motor-visual-semantic-oral-motor readiness and effort help separate genotypical from phenotypical subjects at their time of execution and (very specially) at the number of their errors. UniNami Tests can be administered to low-proficient speakers of English in their own primary language, so as to confirm or reject the English scores obtained. Correspondence: *Manuel A. Sedo, Ph.D., Test creation, UniLingual-Testing, 9 Ingleside Rd., Natick, MA 01760. E-mail: manuel@sedo.net*

J.C. SHEEHAN, J.C. LARSON, J. WILSON & Y. SUCHY. The Impact of Natural Strategy vs. Verbal Strategy in Motor-Control.

Objective: The current study examined the impact of an imposed verbal strategy as compared to one's natural strategy on motor control (M-CNT), as measured by the smoothness of a double-tap movement, in a computerized motor sequence learning task.

Participants and Methods: 81 healthy participants, ages 18-27, were pre-trained in either a five- or eight-movement motor sequence that included a double-tap movement. 39 participants were pre-trained in the sequence using a verbal strategy (VS), i.e., they were given verbal labels to use with each movement. 42 participants were pre-trained using their own natural strategy (NS), i.e., no labels were provided for them. Once trained, all participants completed 3 Performance Blocks: Block-1—participants performed the sequence as they had been trained; Block-2—verbal labels used in the VS condition appeared on the screen and all participants were required to vocalize them while performing the movements; and Block-3—verbal labels disappeared and participants were instructed to continue to perform the motor sequence and were free to choose whether to use verbalization.

Results: Repeated measures ANOVA revealed a significant Block X Group interaction ($F(2,78) = 3.51, p = .032$), such that the presentation of verbal labels deleteriously affected M-CNT in Blocks 2 and 3 in the NS group, but not in the VS group.

Conclusions: Following pre-training, M-CNT performance was comparable for both groups; this suggests that an imposed verbal strategy works as well as one's own strategy when used from the outset. However, upon imposition of verbal labels (Block-2), the NS group was deleteriously affected. This suggests that NS participants initially relied on verbal labels that differed from those presented on the screen (e.g., “twist” vs. “turn”). Thus, if material has been partially learned by an individual using their own strategy, imposing new verbal labels different from their own may interfere with performance.

Correspondence: *John C. Sheehan, BS, Psychology; University of Utah, 1061 Creekside Dr., Ogden, UT 84404. E-mail: j.sheehan@utah.edu*

R. O'NEIL, A. WEST, N. SWAN, L. BUTTON, A. FRANKS, J. JOHNSTON, M. BAURLE, M. HATFIELD-ELDRED & R. SKEEL. Individual differences in Urgency, Impulsivity, & Anxiety Affect Performance on Risk-Taking Tasks.

Objective: The role of individual differences in personality and the relationship these have to risk-taking have recently been drawing

more research interest. In addition to impulsivity, urgency and anxiety are two factors that have been associated with engagement in risky behaviors. The current study explored the relationship between these personality features and performance on two different measures of risk taking, the Angling Risk Task (ART) and the Iowa Gambling task (IGT).

Participants and Methods: Participants included 241 college-aged individuals who completed the ART and the IGT as well as measures of anxiety sensitivity, behavioral urgency, and impulsivity.

Results: Results showed different relationships among predictors for the ART & IGT. ART performance was related to both urgency ($r = .14$, $p < .05$) and anxiety sensitivity ($r = .15$, $p < .05$), while neither construct was related to IGT performance. Impulsivity was not associated with either ART or IGT performance. Regression analyses for the ART indicated the total model was significant (R^2 Total Model = .042, $p < .05$) with urgency and anxiety being the largest factors.

Conclusions: Results suggest individual differences may impact similar tasks to varying degrees. Task differences in the ART and IGT with regard to ambiguity inherent in the tasks are discussed as they relate to urgency and anxiety.

Correspondence: Reid Skeel, Ph.D., Central Michigan University, 136 Sloan Hall, Mt. Pleasant, MI 48859. E-mail: reid.skeel@cmich.edu

T. BOYD, M.M. SOHLBERG & Y. CHO. Normative Performance Across Settings on the Revised Executive Function Route-Finding Task.

Objective: The recovery of executive functions is crucial to community re-entry following acquired brain injury. Despite the importance of executive functions to functional outcome, ecological assessment of this complex and interrelated array of regulatory functions remains challenging. Route finding is one assessment domain with clear promise. The Executive Function Route Finding Task (EFRT; Boyd & Sautter, 1993)) has been shown to discriminate between participants with frontal lesions due to closed head injury and healthy controls (Spikman, Deelman, & van Zomeren, 2000). Though the EFRT provides useful descriptive data on patients' overall executive functions, it lacks standardization. This study built upon the ecological validity of the EFRT and improved sensitivity, thereby facilitating its clinical applicability. We added a quantitative measure of route-finding efficiency (footstep ratio). We further compared the performance on two routes equated for length and complexity to gauge transferability of the executive function measure across contexts.

Participants and Methods: Sixty healthy adults who met criteria for the study were consented and randomly assigned to complete the revised EFRT on one of two routes. Subjects were asked to find a specific destination as efficiently as possible, using any resources available. Twenty of the subjects returned to complete a second route after a minimum interval of two months after initial testing.

Results: Performance was analyzed for the psychometric properties of the measures. The footstep ratio was normally distributed and provided a quantitative index of route finding efficiency.

Conclusions: Results suggested the modified EFRT provides a reliable method to measure route finding. This study provides the first normative data on route finding performance.

This work supported by University of Oregon/Peacehealth Translational Research Grant

Correspondence: McKay M. Sohlberg, PhD, university of oregon, 5284 University of Oregon, Eugene, OR 97403. E-mail: mckay@uoregon.edu

J. STÅLNACKE, R. DIAZ-HEIJTZ, H. NORBERG, M. NORMAN, A. SMEDLER & H. FORSSBERG. Cognitive and Behavioral Functioning in Adolescents and Young Adults after Exposure to Antenatal Corticosteroids.

Objective: It remains unclear whether exposure to stress in utero adversely affects cognitive function and behavior later in life. Administration of antenatal corticosteroids to women at risk for pre-

mature delivery is a clinical intervention which reduces the incidence and severity of lung disease in preterm infants. However, repeat courses have also been associated with decreased fetal growth, and there is concern for adverse neurodevelopmental effects. We examined long-term cognitive and psychological functioning 14 to 26 years after antenatal corticosteroid treatment in a Swedish population-based cohort. This is the first follow-up study to go beyond the preschool years.

Participants and Methods: Fifty-eight youths (36 boys) exposed to two to nine weekly courses of antenatal betamethasone were evaluated with tests of general cognitive ability, memory and learning, working memory, attention and speed, and cognitive flexibility and inhibition. Behavior self-reports were also administered. Unexposed subjects ($n = 44$), matched for age, sex, and gestational age at birth, served as a comparison group. An additional group exposed *in utero* to a single course ($n = 25$) was included for dose-response analyses.

Results: Mixed model regression analyses showed that exposure to repeat courses of antenatal corticosteroids were neither associated with deficits in higher cognitive functions nor self-reported psychological health in later life. Adjusted mean scores in two measures of attention and speed (Symbol Search and Digit Span Forward) were significantly lower in subjects exposed to two or more corticosteroid courses, but this was not dose-dependent. However, such differences were not observed with regard to more complex cognitive tasks, or overall psychological functioning.

Conclusions: Repeat exposure to antenatal corticosteroids may be associated with limited deficits in attention and speed through adolescence and young adulthood, but there is no evidence for long-term adverse effects on higher cognitive and behavioral functioning.

Correspondence: Jannica Stålnacke, Master of Science, Dept of Psychology, Stockholm University, Frescati Hagväg 8, Stockholm SE-10691, Sweden. E-mail: jannica.stalnacke@psychology.su.se

K.N. THAKKAR, E. CONGDON, R.A. POLDRACK, F.W. SABB, E.D. LONDON, T.D. CANNON & R.M. BILDER. Women Are More Sensitive to Prior Trial Events in the Stop Signal Task.

Objective: Fast, flexible behavioral adjustments based on past experiences are central to functioning in an ever-changing environment. In cognitive tasks, these reactive adjustments are typically measured by reaction time changes as a function of trial history. Although sex differences have been reported in several domains of cognition, little research has investigated differences in reactive performance-based adjustments.

Participants and Methods: 445 healthy males and 489 females participants performed a stop signal task. On no-stop trials, a stimulus appeared on the screen, and subjects were instructed to make the appropriate keypress. On stop signal trials, an auditory stimulus (stop signal) was presented following target onset, and subjects were instructed to withhold the keypress. Increased delay between target and stop signal onset leads to more erroneous signal-respond trials. The magnitude of trial history effects was examined by comparing no-stop RTs preceding and following signal-respond trials, correct signal-inhibit trials, and correct no-stop trials.

Results: We observed speeding following consecutive no-stop trials and slowing following erroneous signal-respond trials in both men and women. Women slowed down more following errors and sped up more following no-stop trials than males. There were no differences between genders for overall mean RT on no-stop trials or proportion of successfully inhibited trials.

Conclusions: Results from this large sample indicate that females are more sensitive to trial history in preparing current motor responses. These findings are interpreted within an evolutionary framework of frontal lobe cytoarchitecture, and suggest gender differences in the function of paleocortex, the cortical regions purported to underlie the responsive control of action.

This work was supported by the Consortium for Neuropsychiatric Phenomics (NIH Roadmap for Medical Research grants UL1-DE019580, RL1MH083269, RL1DA024853, PL1MH083271).

Correspondence: *Katy Thakkar, M.A., Psychiatry, UCLA, 740 Westwood Plaza, CS-737, Los Angeles, CA 90095. E-mail: kthakkar@mednet.ucla.edu*

S.R. THORCUSEN, M. SHAHREBANI, K. WILLIAM & Y. SUCHY. Age and Gender Differences in a Motor Learning Task.

Objective: Research shows that deleterious effects of novelty on motor planning (M-PLN) latencies predict incipient cognitive decline among community-dwelling older adults (Suchy et al., 2011). To facilitate the utility of M-PLN for identification of older adults at risk for cognitive decline, it is necessary to investigate demographic factors that may impact performance. The present study investigates whether patterns of performance on a motor learning task differ as a function of age or gender.

Participants and Methods: Participants were 42 college-age students (mean age = 21.31) and 40 older adults (mean age = 70.33) recruited from the community. Participants completed the Push-Turn-Tap task (Suchy et al., 2007), which provides indices of the deleterious effects of task novelty and complexity on motor planning latencies.

Results: A repeated measures analysis of variance (ANOVA)—using M-PLN latencies as dependent variables, block (novel vs. normal vs. complex) as a within-subjects factor, and age and gender as between-subjects factors—yielded a significant three-way interaction between block, age group, and gender ($F[3,77]=3.626, p<.05$), with older females showing a smaller novelty effect compared to young adults or older males, and older males showing a larger complexity effect compared to young adults and older females.

Conclusions: Both age and gender can significantly influence the effects of novelty and complexity on M-PLN latencies. These variables need to be accounted for if M-PLN is to be used to inform clinical decisions about risk for cognitive decline.

Correspondence: *Sommer R. Thorgusen, M.S., Psychology, University of Utah, 380 S 1530 E, Room 502, Salt Lake City, UT 84112. E-mail: sommer.thorgusen@hsc.utah.edu*

E. VERA, J. DOOLEY & M.H. BEAUCHAMP. The Influence of Cognitive Flexibility on Moral Reasoning in Adolescence.

Objective: Socio-moral reasoning (SMR) undergoes major development during adolescence. This ability is particularly important at this stage because it guides social decisions between right and wrong. Even if SMR is theoretically related to cognitive flexibility (CF) (Kohlberg, 1981), the specific impact of CF on SMR remains unclear, in part because of methodological flaws associated with traditional SMR tasks (Dooley et al., 2010). The aim of this study was to evaluate the influence of CF on SMR using an ecologically valid tool in an adolescent population.

Participants and Methods: A new visual task known as the Socio-Moral Reasoning Aptitude Level, ('So-Moral', Dooley, et al., 2010) was developed to take into consideration adolescent social reality and the developmental stages of SMR. The So-Moral task, the WASI and the D-KEFS Trail Making Test were administered to 50 healthy developing adolescents aged 13 to 17 ($M=14.8, SD=1.2, 22$ males). Participants also completed a demographic form and a questionnaire measuring pubertal development.

Results: SMR level was positively correlated with CF, pubertal development and estimated intelligence. Together these variables explained 55.6% ($F(3,42) = 6.28, p=.001$) of the variance in SMR level in adolescents. CF predicted 13.4% of the variability in SMR after controlling for the other variables (R squared change = 0.13, $F(1,42) = 8.132, p=.007$).

Conclusions: The results of this study support theoretical claims about the relationship between SMR and CF, suggesting that the ability to modify perspectives and behavioral responses according to the context contributes to SMR maturity in adolescents.

Correspondence: *Evelyn Vera, Psychology, Université de Montréal, 3171 rue Boyer app.10, 3171 rue Boyer app.10, Montréal, QC H2S 2J9, Canada. E-mail: ec.vera.estay@umontreal.ca*

J. WALDMAN. The PASAT: A Sensitive Measure of Inhibition, Attention, and Working Memory in Adolescents.

Objective: Although the Paced Auditory Serial Addition Test (PASAT) was developed to assess the effects of traumatic brain injury (TBI) on processing speed in adults, this task requires the integration of many additional cognitive functions including attention, working memory, and inhibition. Here, we examine several predictor variables of PASAT performance in a large sample of typically developing, healthy adolescents.

Participants and Methods: 92 adolescents (34 girls), ages 12 to 16 (mean age=13.9±1.1), completed a modified PASAT that included 3.0 second (s) and 2.0s trials. Multiple regression analyses were conducted to determine how measures of processing speed, attention, working memory, and inhibition predicted accuracy in performance on both PASAT trials, while controlling for age and IQ.

Results: Results indicated that the overall models for each predictor variable significantly predicted PASAT 3.0s performance (processing speed: $R^2=.19, F(5,85)=3.9, p=.03$); inhibition: $R^2=.29, F(5,85)=6.8, p<.001$; working memory: $R^2=.35, F(6,86)=7.2, p<.001$; attention: $R^2=.32, F(8,79)=4.7, p<.001$. However, beta-weights indicated that only one measure of inhibition (D-KEFS Color Word, Condition 4: $\beta=-.33, p=.002$) significantly predicted PASAT 3.0s performance, above age and IQ. Overall model results were similar for PASAT 2.0s (processing speed: $R^2=.25, F(5,85)=5.6, p<.001$; inhibition: $R^2=.24, F(5,85)=5.5, p<.001$; working memory: $R^2=.35, F(6,80)=7.2, p<.001$; attention: $R^2=.39, F(8,79)=6.2, p<.001$). However, beta-weights indicated that one measure of attention (Connor's Continuous Performance Test-2, Vigilance: $\beta=-.29, p=.003$) and one measure of working memory (WISC-IV Digit Span Backward Span: $\beta=-.48, p<.05$) significantly predicted PASAT 2.0s performance, above age and IQ.

Conclusions: Although it was first developed to assess processing speed in individuals with TBI, the adult version of the PASAT seems to be a more sensitive measure of inhibition, attention, and working memory in an adolescent population.

Correspondence: *Jill Waldman, MA, Graduate School of Professional Psychology, Pacific University, 190 SE 5th Ave., Hillsboro, OR 97123. E-mail: wald5224@pacificu.edu*

K.S. WALSH, K. HARDY, S. HOSTETTER, R. PACKER & M. ACOSTA. Symptom Congruence Between Developmental ADHD and Neurofibromatosis Type 1.

Objective: Deficits in attention and executive function are prevalent in NF1, with 40% diagnosed with ADHD. No studies have compared ADHD symptomatology and functional impairments between children with NF1 and those with developmental ADHD. We aim to evaluate DSM-IV ADHD symptom congruence and related functional impairment in a sample of NF1 patients and healthy children with ADHD.

Participants and Methods: Retrospective neurocognitive data from 55 children with NF1 (47% male, mean age = 9.8, SD = 3.59) and 20 children with ADHD (61% male, mean age = 9.1, SD = 4.16) were included. The ADHD Rating Scale-IV (ADHD-RS), Behavior Rating Inventory of Executive Functioning (BRIEF), and other quantitative neuropsychological measures were included.

Results: The developmental ADHD group had significantly greater inattentive symptoms than the NF1 group (mean parent-rated symptoms = 6.2 vs. 3.4; $p<.05$; mean teacher-rated symptoms = 6.8 vs. 2.4, $p<.05$). 29% of children with NF1 exhibited >6 symptoms of inattention by parent report (vs. 65% of the ADHD sample), but only 15% by teacher report (vs. 71% of the ADHD sample). Additional analyses will assess group differences on quantitative neurocognitive measures associated with ADHD.

Conclusions: Children with NF1 exhibit fewer symptoms of inattention than do those with developmental ADHD, although the NF1 patients showed an elevation of symptoms relative to standardization samples. The ADHD diagnosis may not fully characterize the spectrum of attentional problems exhibited by children with NF1 and future research should examine the efficacy of ADHD treatments in children with NF1.

Correspondence: *Karin S. Walsh, PsyD, Division of Pediatric Neuropsychology, Children's National Medical Center, 111 Michigan Avenue NW, Suite 1200, Washington, DC 20010-2970. E-mail: kwalsh@cnmc.org*

R.C. WEBER, A. JOHNSON & C. WILEY. Hot and Cool Executive Functioning Advantages in Bilingual Children.

Objective: The purpose of this study is to extend previous research regarding executive functioning (EF) advantages in bilingual children to include comparisons across both hot and cool EF. Previous research has established bilingual advantages on cool measures of inhibition and working memory (Bialystok & Martin, 2004; Bialystok, 2010). Very few studies have included hot EF tasks. It is hypothesized that bilingual advantages will be observed across measures of hot and cool EF.

Participants and Methods: Participants were recruited from elementary schools and community centers in multiple urban areas in the Southwestern United States. Children, ages 4-7, and their families, were contacted through the distribution of recruitment materials at these schools and community centers. Demographic information was collected via parental forms while children completed 2 measures each of hot and cool EF. Bilingualism was determined by parental report and receptive vocabulary in both English and Spanish.

Results: A MANCOVA model was utilized to examine multivariate differences in EF scores on all tasks. Economic stress was included as a covariate, due to a significant group difference in this area. This analysis yielded a nonsignificant multivariate effect for language group ($\lambda = .940$; $F(4, 58) = .925$; $p > .05$; partial $\eta^2 = .06$). Follow-up univariate analyses were also nonsignificant.

Conclusions: The hypothesis was not confirmed. This was surprising, as previous research had consistently identified bilingual advantages in several of the EF components measured. These results may be partially explained by differences between the current bilingual population used and previous studies. Additional explanations will be provided and discussed.

Correspondence: *Rachel C. Weber, Ph.D., Pediatric Neuropsychology, University of Minnesota Medical School, 1293 Grand Avenue #202, Saint Paul, MN 55105. E-mail: rachel.c.weber@gmail.com*

R. PERNA, A.R. LOUGHAN & K. REDMOND. Driving After Brain Injury: The Value of Executive Functioning Tests.

Objective: After acquired brain injury, individuals often have cognitive impairments which may negatively affect the ability to drive safely. Research findings remain unclear regarding which neuropsychological tests are most relevant to safe driving, with investigations largely involving only older adult populations. Some research suggests that with acquired brain injuries (ABI), divided attention and planning are relevant to driving (Milleville-Pennel et al., 2010), but specific executive findings are not well established.

Participants and Methods: Fifty-five (33 women, 32 men) individuals with ABI who were involved in post-acute neurorehabilitation completed neuropsychological testing. Some individuals had returned to driving ($n = 29$, mean education = 13.5 years) while others ($n = 26$, mean education = 12.1 years) had either not passed their driving exam or were deemed not ready for an on-road evaluation.

Results: Comparison of the two groups found significant differences on many executive functioning measures including: TMT-A, TMT-B, Ruff2&7CSS, WCST-Perseverative Responses, and WAIS-IV Working Memory and Processing Speed. The no-driving group had scores in the borderline range on each of these measures. The driving group performed in the average range on all related measures except WCST-Perseverative Responses which was low average. Several measures had large effect sizes (Partial η^2) including: TMT-A (.24), TMT-B (.29), Working Memory (.31), and Processing speed (.43).

Conclusions: Data suggests that the aforementioned measures are relevant to driving and should ideally be in or near the average range for safe driving.

Correspondence: *Ashlee R. Loughan, M.Ed., Walden University, 106 Aulee Ct, Winchester, VA 22602. E-mail: aspicerSS@yahoo.com*

Malingering/Effort Testing

A.R. LOUGHAN & R. PERNA. Performance on the Test of Memory Malingering (TOMM) by Age in Children.

Objective: The Test of Memory Malingering (TOMM) is often used as a measure of adult effort and recent research suggests this measure may have utility within the pediatric population (Constantinou & McCaffrey, 2003); although possibly less efficient with younger children (Donders, 2005). The research hypothesis is that younger children will perform more poorly on the TOMM than older children.

Participants and Methods: Data was collected from 57 children (Male=35, Female=22; ages 6-18) during a neuropsychological evaluation which involved TOMM administration. Age groups were bracketed as: 6-10yrs (young, $n = 22$), 11-14yrs (middle, $n = 21$), 15+yrs (old, $n = 14$).

Results: Significant differences ($p < .05$) were found between age groups. Correlations revealed positive significant relationships ($p < .05$) between age and performance. Out of 57 participants, 9% ($n = 5$) fell below the TOMM Trial 2 cut-off score of 45. More notably, all of these children were in the young age bracket, representing 23% of the younger group. Intelligence testing did not appear to significantly impact TOMM scores.

Conclusions: Data reveals that as children become older, their TOMM scores improve. Similar to Donders' (2005) results, our data suggests that younger children may be less efficient on the TOMM as 23% of the younger age group performed suboptimal compared to 0% of the middle or older groups. These results, added to Donders' (2005) report, raise reasonable concern regarding the interpretation of TOMM scores in young children.

Correspondence: *Ashlee R. Loughan, M.Ed., Walden University, 106 Aulee Ct, Winchester, VA 22602. E-mail: aspicerSS@yahoo.com*

A.R. LOUGHAN & R. PERNA. Does Intelligence Impact Performance on the Test of Memory Malingering (TOMM) in Children?

Objective: At the lower end of the intellectual ability spectrum, measures of memory may be cognitively demanding. Questions remain regarding the utility of memory based symptom validity tests in those with limited intelligence. Research investigating adults with intellectual disability range from 5% (FSIQ 51-69; Simon, 2007) to 41% (FSIQ 50-78; Hurley & Deal, 2006) scoring below optimal levels when evaluating effort using the TOMM. The research hypothesis is that children with lower IQ scores will also have lower TOMM scores.

Participants and Methods: 74 children (Male=46, Female=28; mean age=11.8) completed a neuropsychological evaluation which involved WISC-IV and TOMM administration. IQ groups were bracketed as: >75 (impaired, $n=10$), 76-90 (below average, $n=24$), 91-110 (average, $n=30$), and 111+ (above average, $n=10$).

Results: ANCOVA correcting for age and grade, revealed no significant difference between IQ groups on the TOMM Trial 1, 2, or 3 ($p > .05$). The average and above average IQ group TOMM scores exceeded the below average and impaired groups on all three Trials, although mean differences did not reach significance. Out of 74 participants, 7% ($n=5$) fell below the TOMM Trial 2 cut-off score of 45. Low TOMM children were spread amongst IQ groups including impaired ($n=1$), below average ($n=3$), and above average ($n=1$).

Conclusions: TOMM scores obtained by children were not affected by intelligence levels. Those who performed at suboptimal levels demonstrated a range of IQ's extended across three groups examined in this study. The TOMM has utility across intelligence levels/IQ. Low IQ does not appear to be a plausible reason for below cutoff scores on the TOMM

Correspondence: *Ashlee R. Loughan, M.Ed., Walden University, 106 Aulee Ct, Winchester, VA 22602. E-mail: aspicerSS@yahoo.com*

A.M. BAKER, I. PIRYATINSKY, N. MCLAUGHLIN & P. MALLOY. Performance characteristics on the TOMM and WMT in an aging population: Preliminary Data.

Objective: The memory profile of individuals with dementia has been shown to impede performance on certain effort tests during neuropsychological evaluations. These individuals may be at a significant disadvantage when even simple memory tasks are used to assess effort. If individuals with genuine memory impairment score below recommended cutoffs, the current utility of such tests will be degraded as false-positive errors increase.

Participants and Methods: As part of ongoing data collection, we administered the Test of Memory Malingering (TOMM) and the Word Memory Test (WMT) to 16 participants diagnosed with dementia and 35 aging individuals residing in a senior living facility with normal cognitive functioning. Performances on the TOMM (Trial 2 and Retention) and the WMT (Immediate, Delayed, and Consistency) were compared to published cutoff scores.

Results: Results indicated that false-positive rates for the dementia group ranged from 63 – 88% across the five indices. False-positive rates for individuals without cognitive impairment ranged from 2 – 26%.

Conclusions: While research on effort testing within a dementia population remains sparse, the knowledge base regarding dementia and performance on effort testing has received increasing attention over the last decade. Unfortunately, accuracy rates have been far from consistent across studies (e.g., the majority of effort tests have revealed specificity rates ranging from 30 – 70%). The data provided within this preliminary study serve to further strengthen the need for future normative studies on demented individuals and effort testing. Our results are consistent with literature suggesting that individuals with dementia are vulnerable to misclassification of adequate effort secondary to actual genuine memory impairment. We aim to augment traditional cut-off scores on two widely used tests for detecting suboptimal effort.

Correspondence: Aaron M. Baker, Psychology, University of Rhode Island, 445 Boston Neck Rd., North Kingstown, RI 02852. E-mail: aaron.m.baker@gmail.com

E. BOHME, R. GALE, K.M. REIMINK, H.A. GREENE & D. FUERST. Effort as Measured by the TOMM and MMPI-2 Clinical Scale Correlates in Adults with Epilepsy.

Objective: A measure of effort in neuropsychological assessment of epilepsy is crucial in determining a path for further diagnosis and treatment. Research indicates that the Test of Memory Malingering (TOMM) is useful in measuring effort, and that inadequate effort occurs in a small but significant proportion of the epileptic population. However, these studies were conducted primarily with pediatric populations and there is little research that examines effort among adults with epilepsy.

Participants and Methods: In this study, a sample of 201 adults with epilepsy were given a battery of neuropsychological tests to assess overall cognitive functioning.

Results: Results found that eight percent (n=16) failed the TOMM. T-test analyses using .01 significance found that those who failed the TOMM also scored lower on several other measures, including the Wechsler Abbreviated Scale of Intelligence (WASI), California Verbal Learning Test-II (CVLT-II), and Trails A. More notable were the correlates among those who failed the TOMM and their Minnesota Multiphasic Personality Inventory (MMPI-2) profiles. The TOMM failures sample showed comparable scales to non-TOMM failures with the exception of three significantly elevated clinical scales indicative of bodily dysfunction (hypocondriasis, depression, hysteria).

Conclusions: Results raise concern that epileptic patients who fail the TOMM may also be exaggerating their somatic symptoms as seen in elevated MMPI-2 clinical scales. Therefore, in such cases clinicians must be cognizant of a psychiatric basis for symptoms when planning treatment. Correspondence: Elizabeth Bohme, M.A., Adult Neuropsychology, Wayne State University, 4201 St. Antoine 4J, Detroit, MI 48335. E-mail: ebohme@med.wayne.edu

K.E. BORTNIK, M.D. HORNER & D.L. BACHMAN. Performance on Standard Indices of Effort Among Patients with Dementia.

Objective: To examine the clinical utility of several effort measures in a sample of dementia patients.

Participants and Methods: 128 consecutive patients with dementia (all male) who met study criteria were identified from records of elderly adults clinically referred to a Memory Disorders Clinic. Dementia diagnosis was based on interdisciplinary evaluation including Neuropsychology and Behavioral Neurology. Mean age was 76.7 years (SD=7.15); mean educational level was 11.4 years (SD=3.8). Effort measures included RBANS Effort Index, Trail Making Test Ratio (ratio of Trails B to Trails A completion time), Rey 15-Item Test with Recognition Trial (from which a RFIT combination score was derived), and TOMM. Assignment to good/suspect effort group included: 1) failure on TOMM; 2) testing deficits grossly disproportionate to the patient's observed functional level or that reported by family members; and 3) implausible errors, response patterns, or test scores. To be assigned to the suspect effort group, a patient must have failed the TOMM and at least one other behavioral indicator.

Results: Using established cutoffs, 78% of good effort participants passed TOMM Trial 2; 68% passed the Retention trial. 53% of good effort participants and 50% of suspect effort participants passed RBANS EI. 99% of good effort participants and all suspect effort participants passed TMT Ratio. 28% of good effort participants and no suspect effort participants passed RFIT free recall. No patients in either group passed RFIT combination. Adjustment of cut scores failed to yield acceptable sensitivity and specificity.

Conclusions: Many patients clinically diagnosed with dementia fail effort measures despite adequate motivation. In most cases, adjusting cut-scores resulted in unacceptable sensitivity. Thus, while evaluation of effort remains crucial, additional caution is warranted in dementia patients. For patients with true dementia (i.e., not mild memory complaints), effort measures that provide dementia profiles (e.g., WMT or MSVT) are recommended.

Correspondence: Kirsty E. Bortnik, PhD, Columbia Comprehensive Epilepsy Center, Columbia University, 710 West 168 Street, 7th floor, New York, NY 10032. E-mail: kbortnik@gmail.com

L. BOXLEY, B. WALDRON-PERRINE, S.D. NA, S. CHEN, L.A. BIELIAUSKAS & P.H. PANGILINAN. Utility of the CVLT-Short Form Forced Choice Paradigm in the Detection of Adequate Effort in a Veteran Population.

Objective: To our knowledge, embedded effort measures within the California Verbal Learning Test- Short Form (CVLT-SF) have not been evaluated for their utility in discerning optimal vs. suboptimal effort. The purpose of the current study was to examine the ability of the CVLT-SF forced choice (FC) task to detect adequate effort.

Participants and Methods: A neuropsychological test battery was administered to 135 consecutively referred veterans [age 34.7 (13.3)] within a VA polytrauma clinic. Among other standard tests of cognitive functioning, the battery included the Test of Memory Malingering (TOMM), CVLT-SF, and Wechsler Adult Intelligence Scale- Fourth Edition (WAIS-IV) Digit Span subtest. Scaled scores were calculated for Digit Span based on published norms. Determinations of adequate and suboptimal effort were made based on standard cut points for TOMM Trial 2 scores and Digit Span scaled scores. Sensitivities, specificities, positive predictive values (PPV), and negative predictive values (NPV) were calculated at two levels of performance for the CVLT-SF-FC using dichotomized TOMM and Digit Span performance (pass/fail) as separate criterion.

Results: Of those with perfect performance on the CVLT-SF-FC, 13.9% failed the TOMM and 24.6% failed Digit Span. With one error on the CBLT-SF-FC, specificity (i.e., detection of suboptimal effort) was 30% (TOMM) and 23% (Digit Span).

Conclusions: Clinicians should use caution in interpreting even perfect performance on CVLT-SF-FC as adequate effort, as the threshold for passing (i.e., specificity) may be unacceptably low. Alternately, failure of even one item likely reflects suboptimal effort.

Correspondence: *Laura Boxley, Ph.D., VA Ann Arbor Healthcare System, VA Ann Arbor Healthcare System 2215 Fuller Road, Ann Arbor, MI 48105. E-mail: lauraboxley@gmail.com*

M. BUSSE, D. WALD & D. WHITESIDE. Classification Accuracy of a Combined Visual Spatial Measure in Detecting Problematic Cognitive Effort.

Objective: Previous research examining the classification accuracy of visual spatial measures as embedded symptom validity tests (SVTs) found that these visual spatial measures demonstrated acceptable classification accuracy (Whiteside et al., 2011). This study extended the Whiteside et al. results by investigating the classification accuracy of a combined visual spatial measure (VSM). Given that Larrabee (2003) found that combining SVTs increases sensitivity, it was hypothesized that classification accuracy of the combined VSM would have at least excellent classification accuracy.

Participants and Methods: Participants (N=445) were consecutive neuropsychological referrals who completed the study's measures. Participants were assigned to the Biased Responding group (BR=42), or the Unbiased Responding group (UR=403) based on their performance on the Test of Memory Malingered (TOMM; Tombaugh, 1996). Raw scores from the Judgment of Line Orientation Test, Benton Facial Recognition Test, Hooper Visual Organization Test, and Rey Complex Figure Test-Copy and Recognition trials were summed to create the combined VSM.

Results: Results indicated that the BR group performed significantly lower on the VSM than the UR group (Mann-Whitney U= 10108.00, $p < .001$). The research hypothesis was supported in that results indicated VSM had excellent classification accuracy (.83); a cut-off raw score of 134 resulted in sensitivity of 57% and specificity of 87%. Using a 10% base rate, Positive Predictive Power (PPP) = .33, and Negative Predictive Power (NPP) = .95.

Conclusions: Findings suggested that VSM detected biased responding better than individual visual spatial measures, and supported the idea that combining embedded visual spatial measures improved classification accuracy.

Correspondence: *Michelle Busse, M.A., Argosy University, Seattle, 1900 Alaskan Way, #409, Seattle, WA 98101. E-mail: michelle.busse@hotmail.com*

M. BUSSE, D. WHITESIDE & A. BROWN. The CPT-II as a Symptom Validity Measure.

Objective: Using multiple embedded and freestanding symptom validity tests (SVTs) is essential to effectively assessing cognitive effort throughout the course of a neuropsychological assessment (Boone, 2009). In response to this need, measures of various cognitive domains have been investigated as embedded SVTs, particularly measures of memory (Larrabee, 2007). One area of potential research is with measures of attention; thus, the current study analyzed the Conners' Continuous Performance Test-II (CPT-II; Conners, 2000).

Participants and Methods: Participants (N=162) consecutively referred for a neuropsychological evaluation who completed the CPT-II and Test of Memory Malingered (TOMM; Tombaugh, 1996) were studied. Participants were assigned to a Biased Responding group (BR=13), or an Unbiased Responding group (UR=149), based on their performance on Trial 2 of the TOMM.

Results: Participants in the BR group had a significantly higher number of omissions and commissions, and a slower standard hit rate error. Correlational analysis indicated significant correlations between all CPT variables used in the study and Trial 2 of the TOMM. Classification accuracy analysis indicated acceptable performance for omission errors (OE; 0.86) and commission errors (CE; 0.81), with excellent classification accuracy for Hit Rate Standard Error (HRSE; 0.90). HRSE had an optimal cut-off score of 10.2 with sensitivity of .77 and specificity of .88. A combined CPT variable using HRSE, OE, and CE indicated excellent classification accuracy of .93, and an optimal raw cut-off score of 42.95 resulted in sensitivity of .85 and specificity of .88.

Conclusions: Results support the use of the CPT as an embedded SVT when used in conjunction with other SVTs.

Correspondence: *Michelle Busse, M.A., Argosy University, Seattle, 1900 Alaskan Way, #409, Seattle, WA 98101. E-mail: michelle.busse@hotmail.com*

J. DENBOER, L. JENSEN, S. SCHALK & S. HALL. Memory for Complex Pictures (MCP): Development and Validation of a Symptom Validity Test in a Sample of Patients with Traumatic Brain Injury.

Objective: This study highlights preliminary results from an emerging symptom validity test (SVT), entitled Memory for Complex Pictures (MCP). The MCP is a computerized measure employing 50 high-resolution color photographs of complex visual scenes presented over two trials. This test has shown strong psychometric characteristics, including equivalent specificity and better sensitivity when compared to the TOMM (DenBoer & Hall, 2008) and, when compared to the WMT, equivalent specificity and sensitivity (DenBoer & Hall, 2009). The MCP has also shown excellent face validity (DenBoer & Hall, 2007).

Participants and Methods: In this study data was collected from adult patients (n = 197, mean age = 25 years) who were referred for outpatient neuropsychological evaluation after an inpatient stay on a Level I Trauma unit. All patients had documented traumatic brain injury (TBI), ranging from mild to severe. All participants were administered the MCP in the context of a full neuropsychological battery. Only data from patients with demonstrable memory deficits (-1 SD on either verbal and visual memory measures) was included in this analysis. Data from patients who failed the MCP (Trial 2 < 45) (a small minority in this sample) was not included in this analysis.

Results: Results showed that the majority of the adult sample achieved passing scores on the MCP. Specifically, 96% of adults with various forms of TBI who were not involved in litigation passed the MCP, achieving an average Trial 1 score of 45.71 and an average MCP Trial 2 score of 47.82.

Conclusions: The Memory for Complex Pictures (MCP) test may be a useful and effective symptom validity test.

Correspondence: *John DenBoer, Ph.D., Clinical Neuropsychology, Maricopa Medical Center, 1122 W. Culver St., Phoenix, AZ 85007. E-mail: judenboer@yahoo.com*

J. DENBOER, S. SCHALK, L. JENSEN & S. HALL. Memory for Complex Pictures (MCP): Results for Pediatric Patients with Traumatic Brain Injury.

Objective: Sub-optimal effort is a particularly challenging problem in conducting neuropsychological assessment with child and adolescent patients.

The primary purpose of this study is to present the performance of pediatric patients with traumatic brain injury (TBI) and demonstrable memory deficits on the Memory for Complex Pictures (MCP) test, a new symptom validity measure.

Participants and Methods: Participants were 35 pediatric patients ranging in age from 4 to 17 (mean age = 13.2). All patients had a verified TBI (ranging from concussion to severe TBI) and had undergone an inpatient stay on the pediatric floor of a Level I Trauma Unit. Patients were referred for outpatient neuropsychological evaluation approximately 1 month post-injury. No patients were currently involved in litigation. Participants were administered the MCP as the first measure in the context of a full neuropsychological battery.

Results: Of all the patients, only 2 failed the MCP (Trial 2 < 45), resulting in a 94% pass rate. Of the two patients that failed the MCP, both failed the TOMM as well. These were patients with severe TBI who performed in the severely-impaired range on the majority of standard neuropsychological assessment measures.

Pediatric patients with various forms of TBI who were not involved in litigation achieved an average Trial 1 score of 43.42 and an average MCP Trial 2 score of 46.52. This finding is commensurate with other preliminary research on a pediatric population on the MCP (DenBoer & Hall, 2011).

Conclusions: Results showed that the majority of this pediatric sample with TBI and demonstrable memory deficits achieved passing scores on the MCP. These results indicate that the MCP may be a useful and effective symptom validity test in a pediatric, as well as adult, population. Correspondence: *John DenBoer, Ph.D., Clinical Neuropsychology, Maricopa Medical Center, 1122 W. Culver St., Phoenix, AZ 85007. E-mail: judenboer@yahoo.com*

J.C. YOUNG, R.J. SAWYER, B.L. ROPER & P.W. HELMER. Verbal Intelligence and Reading Measures: Are These Insensitive to Poor Effort?

Objective: The validity of neuropsychological testing is reliant on examinees putting forth adequate effort, yet it has been asserted that verbal subtests from the Wechsler Adult Intelligence Scales are insensitive to malingering (Williams, 2011). The purpose of the current study was to examine performance differences on the WAIS-IV Verbal Subtests and the WRAT-4 Reading subtests in "Adequate" and "Poor" effort groups.

Participants and Methods: Retrospective review identified 198 veterans who were administered the Vocabulary ($n = 146$), Similarities ($n = 188$), and Information ($n = 179$) subtests from the WAIS-IV as part of a comprehensive neuropsychological evaluation. Additionally, 75 of these individuals completed the WRAT-4 Reading subtest. All individuals were under age 65 and none were diagnosed with dementia. The Poor Effort (PE) group was identified based upon two or more failures on freestanding or embedded measures of symptom validity (SVT). The Adequate Effort group was defined by above cutoff performance on all examined SVTs. Effort groups significantly differed in level of education ($p = .002$) and race ($p = .008$). Group differences were not found for age, gender, or level of service connection.

Results: The PE group performed significantly worse on Vocabulary ($t = 3.53, p = .001$), Similarities ($t = 6.83, p < .001$), Information ($t = 4.27, p < .001$), and WRAT-4 Reading ($t = 3.43, p = .001$). Subsequent logistic regressions controlled for education and found that each of these verbal measures significantly predicted effort group membership.

Conclusions: Present results suggest that measures of reading and verbal intellectual abilities are sensitive to the effects of poor effort. Accordingly, such measures underestimate actual abilities and cannot be assumed to provide accurate estimates of intellectual abilities under conditions of poor effort.

Correspondence: *John C. Young, Ph.D., Memphis VAMC, 1031 Jefferson Ave, Memphis, TN 38104. E-mail: cyoungphd@gmail.com*

A.G. DOWD, B.L. ROPER & J.C. YOUNG. Classification Accuracy of Simple Proration and Regression-Derived FBS Estimation Methods using the 370-Item MMPI-2 Fake Bad Scale (FBS-S).

Objective: The Fake Bad Scale (FBS) is a rationally derived MMPI-2 scale developed to detect noncredible symptom endorsement within medicolegal contexts. The 370-item version of the MMPI-2 allows scoring of the basic clinical and validity scales, but not the FBS. Several methods of estimation have been proposed, including simple proration (Greene, 2000) and regression in defined groups (Fox, 2010).

Participants and Methods: Our study explored two methods of simple proration and three regression-derived multipliers for the prediction of FBS using the 33-item FBS-Short Form (FBS-S). An archival mixed clinical sample of 284 veterans (91.5% male) were administered the 567-item MMPI-2 in the context of a neuropsychological evaluation. FBS cutoffs from 21 to 27 were examined as criterion reference scores.

Results: The accuracies of FBS-S estimation methods of predicting full FBS scores were similar to those of Fox (2010). We also examined the ability of FBS-S to accurately predict the presence or absence of FBS elevation at commonly used FBS cutoffs. Results of these analyses showed that prediction accuracy ranged from 90.5% to 94.4% across FBS cutoffs, with no differences across prediction methods. However, differences were found across methods in the degree of over- versus under-classification of FBS elevation at the frequently used cutoffs of 24 and 25, with over-classification as high as 14% using the Fox (2010) or Greene (2000) methods.

Conclusions: Methods to estimate FBS from FBS-S differ little in overall error. However, small estimation differences may result in over-classification of FBS elevation at commonly used cutoffs. Implications of using various FBS-S estimation methods at different FBS criterion cutoffs are discussed.

Correspondence: *John C. Young, Ph.D., Memphis VAMC, 1031 Jefferson Ave, Memphis, TN 38104. E-mail: cyoungphd@gmail.com*

R.D. JONES, E.J. WALDRON, K. MANZEL, A. KOSKOVICH & D. TRANEL. FBS cutoff scores in a mixed neurological patient group.

Objective: The Fake Bad Scale (FBS) of the MMPI-2 has been extensively investigated in relation to its sensitivity and specificity in the diagnosis of effort and malingering in patients with pending litigation or secondary gain. However, concern has been expressed in relation to false positive errors with this test, and in particular in patients with known brain damage. Specifically, some signs and symptoms of brain damage may artificially inflate FBS values. Also, there is little guidance in the literature in the case of individuals with known brain damage, who may concurrently exaggerate symptomatology. In an effort to minimize false positive errors on this measure, some researchers have suggested modifying cutoff scores for clinical brain damaged groups.

Participants and Methods: To examine this issue, we administered the MMPI-2 to 154 nonlitigating subjects with focal brain damage of various etiologies (CVA, lobectomy, TBI, tumor resection, anoxia, and post encephalitis). All had confirmed lesions based on structural neuroimaging, and none had a history of significant psychiatric disease, mental retardation, or learning disability. The average age of subjects was 49.9 (SD=13.1), and average education was 13.7 (SD=2.5).

Results: Analyses indicated no relationship between raw scores on the MMPI-2 FBS scale and age ($r = .022, ns$), education ($r = -.022, ns$), or WAIS Verbal IQ ($.025, ns$). Using a cutoff of 27, two of 154 subjects were incorrectly classified as having elevated scores (1.3%).

Conclusions: The findings suggest that cutoffs for the MMPI-2 FBS should be higher than many previous recommendations when examining patients with known brain damage. However, in general, cutoffs for the FBS can be adjusted to reflect any inflation in the scale that may be due to neurologic disease. In combination with other measures of effort and motivation, the findings suggest the MMPI-2 FBS may be used as part of a battery of tests of motivation in clinical groups with known brain dysfunction.

Correspondence: *Robert D. Jones, Ph.D., Neurology, University of Iowa, 200 Hawkins Dr., Iowa City, IA 52242. E-mail: robert-jones@uiowa.edu*

A. KOLB, M. MOTYKA, C.A. NOGGLE, J.C. THOMPSON, J.R. WALL & M. PILLA. Identification of Embedded Measures of Effort on the Wisconsin Card Sorting Test (WCST) with a Mixed Clinical Population.

Objective: This study sought to identify the classification accuracy of proposed embedded measures of effort on the WCST in a mixed clinical sample using scores obtained on the Word Memory Test (WMT) as criteria to determine markers of insufficient effort.

Participants and Methods: Individuals ($n=114$) were diagnosed with a neurological disorder, an Axis I psychiatric disorder, or both. Participants completed the WCST and WMT as part of their assessment. Individuals were identified as either: (1) Probable Malingering/Exaggeration, (2) Possible Malingering, or (3) Valid Effort based on WMT performance.

Results: On the proposed WCST effort measures, the group identified as Probable Malingering performed significantly worse than the Valid Effort group in Categories Completed and Perseverative Errors. No difference was found between Probable Malingering and Valid Effort on Failure-to-Maintain Set. No significant differences were found between the Possible Malingering group and Valid Effort group on any embedded effort measures. No significant differences were found between the Probable Malingering and Possible Malingering groups. DFA correctly

identified 52.1% of individuals based on their WCST outcomes. When the Probable and Possible Malingering groups were combined for dichotomous comparison, 66.7% of individuals were correctly classified. 82.7% were correctly classified as valid effort while 53.8% were correctly identified as probable/possible malingering.

Conclusions: Findings suggest a potential for examining embedded measures on the WCST to suggest possible non-credible effort. The proposed configuration may lack sensitivity but demonstrates relatively good specificity and suggests that poor performance on the embedded measures should be followed up with additional stand alone measures of effort.

Correspondence: *Alissa Kolb, M.A., University of Indianapolis, 749 East Dr. Woodruff Place, Apt. B, Indianapolis, IN 46201. E-mail: kolba@indy.edu*

A. KOLB, M. MOTYKA, C.A. NOGGLE, J.C. THOMPSON, J.R. WALL & M. PILLA. Convergence of the Embedded Measures of Effort on the WCST and RBANS.

Objective: This study examined the relationship between patterns of performance on embedded measures of effort on both the Wisconsin Card Sorting Test (WCST) and the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Participants and Methods: Participants included 147 individuals from a mixed clinical sample referred for neuropsychological assessment who completed both the RBANS and WCST. The RBANS Effort Index (EI) was calculated based on the methodology proposed by Silverberg and colleagues (2007). WCST effort indices were calculated by using the raw scores for categories completed, perseverative errors, and failure to maintain set, weighting each 0-6 based on their association with the following percentage ranges 0, 0.1-2, 2.1-5, 5.1-9, 9.1-16, 16.1-25, 25.1 and above. Their summative total was also calculated. Canonical correlation was run.

Results: Canonical correlation revealed no significant relationship between the RBANS EI and effort components and the proposed WCST EI and effort components. As would be expected, both EI outcome scores demonstrated relationships with their individual components. For both calculations their individual components also shared significant overlap.

Conclusions: Failure to find a significant relationship between these two proposed measures of embedded effort is interesting and informative as both have shown convergence with more traditional measures of effort (e.g. Word Memory Test and the TOMM). It may be explained by differences in their shared variance with these established measures thereby causing an increased discrepancy between the two. Furthermore, it may reflect differences in their domain specific determination of effort. Additional findings and clinical implications will be discussed.

Correspondence: *Alissa Kolb, M.A., University of Indianapolis, 749 East Dr. Woodruff Place, Apt. B, Indianapolis, IN 46201. E-mail: kolba@indy.edu*

M. MOTYKA, A. KOLB, C.A. NOGGLE, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. Correlations Between Embedded Measures of the WCST and Outcomes on the WMT.

Objective: This study sought to identify the potential relationship between proposed embedded measures of effort on the Wisconsin Card Sorting Test (WCST) and outcomes on the Word Memory Test (WMT) in a mixed clinical sample.

Participants and Methods: Participants included 95 individuals who completed both the WMT and WCST as part of a more comprehensive neuropsychological evaluation. The WCST effort indices were calculated by using the raw scores for Categories Completed, Perseverative Errors, and Failure-to-Maintain-Set, weighting each 0-6 based on their association with the following percentage ranges 0, 0.1-2, 2.1-5, 5.1-9, 9.1-16, 16.1-25, 25.1 and above. Their summative total was then calculated. Canonical correlations were run.

Results: Correlations revealed a significant inverse relationship between outcomes on the WMT Multiple Choice and outcomes on individual com-

ponents of the proposed WCST EI. Specifically, statistically significant correlations were seen between the Multiple Choice outcomes on the WMT and the weighted scores for the WCST categories completed ($r = -.462$; $p < .001$), perseverative errors ($r = -.433$; $p < .001$), and the overall outcome score ($r = -.543$; $p < .001$). The WCST EI also demonstrated a significant inverse relationship with WMT immediate recall ($r = -.273$; $p = .001$), delayed recall ($r = .209$; $p = .012$), and consistency ($r = .246$; $p = .004$).

Conclusions: Results demonstrate various links between the WMT and proposed effort index of the WCST, particularly the cumulative WCST EI outcome score. Nevertheless, there remains a good deal of unshared variance. Possible explanations of unshared variance include inherent differences in the tasks themselves and the nature of the deficits the patient is trying to portray. Additional implications will be discussed.

Correspondence: *Michelle Motyka, M.S., St. Vincent Hospital, 9956 W. Haven Cir., Apt. G, Indianapolis, IN 46280. E-mail: mxmotyka@stvincent.org*

M. MOTYKA, A. KOLB, C.A. NOGGLE, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. Links Between Proposed Embedded Measures of Effort on the WCST and Performance on the TOMM.

Objective: This study sought to identify the potential relationship between proposed embedded measures of effort on the Wisconsin Card Sorting Test (WCST) and the Test of Memory Malingering (TOMM) in a mixed clinical sample. The TOMM is an accepted measure of effort, thus we sought to determine the extent to which the RBANS EI demonstrated shared variability thus supporting its use as an embedded measure of effort.

Participants and Methods: Participants included patients evaluated through either an outpatient neuropsychological clinic or as an inpatient within a general hospital. Archival review was conducted on individuals ($n = 27$) diagnosed with a neurological disorder, an Axis I psychiatric disorder, or both. Individuals completed both the WCST and TOMM as part of a neuropsychological evaluation.

Results: Findings revealed a significant relationship between weighted Perseverative Errors scores and Retention on the TOMM. This association was very strong in an inverse direction ($r = -.914$, $p < .001$). The weighted perseverative error score was also significantly related to Trial 1 learning on the TOMM when using a one-tail design ($r = -.324$, $p < .05$). However, the WCST EI was only related to outcomes on the Retention Trial ($r = -.491$, $p = .032$) though its relationship with the initial learning trial approached significance and may have been limited by low sample size.

Conclusions: Outcomes demonstrate some shared variance between the embedded measures of effort on the WCST and the TOMM though the correlation is lower than desired. Clinically this suggests that re-examination with a larger sample size is needed in addition to possible adjustment to the WCST EI calculation.

Correspondence: *Michelle Motyka, M.S., St. Vincent Hospital, 9956 W. Haven Cir., Apt. G, Indianapolis, IN 46280. E-mail: mxmotyka@stvincent.org*

M. MOTYKA, C.C. NOGGLE, M. PILLA, A. KOLB, J.C. THOMPSON & J. REMONDET WALL. Correlations Between the TOMM and Outcomes on RBANS Subtests.

Objective: The Test of Memory Malingering (TOMM) is an accepted measure of effort commonly used in clinical practice. While assumptions may be made that functioning on this measure equates to general performance patterns across neuropsychological measures, we questioned to what extent the TOMM is actually related to functional outcome. As a result, the current study sought to outline the relationship between performance on the TOMM and RBANS within a mixed clinical sample.

Participants and Methods: An archival data set was utilized for the present study. Participants included 72 individuals who completed both

the TOMM and RBANS as part of a more comprehensive neuropsychological evaluation. Participants were diagnosed with a neurological disorder associated with brain dysfunction (e.g. stroke, TBI, dementia, memory loss), an Axis I psychiatric disorder based on DSM-IV-TR (APA, 2000) criteria, or both.

Results: Canonical correlation revealed a multitude of significant correlations between outcomes on the TOMM and RBANS subtests. Specifically, Trial 1 Learning, Trial 2 Learning, and Retention on the TOMM were all significantly related to outcomes on List Learning, Story Memory, Figure Copy, Line Orientation, Digit Span, Coding, List Recall, List Recognition, Story Recall, and Figure Recall. In comparison, none of the outcomes on the TOMM were related to outcomes in Picture Naming and Semantic Fluency.

Conclusions: Results are of clinical importance as they suggest that poor performance on the TOMM will tend to correspond with a fairly consistent general lowering of performance across the majority of neurocognitive domains covered by the RBANS.

Correspondence: *Michelle Motyka, M.S., St. Vincent Hospital, 9956 W. Haven Cir., Apt. G, Indianapolis, IN 46280. E-mail: mzmotyka@stvincent.org*

C. NOGGLE, M. MOTYKA, A. KOLB, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. How is the WCST Related to Outcomes on the RBANS Indices?

Objective: The Wisconsin Card Sorting Test (WCST) is a common instrument in neuropsychological practice with particular sensitivity to deficit in frontal lobe functioning. However, the various skills involved in successfully completing the task, the higher-order domains of the task, and suggestions of embedded measures of effort raises questions as to how much variability across other neurocognitive domains may be explained by WCST performance alone, which the current study sought to evaluate.

Participants and Methods: An archival data set was utilized for the present study. Participants included 144 individuals from a mixed clinical sample who completed both the WCST and RBANS as part of a more comprehensive neuropsychological evaluation in either an inpatient setting at a general hospital or in an outpatient neuropsychological clinic.

Results: Canonical correlation revealed a significant relationship between a number of WCST outcomes and RBANS indices. Categories Completed was significantly related to all outcomes including Immediate Memory, Visuospatial/constructional, Language, Attention, Delayed Memory, and the Total Scale. Perseverative errors demonstrate a significant, inverse relationship with all domains as well. A significant, inverse relationship was also found between Non-Perseverative Errors and each RBANS domain aside from Delayed Memory. Failure-to-Maintain-Set in comparison was not significantly related to any of the outcomes.

Conclusions: Findings demonstrate that aspects of the WCST do share some variance with the RBANS domains. However, some of these relationships were relatively low in comparison and thus suggest a great deal of variability remains unexplained by the WCST. Additional findings and implications will be discussed.

Correspondence: *Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu*

C. NOGGLE, M. MOTYKA, A. KOLB, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. Associations Between the WMT and RBANS Indices.

Objective: The current study sought to outline the relationship between performance on the Word-Memory Test (WMT) and RBANS indices. Specifically, we sought to determine what influence variability on the WMT appears to have on the resulting RBANS profile.

Participants and Methods: An archival data set was utilized for the present study. Participants included 146 individuals who completed both the WMT and RBANS as part of a more comprehensive neuropsychological evaluation. Participants were diagnosed with a neurological disorder associated with brain dysfunction (e.g. stroke, TBI, dementia, memory loss), an Axis I psychiatric disorder based on DSM-IV-TR (APA, 2000) criteria, or both.

Results: Canonical correlation revealed a multitude of significant correlations between outcomes on the WMT and RBANS indices. Specifically, Immediate Recall on the WMT was significantly related to outcomes on RBANS Immediate Memory ($r=.479$; $p<.001$), Visuospatial/constructional ($r=.352$; $p<.001$), Language ($r=.366$; $p<.001$), Attention ($r=.501$, $p<.001$), and Delayed Memory ($r=.558$; $p<.001$). Delayed Recall on the WMT was significantly related to RBANS Immediate Memory ($r=.490$; $p<.001$), Visuospatial/constructional ($r=.350$; $p<.001$), Language ($r=.334$; $p<.001$), Attention ($r=.471$, $p<.001$), and Delayed Memory ($r=.561$; $p<.001$). Finally, Multiple Choice on the WMT was significantly related to RBANS Immediate Memory ($r=.585$; $p<.001$), Visuospatial/constructional ($r=.384$; $p<.001$), Language ($r=.388$; $p<.001$), Attention ($r=.436$, $p<.001$), and Delayed Memory ($r=.633$; $p<.001$).

Conclusions: Results carry clinical implications as they demonstrate the general relationship between performance on the RBANS indices and the WMT, thus offering some insight into the manner in which interpretations may be made on the prior when there is questionable performance on the latter.

Correspondence: *Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu*

C. NOGGLE, A. KOLB, M. MOTYKA, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. Correlations Between the RBANS Embedded Effort Calculation and Performance on the TOMM.

Objective: This study sought to identify the potential relationship between the proposed embedded calculation of effort on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and the Test of Memory Malingering (TOMM) in a mixed clinical sample. The TOMM is an accepted measure of effort, thus we sought to determine the extent to which the RBANS EI demonstrated shared variability thus supporting its use as a measure of effort.

Participants and Methods: Participants consisted of patients evaluated between the years 2006 and 2011 in either an inpatient general hospital setting or in an outpatient neuropsychological clinic. Archival review was conducted on individuals ($n=37$) diagnosed with a neurological disorder, an Axis I psychiatric disorder, or both. All individuals completed both the RBANS and TOMM as part of a neuropsychological evaluation. The RBANS Effort Index (EI) was calculated based on the methodology proposed by Silverberg and colleagues (2007).

Results: Canonical correlation revealed a significant relationship between the RBANS EI and outcomes on the TOMM. Specifically, a significant inverse relationship was observed between the RBANS EI and learning trial 1 ($r=-.725$, $p<.001$), learning trial 2 ($r=-.799$, $p<.001$), and retention ($r=-.798$, $p<.001$). In sum, the results suggest that over 53% of variance across both the RBANS EI and TOMM is shared.

Conclusions: Findings demonstrate a significant relationship between the RBANS EI and the TOMM. The strength of this relationship and the amount of shared variance seen supports the RBANS EI being used as an embedded measure of effort.

Correspondence: *Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu*

C. NOGGLE, M. MOTYKA, A. KOLB, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. How Does Elevations on the MMPI-2 F-scale Relate to Performance on a Measure of Neuropsychological Functioning?

Objective: Within the clinical setting, an elevated F-scale may be seen on the MMPI, but few studies have sought to describe how this may relate to functional neurocognitive outcomes. Given the relatively high rate of neurocognitive deficits associated with various psychiatric disorders, the current study evaluated whether a linear relationship existed between the MMPI-2 F-scale and outcomes on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Participants and Methods: Participants included 235 individuals who completed both the MMPI-2 and RBANS as part of a neuropsychological evaluation. Participants were diagnosed with a neurological disorder associated with brain dysfunction (e.g. stroke, TBI, dementia, memory loss), an Axis I psychiatric disorder based on DSM-IV-TR (APA, 2000) criteria, or both.

Results: Significant correlations were found between the F-scale of the MMPI-2 and performance in List Learning ($r = -.188$, $p < .004$), Story Memory ($r = -.173$, $p < .008$), Figure Copy ($r = -.240$, $p < .001$), Line Orientation ($r = -.267$, $p < .001$), Digit Span ($r = -.182$, $p = .005$), Coding ($r = .187$, $p = .004$), Story Recall ($r = -.203$, $p = .001$), and Figure Recall ($r = .224$, $p = .001$). No significant relationship was found between the MMPI-2 F-scale and Picture Naming ($r = -.049$, $p = .455$), Semantic Fluency ($r = -.064$, $p = .332$), List Recall ($r = -.114$, $p = .080$), or List Recognition ($r = -.109$, $p = .096$).

Conclusions: Results demonstrate that within the clinical setting as individuals present with elevations on the MMPI-2 F-scale one may suspect/anticipate a subtle deficit across most neuropsychological domains. Thus, clinical interpretation of neurocognitive deficits in the context of suggestion of exaggerated symptom expression on the MMPI must be approached cautiously. Additional findings and implications will be discussed. Correspondence: Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu

C. NOGGLE, A. KOLB, M. MOTYKA, J.C. THOMPSON, J. REMONDET WALL & M. PILLA. Linear Relationships Between Outcomes on the TOMM and RBANS Indices.

Objective: The current study sought to investigate whether any linear relationships existed between the TOMM and the indices of the RBANS. Specifically, we sought to evaluate what degree of variability in RBANS domain outcomes is attributed to effort in a mixed clinical sample.

Participants and Methods: Archival review was conducted on individuals ($n = 36$) diagnosed with a neurological disorder, an Axis I psychiatric disorder, or both. Participants completed both the RBANS and TOMM as part of a broader evaluation.

Results: Findings revealed all three TOMM outcomes were related to each RBANS domain aside from language. Trial 1 Learning of the TOMM was significantly related to Immediate Memory ($r = .667$; $p < .001$), Visuospatial/constructional ($r = .496$; $p = .002$), Attention ($r = .530$, $p < .001$), Delayed Memory ($r = .631$; $p < .001$), and the RBANS Total ($r = .691$, $p < .001$). Trial 2 Learning of the TOMM was significantly related to Immediate Memory ($r = .622$; $p < .001$), Visuospatial/constructional ($r = .499$; $p = .002$), Attention ($r = .504$, $p = .002$), Delayed Memory ($r = .576$; $p < .001$), and the RBANS Total ($r = .612$, $p < .001$). Finally, the Retention trial of the TOMM was significantly related to Immediate Memory ($r = .650$; $p < .001$), Visuospatial/constructional ($r = .465$; $p = .017$), Attention ($r = .523$, $p = .006$), Delayed Memory ($r = .615$; $p = .001$), and the RBANS Total ($r = .661$, $p < .001$).

Conclusions: Results demonstrate a fair amount of variability on the RBANS can be explained by effort as measured by the TOMM. Although the TOMM specifically measures insincere effort related to memory, findings suggest that individuals that perform poorly on the TOMM may not limit production of exaggerated neurocognitive deficit to memory tasks alone. Such findings carry significant implications when it comes to test interpretation and clinical determination.

Correspondence: Chad Noggle, PhD, Psychiatry, SIU School of Medicine, 315 W. Carpenter St., PO Box 19677, Springfield, IL 62794. E-mail: cnoggle@siumed.edu

C.P. PECK, R.W. SCHROEDER, R.J. HEINRICHS, L.E. BAADE, E.J. VONDRAN, B.K. WEBSTER & C.J. BROCKMAN. Can the FBS and the RBS from the MMPI-2 Differentiate Malingering from Conversion Disorder?

Objective: Malingering is the *conscious* amplification of symptoms for secondary gain. Conversion disorders, on the other hand, are the result

of *unconscious* symptom amplification for psychological reasons. Since neither disorder is the result of organic impairment, the differentiating factor is one of conscious versus unconscious motivation. For this reason, differentiating between malingering and conversion disorder is one of the most problematic differential diagnoses (Boone, 2007). The purpose of this study was to examine the utility of the FBS and RBS from the MMPI-2 in differentiating malingering from conversion disorder.

Participants and Methods: Archival data from litigating outpatients who sustained traumatic brain injuries and inpatients with seizures ($N = 141$) was examined. The outpatient group was classified as Probable Malingerers ($n = 18$) and Non-malingering patients ($n = 27$) based on Slick criteria. The inpatient seizure group was classified as Epileptic Seizure patients ($n = 41$) and Psychogenic Non-Epileptic Seizure patients ($n = 55$) based on video-EEG findings. FBS and RBS raw scores were examined using an ANOVA and post hoc analyses. Sensitivity and specificity rates were also calculated.

Results: Overall, post hoc analyses indicate that the probable malingering group endorsed significantly higher FBS and RBS items than the three non-malingering groups. An FBS raw score of >28 produced 61% sensitivity and 93% specificity. An RBS raw score of >15 produced 50% sensitivity and 94% specificity.

Conclusions: The FBS and RBS were able to differentiate probable malingerers from patients with conversion disorders. Cutoff scores by gender are provided and limitations are discussed.

Correspondence: Caleb P. Peck, Department of Clinical and Health Psychology, University of Florida, 1600 SW Archer Rd, Gainesville, FL 32608. E-mail: calebppeck@yahoo.com

H. PEDERSEN, J.E. CARON & J. YOUNG. Digit Span Sequencing as an Embedded Measure of Effort.

Objective: Neuropsychologists increasingly use embedded measures of effort to help determine the validity of neuropsychological test data. The Digit Span subtest from the WAIS-III has been used effectively in this context (e.g., Iverson & Tulsky, 1994; Greiffenstein et al., 1994). The Fourth Edition of the WAIS includes the addition of a new Digit Span condition, an ordinal sequencing span. Unlike the empirical support for the other Digit Span subtests, the Digit Span Sequencing (DSS) subtest's utility as an embedded measure of effort has not yet been evaluated.

Participants and Methods: To evaluate the DSS's utility, 125 veterans referred for neuropsychological evaluation at a Mid-Southern VA hospital were administered the WAIS-IV Digit Span as part of a larger battery of tests. Veterans failing two or more independent SVTs ($n = 51$) were classified as "poor effort," and those without any SVT failures ($n = 74$) were classified as "adequate effort."

Results: Analysis revealed a significantly lower raw score mean for the poor effort group ($p < .001$). Using a raw score of four or less produced the most optimal operational characteristics (0.31 sensitivity, 0.93 specificity, 0.76 positive predictive power, and 0.66 negative predictive power). Logistic regression produced identical classification rates.

Conclusions: Results suggest the DSS raw score can be used as an embedded measure. Although it's not particularly sensitive when used alone, it is fairly specific and may prove useful when combined with additional symptom validity measures, or when combined with other variables in logistic regression or discriminate function analyses.

Correspondence: Heather Pedersen, M.A., Togus VA, 1 VA Center, Augusta, ME 04330. E-mail: heatherpedersen@gmail.com

D. RITCHIE, A. STEVENS, A. DONNELL & W. MITTENBERG. Incidence of Insufficient Effort in Combat Related Head Trauma Examinations.

Objective: Head trauma is frequent among military personnel in Afghanistan and Iraq. These injuries are often characterized as concussions caused by explosive blasts, and may be related to subsequent disability claims. This study examined the base rate of insufficient effort in a series of these cases referred for neuropsychological examination.

Participants and Methods: The TOMM was administered to 76 veterans (aged $M = 32$, $s = 8$) an average of 3.8 years after head trauma due

to explosive blast (74%), blunt impact (9%), MVA (11%), or gunshot (5%) during military deployment. 75% had no disturbance of consciousness or brief disorientation, 5% were unconscious for more than 30 minutes, and 15% had abnormal brain imaging. Neuropsychological examination included measures of intelligence, memory, executive function, and processing speed.

Results: Insufficient effort was present in 35.5% of cases using published TOMM cutoffs, with mean scores of 32 ($s=8$) on Trial 2 and 34 ($s=8$) on Retention. Poor effort was associated with reported PTSD ($r=.26$), and lower WASI IQ ($r=.3$), CVLT delayed recall ($r=.35$), BVMT delayed recall ($r=.46$), and slower Trails A ($r=.27$), Stroop ($r=.3$), and Grooved Pegboard ($r=.37$) completion times.

Conclusions: Rates of insufficient effort in neuropsychological examinations following combat related head trauma are consistent with those previously reported in civilian mild head injury and disability claims in non-combat contexts. This base rate is also consistent with the incidence of poor effort in combat related cases in prior studies that used the Medical Symptom Validity Test. Insufficient effort is associated with more reported symptoms and reduced neuropsychological test performance. Correspondence: *David Ritchie, Nova Southeastern University, 3300 College Ave., Davie, FL 33014. E-mail: dritchie@nova.edu*

R.S. SCHEIBEL, M. TROYANSKAYA, N.J. PASTOREK, N.J. PETERSEN, A.M. WALDER & H.S. LEVIN. Atypical Word Memory Test Performance in OEF/OIF Veterans with Mild, Blast-Related Traumatic Brain Injury.

Objective: Previous studies have shown that effort can sometimes make a greater contribution to neuropsychological test scores than injury severity. This study investigated effort test performance among Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) veterans.

Participants and Methods: The Word Memory Test (WMT) is a computerized instrument which provides measures of immediate and delayed recognition, consistency rate, and other validity measures. Based upon a cutoff score of 82.5% correct, a low score on at least one of three key measures may reflect the possibility of poor effort or invalid performance. The WMT was administered to 99 OEF/OIF veterans who had been exposed to blast and reported alteration of mental status consistent with mild traumatic brain injury (TBI). Fifty four of these (53.5%) failed the WMT by scoring below the cut-off score on one or more of the WMT measures. The PTSD Checklist-Civilian Version (PCL-C) was used to assess severity of posttraumatic stress disorder (PTSD) symptoms and the Neurobehavioral Symptom Inventory (NSI) was used to assess post-concussive symptoms.

Results: There were no significant differences between TBI subjects who had passed the WMT and those who had failed for age (WMT-Pass: mean=31.4, SD=7.2; WMT-Fail: mean=31.7, SD=6.9), years of education (WMT-Pass: Mean=13.9, SD=1.9; WMT-Fail: mean=13.7, SD=2.0), or total score on the Combat Exposure Scale (WMT-Pass: mean=24.2, SD=7.6; WMT-Fail: mean=26.6, SD=8.7). Subjects who failed the WMT had higher scores on the PCL-C (WMT-Pass: mean=49.9, SD=15.1; WMT-Fail: mean=64.4, SD=13.4) and the NSI cognitive cluster (WMT-Pass: mean=8.2, SD=4.2; WMT-Fail: mean=12.7, SD=4.9).

Conclusions: These findings raise questions about the reasons for elevated failure rates on the WMT within this sample. Detailed information relating WMT performance to measures of psychological status, cognitive and daily functioning, financial compensation and benefits will be obtained as part of our future research conducted with this population. Correspondence: *Randall S. Scheibel, Ph.D., Physical Medicine and Rehabilitation, Baylor College of Medicine, 1709 Dryden Road, Suite 1200, Houston, TX 77030. E-mail: scheibel@bcm.tmc.edu*

R.W. SCHROEDER, L.E. BAADE & R.J. HEINRICH. Examination of the Initial Three Word Memory Test Cutoff Scores in a Criterion Group Litigating TBI Sample.

Objective: The Word Memory Test (WMT) has a rich array of normative comparison samples. However, a recent literature review yielded

only one study that classified WMT performances based on Slick et al. criteria (i.e. Greve et al., 2008). In that study, failure of any of the initial three WMT trials achieved 85% sensitivity and 70% specificity in a traumatic brain injury (TBI) group. The current study was undertaken to evaluate the initial three WMT trials in a second criterion group study based on Slick et al. criteria.

Participants and Methods: Archival data from 44 litigating or disability seeking outpatients were examined. The majority of patients (75%) were diagnosed with TBIs and were in litigation. The remaining patients (25%) were diagnosed with other neurological conditions and were either seeking disability or in litigation. The 44 patients were divided into two groups: patients failing Slick et al. criteria ($n = 19$) and patients passing Slick et al. criteria ($n = 25$). The WMT was not used to classify patients into these two groups.

Results: The original recommended cutoff scores for the initial three WMT trials yielded a sensitivity rate of 84% and specificity rate of 68%.

Conclusions: The results of this study are very similar to the results of the Greve et al. study (sensitivity = 84% vs. 85%, specificity = 68% vs. 70%). Both studies suggest that the standard WMT cutoff scores result in specificity well below the 90% rate utilized in by most neuropsychologists and, therefore, should be used with caution when applied to Slick et al. criteria. Correspondence: *Ryan W. Schroeder, PsyD, Psychiatry and Behavioral Sciences, University of Kansas School of Medicine - Wichita, 7829 E. Rockhill, Suite 105, Wichita, KS 67206. E-mail: Ryan.W.Schroeder.PsyD@hotmail.com*

C.A. SIDERS, A.L. WONG, E. ROMERO, A.E. WIKE, H. KAKAVAND, F.W. MARTINEZ, M.J. WRIGHT & K.B. BOONE. Sensitivity and Specificity of the Brief Visual Memory Test-Revised (BVMTR) for Detecting Suspect Effort in a Clinical Sample.

Objective: Our goal was to determine whether the BVMTR could differentiate between suspect effort and credible effort in a clinical sample.

Participants and Methods: We divided 81 participants into three groups of similar age/education: 43 participants without evidence of suspect effort or visuospatial impairment (C-NV), 19 credible participants with visuospatial impairment (C-VI), and 19 participants with ≥ 2 failed symptom validity measures and external motivation to give suspect effort (NC). Participants completed a neuropsychological evaluation including standard administration of the BVMTR (form one) and ten symptom validity measures.

Results: The C-NV group scored significantly higher on BVMTR copy than the C-VI and NC groups. There were no significant differences between the C-VI and NC groups. For recognition discriminability, both C-NV and C-VI groups obtained significantly higher scores than the NC group with no significant difference between the C-NV and C-VI groups. To obtain high specificity ($>90\%$) a cutoff score of 2 was used for BVMTR recognition discriminability. This yielded high specificity for the C-NV (97.7%) and C-VI (94.5%) groups but poor sensitivity (38.9%). Data examination revealed three distractors and one recognition item rarely misidentified ($<2\%$) by either credible group. Assessing one point penalties for errors on these items raised sensitivity to (55.5%) while maintaining high sensitivity for the C-NV (95.4%) and C-VI groups (94.5%).

Conclusions: Results demonstrate BVMTR copy could not distinguish visuospatial impairment from suspect effort. BVMTR recognition discrimination combined with penalties for errors on rarely missed items demonstrated moderate sensitivity and excellent specificity, even in those with visuospatial deficits.

Correspondence: *Craig A. Siders, Ph.D., Psychology, Harbor UCLA Medical Center, 1124 W. Carson St., B4 South, Torrance, CA 90502. E-mail: siderscraig@gmail.com*

J.C. THOMPSON, C.A. NOGGLE, A.B. KOLB, M. MOTYKA, J.R. WALL & M. PILLA. Association of the WCST embedded effort calculation and the F-scales of the MMPI-2 and MMPI-2RF.

Objective: This study sought to identify the potential relationship between embedded measures of effort on the WCST with the validity scales of the MMPI-2 and MMPI-2-RF in a mixed clinical sample.

Participants and Methods: Participants included 65 individuals who completed the MMPI-2 and 45 individuals who completed the MMPI-RF who were also administered the WCST as part of a comprehensive neuropsychological evaluation. The WCST effort indices were calculated by using the raw scores for Categories Completed, Perseverative Errors, and Failure-to-Maintain-Set, weighting each 0-6 based on their association with the following percentage ranges 0, 0.1-2, 2.1-5, 5.1-9, 9.1-16, 16.1-25, 25.1 and above. Their summative total was then calculated with this constituting the WCST EI. Correlations between the various outcome variable were run.

Results: Canonical correlation revealed no significant relationship between elevations on the WCST EI and outcomes on the F-scale calculations of the MMPI-2 ($r=.142$; $p=.251$) or the MMPI-2 RF ($r=-.062$; $p=.679$). Additional correlations with WCST EI were not significant and are as follows: MMPI-RF Fp-r ($r=-.204$; $p=.178$), MMPI-RF Fs-r ($r=-.003$; $p=.982$), MMPI-RF FBS-r ($r=-.071$; $p=.643$), MMPI-RF NUC ($r=-.118$; $p=.223$), MMPI-RF COG ($r=-.112$; $p=.235$)

Conclusions: Findings demonstrate no shared variance between proposed measures of effort on the WCST and signs of exaggeration of psychiatric, somatic, or cognitive symptoms of the MMPI-2 and MMPI-2RF. This suggests that despite ample research suggesting the presence of significant executive function weaknesses in many psychiatric conditions, patients that may be exaggerating psychiatric or somatic symptoms rarely endorse significant symptoms of executive function weakness as well.

Correspondence: *Jon C. Thompson, Psy.D., Neuropsychology, St. Vincent Hospital, 2001 W. 86th Street, 7SE, Indianapolis, IN 46260. E-mail: jthomp1@stvincent.org*

J.C. THOMPSON, C.A. NOGGLE, M. MOTYKA, A. KOLB, J.R. WALL & M. PILLA. Is there a relationship between the WMT and outcomes on the F-scales of the MMPI-2 and MMPI-RF.

Objective: This study sought to identify the potential relationship between insincere cognitive effort as measured by the Word Memory Test (WMT) and psychiatric exaggeration as measured by the Multiphasic Personality Inventory – 2 (MMPI-2) and the Restructured Form (MMPI-2-RF) in a mixed clinical sample.

Participants and Methods: Participants included 82 individuals who completed the MMPI-2 and 29 individuals who completed the MMPI-RF who were also administered the WMT as part of a neuropsychological evaluation. Participants were diagnosed with a neurological disorder, an Axis I psychiatric disorder, or both.

Results: Findings revealed a significant inverse relationship between outcomes on the MMPI-2 F scale and Immediate Recall ($r=-.313$, $p=.002$), Delayed Recall ($r=-.266$, $p=.007$), and Multiple Choice ($r=-.264$, $p=.009$). No significant relationship was found between the WMT and the MMPI-RF F-r scale though this may have been influenced by lower sample size. The MMPI-RF Fp-r-scale was the only other significant finding with a relationship demonstrated between it and delayed recall on the WMT ($r=-.375$, $p=.022$).

Conclusions: Findings suggest that while the WMT and F-scale of the MMPI are measures of validity and effort used to detect exaggeration or malingering, they are not inherently related. Rather, their weak relationship suggests that patients may often exaggerate either neurocognitive or psychiatric domains, but rarely exaggerate both. Given the high degree of overlap between psychiatric conditions and neurocognitive domains related to processing speed, executive functions, and memory, the lack of relationship between neurocognitive symptoms and psychiatric symptoms in patients that may be exaggerating psychiatric impairment may carry important clinical implications.

Correspondence: *Jon C. Thompson, Psy.D., Neuropsychology, St. Vincent Hospital, 2001 W. 86th Street, 7SE, Indianapolis, IN 46260. E-mail: jthomp1@stvincent.org*

D.M. WALD, M. BUSSE & D.M. WHITESIDE. Classification Accuracy of the Rey Complex Figure Test.

Objective: While there is a need for continuous assessment of symptom validity (Boone, 2009), memory measures are still the most commonly

used to assess cognitive effort (Boone, 2007). Embedded measures in visuospatial tests, such as the Judgment of Line Orientation (JLO) are much less researched (Iverson, 2001). The current study sought to further explore the usefulness of other visual spatial measures in detecting suspect effort, particularly the Rey Complex Figure Test (RCF).

Participants and Methods: Participants ($N=445$) were consecutive neuropsychological referrals who met the study criteria, which required the participant to be at least 18 years of age and completed the RCF and the Test of Memory Malingering (TOMM; Tombaugh, 1996). Participants were assigned to either a biased responding group (BR=30), or an unbiased responding group (UR=415) based upon their performance on the TOMM.

Results: Results indicated the BR group scored significantly lower than the UR group (Mann-Whitney $U=8870.00$, $p=.001$) on the RCF-Copy trial (ROCF-C) and on the RCF-Recall trail (RCF-R; (Mann-Whitney $U=8881.5$, $p=.001$)). Additionally, ROC analysis indicated that both the RCF-C and RCF-R had acceptable classification accuracy of .71. On RCF-C a cut-off raw score of 26.5 resulted in sensitivity=49% and specificity=82%, with Positive Predictive Power (PPP) = .23, and Negative Predictive Power (NPP) = .94 at a 10% base rate. On RCF-R a cut-off raw score of 17 resulted in sensitivity=46% and specificity=82%, with PPP=.22 and NPP=.93 at a 10% base rate.

Conclusions: Implications from the results include the utility of using the RCF-C and RCF-R as embedded measures of suspect effort.

Correspondence: *Danielle M. Wald, Argosy University, Seattle, 2601-A Elliott Avenue, Seattle, WA 98121. E-mail: d_wald593@hotmail.com*

J.R. WALL, C.A. NOGGLE, M. MOTYKA, A. KOLB, J.C. THOMPSON & M. PILLA. Do Renderings of the MMPI-2 F-Scale Predict Outcomes on the TOMM?

Objective: This study sought to identify the potential relationship between the Test of Memory Malingering (TOMM) and psychiatric exaggeration as measured by the Multiphasic Personality Inventory – 2 (MMPI-2) in a mixed clinical sample. This was done with the intent of determining the link between poor cognitive effort and psychiatric symptom exaggeration.

Participants and Methods: Participants included 40 individuals who completed both the MMPI-2 and the TOMM between the years 2006 and 2011 as part of a comprehensive neuropsychological evaluation in either an inpatient general hospital setting or in an outpatient neuropsychological clinic. Participants were diagnosed with a neurological disorder associated with brain dysfunction (e.g. stroke, TBI, dementia, memory loss), an Axis I psychiatric disorder based on DSM-IV-TR (APA, 2000) criteria, or both.

Results: Canonical correlation revealed a significant inverse relationship between outcomes on the MMPI-2 F scale and outcomes on both the initial learning trial of the TOMM ($r=-.550$, $p=.002$) and the second learning trial ($r=-.477$, $p=.008$). However, no significant relationship was found between the F-scale and retention on the TOMM ($r=-.265$, $p=.190$).

Conclusions: Findings are mixed. Though the TOMM and F-scale of the MMPI both measure effort or exaggeration, the prior is intended to detect poor memory effort whereas the latter assess psychiatric exaggeration. While in this case we found that there was some shared variability this was very low with minimal overlap suggesting the inherent differences of the task permits for exaggeration on one measure that may not also occur on the other.

Correspondence: *Jacqueline R. Wall, PhD, School of Psychological Sciences, U of Indianapolis, 1400 East Hanna Avenue, Indianapolis, IN 46142. E-mail: juwall@uindy.edu*

J.R. WALL, C.A. NOGGLE, M. MOTYKA, A. KOLB, J.C. THOMPSON & M. PILLA. Covariance of the RBANS Effort Scale and F-scale of the MMPI-2 and MMPI-RF.

Objective: This study sought to identify the potential relationship between embedded measures of effort on the Repeatable Battery for the

Assessment of Neuropsychological Status (RBANS) and the F-scales of the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2) and the Restructured Form (MMPI-2-RF) in a mixed clinical sample. Shared variance of these two separate outcomes and the potential relationship between psychiatric and neurocognitive exaggeration was examined.

Participants and Methods: Participants included 38 individuals who completed the MMPI-2 or MMPI-RF and were also administered the RBANS as part of a more comprehensive neuropsychological evaluation. The RBANS Effort Index (EI) was calculated based on the methodology proposed by Silverberg and colleagues (2007). Correlations between outcome variables were run.

Results: No significant relationship between elevations on the RBANS EI and outcomes on the F-scale calculations of the MMPI-2 or MMPI-RF. Correlations with RBANS EI were as follows: MMPI-2 F ($r=.152$; $p=.068$), MMPI-RF Fr ($r=.147$; $p=.189$), MMPI-RF Fp-r ($r=.171$; $p=.152$), MMPI-RF Fs ($r=.098$; $p=.283$), MMPI-RF FBS-r ($r=.195$; $p=.120$), MMPI-RF NUC ($r=.049$; $p=.388$), MMPI-RF COG ($r=.236$; $p=.084$).

Conclusions: Results suggest that there is not an inherent link between effort on the RBANS as measured by the EI and exaggerated responding on the MMPI or MMPI-2RF as measured by F-scale outcomes. This suggests that within clinical practice, individuals may over state psychiatric concerns or neurocognitive concerns, but they may not endorse symptoms across both psychiatric and neurocognitive domains simultaneously. Such independence of variance is important to note from a clinical standpoint. Further implications will be discussed.

Correspondence: *Jacqueline R. Wall, PhD, School of Psychological Sciences, U of Indianapolis, 1400 East Hanna Avenue, Indianapolis, IN 46142. E-mail: jwall@uindy.edu*

N. WISDOM, W.L. BROWN, D.K. CHEN & R.L. COLLINS. Empirical Support for Abbreviating the Administration of the Test of Memory Malingering (TOMM).

Objective: Assessment of effort level is an essential step in establishing the internal validity of any neuropsychological evaluation. However, the amount of time needed to administer these tests decreases the frequency of their use. Recent studies have started publishing normative information for abbreviated versions of several response bias tests. The purpose of this study was to examine early discontinue criteria for the TOMM. It was hypothesized that all individuals passing TOMM Trial 1 would continue to pass the remaining trials. It was also hypothesized that the administration of the optional Retention trial would help identify suboptimal effort in some patients that had previously exerted adequate effort on Trial 2. Finally, this study presents the diagnostic accuracy of TOMM Trial 1 in the detection of suboptimal effort using various cut scores.

Participants and Methods: Data were collected from 213 inpatients (184 men; 29 women), all referred for a neuropsychological screening at a Veterans Affairs hospital. All of the patients were undergoing week-long observation on an epilepsy monitoring unit to establish the presence of genuine or psychogenic seizures. All 3 trials of the TOMM were administered to the patients and their level of effort was classified based on their performance on TOMM Trial 2 and/or the Retention trial. Once the sample was divided, the diagnostic classification statistics for TOMM Trial 1 were calculated.

Results: 99.3% of those patients that passed Trial 1 went on to pass the remaining trials. Only 3 patients that passed Trial 2 later failed the Retention Trial. Finally, this study found that using a Trial 1 cut-score of < 39 was very likely to result in failure of later TOMM trials.

Conclusions: TOMM Trial 1 demonstrated impressive diagnostic accuracy for determining adequate or suboptimal levels of effort on remaining trials. Administration of the Retention Trial resulted in a 16% increase in the TOMM's hit rate for poor effort. Limitations and directions for future research are discussed.

Correspondence: *Nick Wisdom, Ph.D., Michael E. DeBakey Veterans Affairs Medical Center, 2002 Holcombe Blvd, Houston, TX 77030. E-mail: nickandjen@gmail.com*

Showcase of Outstanding Student Research:

Chair: Sommer Thorgusen

11:45 a.m.–1:15 p.m.

S.R. THORGUSEN. Showcase of Outstanding Student Research.

The Student INS (SINS) Committee is proud to host its 2nd Annual Student Research Symposium designed to highlight outstanding student research that provides a novel contribution to the field of neuropsychology. The following titles were selected from among all student abstract submissions for their exceptional quality.

Correspondence: *Sommer R. Thorgusen, M.S., Psychology, University of Utah, 380 S 1530 E, Room 502, Salt Lake City, UT 84112. E-mail: sommer.thorgusen@hsc.utah.edu*

T. GEFEN, K. GASHO, A. RADEMAKER, M. LALEHZARI, J. ORTIZ, S. WEINTRAUB, E. ROGALSKI, C. WIENEKE, E. BIGIO, C. GEULA & M. MESULAM. Quantitative and Clinically Concordant Regional Variations of Alzheimer's disease Pathology in Aphasic versus Amnesic Dementia Phenotypes.

Objective: Concordance between neuroanatomic distribution of pathological inclusions and disease phenotype is not well established in atypical dementias such as primary progressive aphasia (PPA). Unlike typical dementia of the Alzheimer type (DAT) where amnesia is the primary symptom, PPA is marked by progressive language impairment. Various neuropathologies have been shown to underlie PPA, including Alzheimer's disease (AD). One purpose of this study was to determine whether AD pathology in PPA follows a clinically concordant, and hence different, distribution from the DAT phenotype.

Participants and Methods: Brain specimens from seven PPA and five DAT patients with clinical evaluations and neuropathologically confirmed AD were analyzed. Methods included thioflavin-S staining to visualize neurofibrillary tangles (NFTs) and compact plaques. Unbiased stereological counting was used in five bilateral brain regions, typically associated with language or memory, per case.

Results: Results revealed greater leftward asymmetry of NFTs, but not of plaques, in PPA/AD vs. DAT/AD ($p<0.05$). Only one PPA/AD case displayed greater right-sided NFT density in neocortices. Although there were more NFTs in the memory-related entorhinal cortex than in neocortices in both phenotypes ($p<0.001$), the ratio of neocortical-to-entorhinal NFTs tended to be higher in PPA/AD.

Conclusions: The presence of left-sided NFT asymmetry in PPA/AD but not DAT/AD, and the higher neocortical-to-entorhinal ratio of NFTs in PPA/AD, establishes concordance of AD pathology with the aphasic phenotype. The case with reversed asymmetry suggests that this relationship may be inconsistent. The conundrum of greater NFT density in memory-related entorhinal cortex than in language-related neocortices in PPA patients, who lack early amnesia, remains to be resolved.

Correspondence: *Tamar Gefen, Cognitive Neurology and Alzheimer's Disease Center, Northwestern University, Feinberg School of Medicine, 320 E. Superior St., Searle 11-447, Chicago, IL 60611. E-mail: Tamar.Gefen5@gmail.com*

A.M. BUTTS, K. NIELSON, N. HANTKE, M. LANCASTER, M. SEIDENBERG, J. WOODARD, J. SMITH, M. MATTHEWS, S. DURGERIAN & S. RAO. FreeSurfer vs. Manual Tracing: Distinguishing Stable from Cognitively Declining Elders Using Prospectively Measured Hippocampal Volume.

Objective: Alzheimer's disease (AD) pathology is thought to begin years before symptom onset. Hippocampal volume is sensitive to age-related

cognitive decline and conversion from MCI to AD. Measurement of hippocampal volumes has used either automated methods such as FreeSurfer (FS) or manual tracing (MT). We compared the ability of FS and MT in detecting baseline volume differences in cognitively intact older individuals who subsequently showed significant cognitive decline.

Participants and Methods: Seventy-five cognitively intact elders underwent baseline and 18-month follow-up structural MRI scan and neuropsychological testing. Participants were classified as Declining ($n=27$) or Stable ($n=48$) based on the baseline to 18-month changes on a list-learning task and a measure of general cognitive functioning. A 2 (left, right) \times 2 (anterior, posterior) \times 2 (Declining, Stable) repeated measures ANOVA was conducted for both the MT and FS hippocampal volumes derived at baseline.

Results: MT identified significantly smaller left and right hippocampal volumes and smaller anterior than posterior hippocampal volumes in Declining compared to Stable subjects. In contrast, no group differences in hippocampal volumes were observed using FS. Notably, MT included more subiculum and entorhinal cortex, while FS included more of the amygdala and the CA region of the hippocampus.

Conclusions: MT was superior to FS for detecting prospective volumetric differences associated with cognitive decline in cognitively intact older participants. MT afforded more unique coverage of the anterior hippocampus than FS. The differences in regional coverage of the mesial temporal lobe between MT and FS may account for the different findings in discriminating Stable and Declining groups.

Correspondence: *Alissa M. Butts, M.S., Psychology, Marquette University, 1570 N. Prospect Ave, Apt. 30S, Milwaukee, WI 53202. E-mail: Alissa.m.butts@gmail.com*

S. SORG, M.W. BONDI, N. LUC, E. LANNI, D.M. SCHIEHSER, D.C. DELIS, L.R. FRANK & L. DELANO-WOOD. Loss of Consciousness is Associated with Disrupted Frontal White Matter and Impaired Executive Functions in Veterans with Mild Traumatic Brain Injury.

Objective: Many Afghanistan and Iraq war veterans continue to struggle years after withstanding a mild traumatic brain injury (mTBI). The range of severity from being dazed to experiencing formal losses of consciousness (LOC) may partly account for variable long-term cognitive and functional outcomes post-mTBI. As reduced white matter integrity and impaired executive functioning (EF) are associated with TBI, we used diffusion tensor imaging (DTI) to investigate whether injury severity (LOC) was related to executive dysfunction and white matter integrity.

Participants and Methods: Thirty-six combat military veterans with mTBI completed neurocognitive assessment and were scanned using DTI. EF impairment was defined as 1 SD below the mean on one or more of three EF tests. Fractional anisotropy (FA) was extracted from known TBI predilection sites identified on diffusion images.

Results: After removing 10 participants due to suboptimal effort, 11 of 26 participants evidenced executive dysfunction. Of participants reporting LOC ($n=14$), 57% were impaired on EF, compared with just 25% of the non-LOC group ($n=12$, $p<.10$). DTI analysis found lower FA within the ventral ($p<.01$) and dorsal ($p<.04$) prefrontal white matter, and splenium ($p<.05$) in the LOC group. Groups did not differ on demographic characteristics or psychiatric measures.

Conclusions: Within our sample of combat veterans, LOC was associated with poorer white matter integrity in frontal and posterior regions, and the LOC group demonstrated a higher proportion of EF impairment than the non-LOC group. Findings highlight the heterogeneity of cognitive outcomes following mTBI and suggest that identifying the severity level within mTBI may aid prognosis and guide treatment.

Correspondence: *Scott Sorg, UCSD, 8500 Gillman Drive, La Jolla, CA 92037. E-mail: ssorg@ucsd.edu*

L.M. JENKINS, D.G. ANDREWES, C.L. NICHOLAS, K. DRUMMOND, B. MOFFAT, P. PHAL & P. DESMOND. Perception of Emotion in Patients Following Surgery to the Prefrontal Cortex.

Objective: We aimed to investigate which anatomical locations are important for perception of emotional and social information by examining a group of brain surgery patients with discrete lesions to the prefrontal cortex (PFC). It was hypothesised that patients with PFC lesions would be more impaired on these tasks than a control group of non-cerebral neurosurgical patients.

Participants and Methods: Brain surgery patients were divided into groups using Brodmann areas, as determined by post-surgical MRI registered to MNI space. Patients had lesions to the anterior cingulate ($n=4$), orbitofrontal ($n=7$), ventromedial (VM, $n=5$) or dorsolateral ($n=12$) PFC. The control group comprised 26 extra-cerebral neurosurgical patients. Participants completed a forced-choice computerised facial morphing task, a questionnaire that assessed theory of mind and empathy, and measures of the perception of emotion in still facial expressions, vocal expressions, and music from film clips.

Results: VM lesioned patients were impaired at identifying morphed facial expressions overall, and fear expressions in particular, and were additionally impaired on the theory of mind scale. They also rated the still facial expressions, vocal expressions, and music clips as more intensely emotional compared to the control group for both congruent (e.g. positive ratings of positive items), and incongruent (e.g. negative ratings of positive items) ratings.

Conclusions: Patients with VM lesions have both an impaired perception of the emotional value of stimuli, and a tendency to be disinhibited in responses when the task allows. The VM cortex is responsible for emotional evaluation and the inhibitory control of other structures involved in emotional processing.

Correspondence: *Lisanne M. Jenkins, B.A. (Hons), Psychology, The University of Melbourne, Level 12, Redmond Barry building, The University of Melbourne, Parkville, VIC 3010, Australia. E-mail: lisannej@unimelb.edu.au*

L.M. MORAN, E. BIGLER, M. DENNIS, C.A. GERHARDT, K.H. RUBIN, T. STANCIN, H. TAYLOR, K.A. VANNATTA & K.O. YEATES. Relationship between Social Information Processing and Perceived Social Competence in Pediatric Traumatic Brain Injury.

Objective: Previous research suggests that children with traumatic brain injury (TBI) demonstrate deficits in social information processing. This study aims to evaluate whether performance on a laboratory measure of social information processing predicts ratings of perceived social competence.

Participants and Methods: Participants included 8 to 12 year old children, 23 with severe TBI, 56 with complicated mild-to-moderate TBI and 61 with orthopedic injuries (OI). For each of five scenarios involving a negative event with an unclear cause, children selected from a fixed set of choices the attribution for the cause of the event, their emotional reaction to the event, and how they would behave in response. Children completed the five scenarios twice, with the antagonist being an unfamiliar peer in one instance and the child's best friend in the other. Social competence was assessed using parent ratings on the Social scale of the Adaptive Behavior Assessment System.

Results: Overall, children with severe TBI were less likely than children with OI to make attributions of external blame, choose anger as their emotional reaction, and respond by avoiding the antagonist; they were more likely to respond by requesting adult intervention. Among children with severe TBI, feelings of anger in situations with friends were negatively related to ratings of social competence on the ABAS. Among children with complicated mild-to-moderate TBI, avoidant responses towards unfamiliar peers were negatively related to social competence and requests for adult intervention in situations with friends were positively related to social competence.

Conclusions: The results provide evidence for effects of TBI on social information processing that may help account for social difficulties as perceived by parents.

Correspondence: *Lisa M. Moran, M.A., Psychology, The Ohio State University, 1835 Neil Ave, Room 10S, Psychology Bldg., Columbus, OH 43210. E-mail: moran.170@osu.edu*

FRIDAY AFTERNOON, FEBRUARY 17, 2012

**Symposium 8:
Common Data Elements in Neurological Research****Co-Chairs: Noelle Carlozzi, David Tulsy****Discussant: Thomas Novaek****1:30–3:00 p.m.**

N. CARLOZZI, D. TULSKY, D. TULSKY, N. CARLOZZI, E.A. WILDE & T. NOVACK. Common data elements in neurological research.

Symposium Description: Several large-scale initiatives are underway to develop new outcome measures that utilize common data elements (CDEs) that will allow within and cross-disease comparisons in federally funded research. The goal of CDEs is to provide policy makers and investigators with a “universal language” that enables comparisons over time and across groups. The importance of utilizing CDEs has been highlighted by the National Institute on Neurological Disorders and Stroke (NINDS) movement toward CDEs in neurological research. Among these efforts are the NIH Toolbox for Neurological and Behavioral Functioning, the Patient Reported Outcomes Measurement Information System (PROMIS), and Quality of Life for Neurological Disorders (Neuro-QOL). There have been additional efforts to develop targeted scales for individuals with Traumatic Brain Injury (TBI-QOL), Huntington’s disease (HD-QOL), Parkinson’s disease, Stroke, Epilepsy, and Multiple Sclerosis (Neuro-QOL). NINDS has cited many of these scales as emerging measures that should be reviewed for use as common data elements. These scales have the potential to become leading outcomes measurement tools and useful to research neuropsychologists. Because of the breadth of symptoms and functioning that are measured, they also have potential to have clinical relevance and could be utilized to assess quality of life in individuals with neurologic impairments. This presentation will provide an overview of the NINDS CDE initiative and introduce neuropsychologists to the NIH Toolbox, PROMIS, Neuro-QOL, TBI-QOL, and HD-QOL measures. The symposium will also discuss how these measures could be utilized as CDEs in clinical care and research. Correspondence: *Noelle Carlozzi, Ph.D., Department of Physical Medicine and Rehabilitation, University of Michigan, 4944 Miller Road, Ann Arbor, MI 48103. E-mail: ncarlozzi@umich.edu*

E.A. WILDE & S.R. MCCAULEY. Establishing Common Data Elements for Adult and Pediatric Traumatic Brain Injury Research.

The National Institute for Neurological Disorders and Stroke (NINDS), National Institute on Disability and Rehabilitation Research (NIDRR), Department of Defense (DoD) and Department of Veterans Affairs recently led a scientific initiative to develop common data elements (CDEs) for traumatic brain injury (TBI). CDEs are intended to be variables or metrics which could serve as a “universal language” to enable comparisons across studies. This presentation will provide an overview of the CDE selection process and will introduce the neuropsychologist to the CDE recommendations for outcome measurement in pediatric and adult TBI research and practice. Experts in TBI and outcomes research were selected to serve as workgroup members. General outcome domains were selected, criteria for selection of outcome measures were established, and data on candidate measures were prepared and reviewed. Ultimately, specific measures were selected by consensus. Two different outcomes working groups selected measures for adult and pediatric populations. The working groups adopted a 3-tier system in selecting measures. In the first tier, the working groups limited their endorsement of core measures to a brief list of measures with extensive use in TBI research and practice and established psychometric properties that could be applied by many researchers (brief and easy to administer) and were applica-

ble across a range of functional levels. The second tier included measures applicable in specific sub-populations, or that could be used for more in-depth assessment within a domain. The committee also recognized measures still undergoing development or validation, and established a third tier, “emerging” measures, which fill existing gaps in measurement of TBI-related sequelae or employ more sophisticated validation techniques than existing measures. The recommended CDEs may gain widespread use in TBI research and practice.

Correspondence: *Elisabeth A. Wilde, Baylor College of Medicine, 1709 Dryden Rd., Ste 1200, Houston, TX 77030. E-mail: ewilde@bcm.edu*

D. TULSKY, N. CARLOZZI, R. GERSHON & D. CELLA. An overview of the NIH Toolbox, PROMIS and Neuro-QOL initiatives.

The NIH Toolbox (Cognitive, Emotional, Motor, and Sensory components) is part of the NIH Blueprint initiative. It seeks to assemble brief comprehensive assessment tools that will be useful in a variety of settings with particular emphasis on measuring outcomes in epidemiologic studies and clinical trials across the life span. The NIH Toolbox tests including: cognitive (episodic memory, language, processing speed, working memory, executive functions, attention), emotional (negative affect, positive affect, stress and coping, social relationships), sensory (vestibular, audition, olfaction, taste, vision), and motor (dexterity, strength, locomotion, endurance, balance) functions. It is being normed on a census matched sample that includes 4500 participants between the ages of 3 and 85. The Patient Reported Outcomes Measurement Information System (PROMIS) is a large NIH initiative to develop a patient reported outcome measure that has been funded as part of the NIH Roadmap to improve the clinical research enterprise. The PROMIS Network has developed and tested over 30 item banks measuring patient reported quality of life including physical functioning, sleep disturbance, fatigue, anxiety, depression, anger, social roles, and social activities. It utilizes computer adaptive testing to streamline assessment and improve reliability. The Neuro-QOL is a third initiative to develop a patient-reported outcome measurement system for individuals with neurological impairments. It includes 14 item banks that can be administered by a computer adapted method or via a static short form.

Correspondence: *David Tulsy, University of Michigan, 2800 Plymouth Road, Ann Arbor, MI 48109. E-mail: dtulsy@umich.edu*

N. CARLOZZI, D. TULSKY & P. KISALA. Adaptations of the PROMIS and Neuro-QOL to traumatic brain injury (TBI) and Huntington disease (HD).

The Patient Reported Outcomes Measurement Information System (PROMIS) and the Neuro-QOL initiatives have been designed to develop state-of-the-art patient reported outcomes measures that can be administered as computerized adaptive tests (CATs). PROMIS was designed for use in chronic health conditions, whereas Neuro-QOL targets individuals with neurological disorders (i.e., stroke, Parkinson’s disease, multiple sclerosis, amyotrophic lateral sclerosis, epilepsy, and muscular dystrophy). Additional efforts have extended these measurement initiatives to include individuals with traumatic brain injury (TBI) and Huntington disease (HD). Two large collaborative grants have provided funding to conduct focus groups with individuals with TBI, HD, as well as caregivers and clinicians to inform the development of several injury-/disease-specific item pools. In TBI, “TBI-QOL” item pools were tested in over 500 individuals; data was analyzed using item response theory analysis and factor analysis. Specifically, the TBI-QOL includes 21 calibrated item banks (i.e., CATs); of these 21 item banks, 7 were targeted for TBI-specific issues. For HD, several PROMIS and Neuro-QOL item banks were identified as relevant to HD, and 3 HD-specific item pools were developed for end of life issues, chorea, and speech and swallowing difficulties. Future work is underway to develop these 3 HD-specific item pools into CATs, and to evaluate relevant

PROMIS and Neuro-QOL item banks in individuals with HD. These new measurement systems have the potential to become standard in clinical trials research. Tailoring them for use in specific injury- and disease-specific populations allows for cross-disease comparison without sacrificing disease-specificity.

Correspondence: *Noelle Carlozzi, University of Michigan, 2800 Plymouth Road, Ann Arbor, MI 48109. E-mail: carlozzi@umich.edu*

Symposium 9: Current Controversies in Parkinson Disease

Chair: Dawn Bowers

Discussant: Donald Stuss

1:30–3:00 p.m.

D. BOWERS, D. STUSS, A. TROSTER, L. ZAHODNE, C. PRICE & D. BOWERS. Current Controversies in Parkinson Disease.

Symposium Description: This symposium will provide an update on current controversies pertaining to one of the most common neurodegenerative disorders of late life, Parkinson disease. Although classically known as a dopaminergic depletion disorder with prominent motor symptoms, Parkinson disease (PD) is now viewed as a multisystem disorder with cognitive, emotional, and motivational changes. Five scientists will discuss contemporary issues relevant to neuropsychology/cognitive neuroscience, drawing from their own and others research. Ample time will be available for participant discussion. Dr. Alex Troster will discuss heterogeneity of cognitive deficits in PD and counter classic claims of a 2-syndrome view of PD-related cognitive decline. In doing so, he will describe newly proposed diagnostic criteria for PD-mild cognitive impairment (PD-MCI) and the advantages they afford for researchers and clinicians. The second speaker, Laura Zahodne, will tackle issues related to cognitive changes following deep brain stimulation (DBS). Who is at risk for cognitive decline, are the changes really relevant, and what are the mechanisms? Dr. Dawn Bowers will focus on recent debate that apathy, rather than depression, is the primary neuropsychiatric signature in Parkinson disease, based on growing evidence of differential neural signatures, physiological characteristics and treatment approaches for depression vs apathy in PD. Dr. Catherine Price will offer insights into recent views of PD as a disconnection syndrome vs a fractionation disorder drawing from ongoing neuroimaging studies of white matter integrity changes over time in PD. Rounding out the symposium is Dr. Donald Stuss, one of the world's leading experts in the neuropsychology/ cognitive neuroscience of frontal lobe systems. Dr. Stuss will serve as the symposium discussant.

Correspondence: *Dawn Bowers, Ph.D., CHP/MBI, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: dawnbowers@phhp.ufl.edu*

A. TROSTER. Mild Cognitive Impairment (MCI) in Parkinson's Disease: New Criteria and Controversies.

Patients with Parkinson's disease have traditionally been thought to develop a dysexecutive syndrome and, later in the disease, a subcortical dementia. Cross-sectional prevalence estimates indicate that about 30% of persons with PD have dementia, and a longitudinal study found that 83% of 20-year survivors had dementia. A logical supposition is that those developing dementia pass through a stage of mild cognitive impairment (MCI). Interest in the neuropsychology of PD in the last 5 years has turned especially to mild and early cognitive impairment in PD and analyses of cognitive impairment patterns in individuals as opposed to groups. This research has shown that 20-30% of patients have subtle cognitive impairment near time of diagnosis and that cognitive impairment is much more heterogeneous than once believed. One view

is that persons who develop dementia within 5 years of diagnosis may have a different syndrome than those who do not develop dementia, and in particular, that those developing dementia early on have posterior, non-dopaminergic cognitive deficits in addition to executive dysfunction. Attempts to apply the concept of MCI to PD, however, show that a subgroup of patients may initially have single domain amnesic MCI. This finding, coupled with the recent finding that those developing dementia within 5-10 years vs. more than 10 years after PD diagnosis may not differ in baseline neuropsychological characteristics, challenge a simple two-syndrome view. To better understand MCI, diagnostic criteria have been proposed. These criteria, challenges in applying these criteria, and issues in prediction of dementia are summarized.

Correspondence: *Alex Troster, Dept. Neurology, 170 Manning Drive, Chapel Hill, NC 27599. E-mail: TrosterA@neurology.unc.edu*

L. ZAHODNE. Cognitive Decline Following Deep Brain Stimulation: Debates Regarding Clinical Relevance and Potential Mechanisms.

Deep brain stimulation (DBS) is an increasingly common surgical intervention for Parkinson's disease (PD) that effectively treats motor symptoms, reduces complications accompanying long-term dopaminergic therapy, and improves physical aspects of quality of life. Despite these benefits, a large body of literature suggests that DBS can produce neuropsychological sequelae. Cognitive decline following DBS is most frequently reported in verbal fluency, executive functioning, and verbal memory. Substantial controversy exists regarding the clinical significance of decline, which appears to be persistent. Idiographic analysis suggests that rather than small declines across patients, DBS produces reliable declines in a subset of patients. These declines have the potential to move some patients into the severely impaired range, as many individuals with PD exhibit impairments in these domains prior to surgery. A recent study examining quality of life following DBS demonstrated that verbal fluency decline, the most prominent cognitive side effect of DBS, correlates with self-reported problems in everyday communication. Thus, for some patients, cognitive decline following DBS may indeed be clinically significant. Since cognitive decline is less common among well-selected patients, presurgical neuropsychological evaluation is vital. The pathophysiological mechanism of DBS-related cognitive decline is a matter of debate. Potential causes are not mutually exclusive and may include preoperative risk factors, surgical lesions along the electrode trajectory, disruption of frontostriatal circuitry by high frequency stimulation, postsurgical alteration of antiparkinsonian medication regimens, and natural disease progression. Evidence for these potential mechanisms will be reviewed, including recent studies attempting to link cognitive performance to stimulation parameters.

Correspondence: *Laura Zahodne, Rhode Island Hospital, POB 430, Providence, RI 02903. E-mail: lzahodne@phhp.ufl.edu*

C. PRICE. Controversial Topics in Neuroimaging: PD as a Disconnection Syndrome?

PD is traditionally considered a basal ganglia and midbrain neurodegenerative disorder. The signature lesion involves loss of dopamine producing neurons in the substantia nigra and a compromised mesocortical dopaminergic projection system from the ventral tegmental area to the frontal lobes. Disruption to these systems results in the hallmark contralateral motor behaviors of PD (e.g., resting tremor, cogwheel rigidity), but also cognitive symptoms involving working memory and cognitive slowing. Until recently, the role of white matter was never seriously considered a marker of PD. Although many researchers hypothesized frontal-subcortical white matter pathway disruption (specifically the dorsolateral prefrontal circuit), it was not until the advancement of in-vivo diffusion imaging that data accumulated in support of white matter compromise in PD. Recent investigations show reduced frontal white matter integrity in PD with this associating to reduced processing speed/ working memory. There is also histopathological evidence that brains of nondemented PD patients contain abnormalities within the glial (astrocyte and oligodendroglial) cells responsible for

myelination of the axonal processes, production of neurotropic factors, and regulation of iron metabolism. These collective findings, combined with evidence of gray matter asymmetry relative to side of onset and behavioral evidence of cognitive hemispheric effects, have stimulated discussion regarding PD as a disconnection syndrome. Other imaging research, however, shows fractionated regions of cortical gray and white matter abnormalities that may indicate alternative mechanisms for PD cognitive impairment as a fractionation syndrome. This presentation will review these neuroimaging controversies and include data from a recently completed investigation addressing white and gray matter integrity on cognition in PD. Supported by NINDS K23NS060660

Correspondence: *Catherine Price, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: cep23@phhp.ufl.edu*

D. BOWERS. The Apathy-Depression Conundrum in Parkinson Disease: Does it Matter?

Although depression and anxiety have long been associated with Parkinson disease, emerging evidence indicates that apathy is the core neuropsychiatric signature of Parkinson's disease. It is distinct from depression, affects between 30-70% of PD patients in cross-sectional studies, and progressively worsens with disease severity. Rather than a "mood" disorder, apathy is a motivational disorder involving goal-directed behavior across affective, cognitive, and behavioral domains. It has significant health and social consequences ranging from reduced ADLs, physical deconditioning, increased burden on caregivers, and negative implications for treatment outcome. To date, there are at least 3 great challenges in this area. First, there are no known empirically validated treatments for apathy in Parkinson disease, either behavioral or pharmacologic, and the search for effective treatments is complicated by lack of empirical markers or probes for apathy. Second, there is paucity of evidence linking experimental tasks of reward-motor circuitry to apathetic behavior in Parkinson disease and how these map onto distinct neural systems. Third, based on observations of parallel worsening of motor symptoms and apathy (but not depression) over time, it remains unclear whether apathy is merely a proxy for dopaminergic disease progression. This presentation will provide critical analysis of tools for assessing apathy, newly proposed diagnostic criteria, and present recent data showing distinct neurophysiologic profiles from psychophysiology/electrophysiology and functional imaging studies. Finally, it will be argued that the common practice of taking an overly "inclusive approach" for diagnosing depression (i.e., counting PD-specific symptoms such as slowing as depression) has obfuscated our understanding and treatment for both apathy and depression in this disorder.

Correspondence: *Dawn Bowers, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: dawnbowers@phhp.ufl.edu*

Invited Symposium: The Interdisciplinary Assessment and Treatment of Learning Disabilities: A Team's use of Neurodevelopmental Models and Empirical Methods to Produce Successful Outcomes

Chair: Tim Conway

Discussant: Kenneth Heilman

1:30-3:30 p.m.

T. CONWAY, T. BRUNEY, S. FRETHEIM, L. RICHARDS, T. WARNER & K. HEILMAN. The Interdisciplinary Assessment and Treatment of Learning Disabilities: A Team's use of Neurodevelopmental Models and Empirical Methods to Produce Successful Outcomes.

Symposium Description: The sensorimotor and cognitive deficits in children with learning disabilities can be effectively assessed and treated

by an interdisciplinary team. The first step is assessment, which can provide an understanding of pathophysiology and lead to rational treatment approaches. In this course Dr. Conway will first provide theoretical models of language, sensorimotor development and discuss how modular and integrative dysfunction may induce learning disorders. Subsequently, to illustrate an interdisciplinary team's approach to assessment and treatment, as well as the outcomes, each speaker will present interdisciplinary data on a child with a learning disability and comorbid disorders. Dr. Bruney will discuss how a neurodevelopmental evaluation provides essential medical and developmental data. Some of the most common and disabling disorders are speech-language deficits (including reading, spelling, writing, comprehension, and language). The assessment and treatment of these disorders will be discussed by Ms. Frethem. Dr. Richards will discuss the sensorimotor disorders that often co-occur with learning disorders. Dr. Warner will discuss the neuropsychologists administrative and treatment provider roles within an interdisciplinary team, as well as how neuropsychology contributes to clinical integration across disciplines. Finally, Dr. Heilman will critique this symposium and make suggestions for future research.

As a result of participation in this session, the learner will:

1. Be able to identify the advantages of an interdisciplinary team approach to evaluation, diagnosis, and treatment of children with sensorimotor deficits and learning disabilities;
2. Learn that a patient's evaluation, together with an understanding of pathophysiology, are often the best means of guiding the forms of treatment;
3. Learn how an interdisciplinary team evaluates pre- and post-treatment data to assess treatment efficacy.

Correspondence: *Tim Conway, Ph.D., Clinical and Health Psychology, VAMC/BRRC & Univ of Florida, 1601 SW Archer Rd (151A), Gainesville, FL 32608. E-mail: tuc@phhp.ufl.edu*

T. BRUNEY. The Nurse Practitioner's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities.

The assessment and treatment of learning disabilities does not occur in isolation from the patient's overall health. Having a medical member of the team enhances the overall quality of the assessment and treatment process. The nurse practitioner can perform the initial medical assessment, including a detailed and thorough physical and neurological exam, the family history, past medical history, nutritional history, sleep history, and assessment of overall health. This member of the team also performs the neurodevelopmental assessment. The neurodevelopmental evaluation is a generalized assessment of the patient's language, memory, sensorimotor, learning and attention functioning. This evaluation provides the basis for further specialized testing and evaluation by members of the interdisciplinary team – speech, psychiatric, psychological, and occupational therapy. Medical and psychiatric problems or risk factors uncovered during the assessment process can be identified and treated, leading to a patient who is healthier and ready to receive maximum benefit from the interdisciplinary treatment program. Throughout this program, the nurse practitioner or physician provides continued assessment and treatment of the patient - serving as consultant to the team, healthcare provider as needed to the patient during treatment, facilitator of necessary medical referrals, and communicator with the client's primary healthcare provider.

Correspondence: *Teresa Bruney, 5930 SW Archer Rd, Gainesville, FL 32608. E-mail: tsb@morriscenters.com*

S. FRETHEIM. The Speech Therapist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities.

Children with dyslexia commonly have a core deficit in phonological processing, which subsequently may impact oral and written language capabilities. The Speech Language Pathologist (SLP) can use theoretical models of language development and empirical outcome studies when helping the interdisciplinary team select specialized testing. Testing may identify a patient's unique profile of strengths and weaknesses,

which assists accurate diagnosis and guides treatment planning. Through ongoing consultation with the interdisciplinary team, the SLP aims to maximize a patient's response to speech-language therapy. If behaviors hinder progress in language therapy – e.g. severe apraxia of speech, poor visual tracking abilities, poor visual processing, off-task or problem behaviors, poor attention, etc., then the SLP consults team members for therapeutic supports. Supports of SLP treatment can include behavior modification (neuropsychologist), psychopharmacology (psychiatrist/nurse practitioner), sensorimotor activities to increase alertness and stamina during language therapy (OT), and environmental modifications to maximize learning, motivation and attention (neuropsychology, OT and psychiatry). Likewise, the SLP provides ongoing consultation to the interdisciplinary team to aid progress in OT and psychotherapy treatments. Overall, the ultimate goal of SLP treatment is improved functional abilities, such as remediation of deficient language skills and improved reading, spelling, writing, comprehension and language.

Correspondence: *Stacy Fretheim, 9821 East Bell Road Suite 100, Scottsdale, AZ 85260. E-mail: stacyfretheim@wac.phxcoxmail.com*

L. RICHARDS. The Occupational Therapist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities.

Many children with learning disabilities have deficits in sensory processing and the production of motor behaviors, which the child should flexibly adapt to the demands of the task environment. The Occupational Therapist (OT) can follow a theoretical model of how sensory processing may support or interfere with cognitive and language development and processing. Based on this model, the OT can aid in selecting assessments and treatments within an interdisciplinary team. Besides treating the sensory processing or motor behavior deficits, the OT can provide essential information to the interdisciplinary team to aid with alertness/arousal issues, oral motor or praxis difficulties, visual tracking and fine motor skills. OT's treatment of these deficits may improve a patient's readiness and ability to learn during OT, language therapy and psychotherapy. OT's can serve as a consultant to the interdisciplinary team throughout the treatment program to aid progression of language and psychotherapy treatments, as well as to facilitate communicating with the family for ongoing management of daily life skills. Correspondence: *Lorie Richards, 520 Wakara Way, Lake City, UT 84108. E-mail: lorie.richards@hsc.utah.edu*

T. WARNER. The Neuropsychologist's Role in the Interdisciplinary Assessment and Treatment of Learning Disabilities.

Neuropsychologists may perform treatment provider and administrative roles within an interdisciplinary team that treats children with developmental learning disabilities (LDs). As a provider, neuropsychologists engage in standard roles of assessment selection and interpretation, treatment planning and program evaluation. Also, neuropsychologists may treat patient's maladaptive and dysfunctional behavior patterns, task avoidance and poor persistence behaviors - similar to a "learned helplessness" syndrome, impulsivity, poor organizing and poor sequential processing – due to highly co-morbid executive functioning difficulties, and psychopathology - anxiety, depression and family dysfunction. Because these behaviors may impede treatment progress, a critical function of neuropsychologists on interdisciplinary teams is addressing problem behaviors through an individualized and comprehensive treatment plan. A variety of approaches are often required for such a plan, including staff training, reinforcement techniques applied by both the treatment team and the patient's family, parent education about learning disabilities, attention control and executive functioning difficulties, and individual and family psychotherapy. Administratively, neuropsychologists can facilitate a common vocabulary and clear communications across disciplines during diagnostic and treatment planning staff meetings, optimize communications to parents – regarding initial assessment findings, treatment goals and treatment progress, as well as assist with discharge planning.

Correspondence: *Tamara Warner, 5930 SW Archer Road, Gainesville, FL 32608. E-mail: twarner@morriscenters.com*

Poster Session 8: Cognitive Neuroscience/ Electrophysiology/Functional and Structural Neuroimaging

1:45–3:15 p.m.

Cognitive Neuroscience

M.A. ANDREJCZUK, T.D. VANNORS DALL, J.R. WEAVER, L.V. BOSLEY, K. REESE, B. GORDON & D.J. SCHRETLEN. Amperage and Electrode Placement Contribute to the Detection of Active Transcranial Direct Current Stimulation (tDCS).

Objective: Transcranial direct current stimulation (tDCS) involves passing a weak electrical current through the scalp and head to modulate the firing of underlying neurons. It is safe and has potential as a tool to investigate and enhance cognitive function. Many tDCS investigators assert that active stimulation is indistinguishable from placebo (sham) stimulation and describe studies as "single blind" in design. However, recipients often report sensations at electrode sites. This raises the question of whether habituation to brief stimulation (the usual sham stimulation procedure) effectively "blinds" people to active stimulation.

Participants and Methods: Over 4 tDCS studies, 92 healthy adults received 30 min of active and 30 min of sham stimulation over the left dorsolateral prefrontal cortex (DLPFC) in counterbalanced order. After each condition, Ss rated the intensity of side-effects and their certainty that they had just received active stimulation.

Results: Participants detected active stimulation (i.e., reported significantly greater confidence stimulation was active) when the tDCS current was set to 2 mA and the reference electrode was placed above the right orbit. They failed to detect active stimulation when the current was set to 1 mA, and the reference electrode was either above the right orbit or on the right bicep, but they detected active stimulation at 1 mA when the reference electrode was over the vertex. In 3 of 4 studies, Ss reported greater tingling, itching, or discomfort during active tDCS, even when they failed to "detect" it. These ratings correlated with confidence judgments during active tDCS ($r_s=0.35$ to 0.66 ; $p_s < 0.05$).

Conclusions: Healthy adults can detect active tDCS stimulation at 1 and 2 mA current strength. At 1 mA, this depends on the location of the reference electrode. Even when participants do not "detect" the presence of active stimulation, side-effect ratings suggest they perceive it.

Correspondence: *Megan A. Andrejczuk, MS, Cognitive Neurology/Neuropsychology, Johns Hopkins University, 1629 Thames Street, Suite 350, Baltimore, MD 21231. E-mail: mandrej1@jhmi.edu*

M. AUBIN, S. ZAHABI & M. ARGUIN. The role of stereoscopic depth cues in shape constancy.

Objective: The goal of the present research was to determine the role of the stereoscopic depth cue in the orientation invariance of shape representation.

Participants and Methods: Two experiments with two sessions using sequential matching tasks have been designed. In both experiments, participants had to determine if two stimuli representing bent paper clips shapes were same or different. The stimuli were rotated between 0 and 80 degrees around the vertical axis, and could be presented without binocular disparity, with normal disparity (given the 3D shape models and simulated distance) or with reversed disparity. The presentation mode was within-subject ($n=12$) in Exp. 1, and between-subjects in Exp. 2 ($n=24$).

Results: Analyses of variance showed strong rotation effects in both experiments. In the first session of Exp.1, the rotation effect is smaller with normal stereoscopic displays than for the other conditions. However, the stereoscopic effect is reversed in the second session of the experiment. In Exp. 2, the rotation effects are weaker for the normal stereoscopic presentation than for the 2D or reversed stereoscopic presentations in both the first and second sessions.

Conclusions: These results indicate that stereoscopic depth cues may contribute to shape constancy. The reversal in the effect of presentation mode across sessions in Exp. 1 (within-subject manipulation of presentation mode) may result from a strategic adaptation to the inconsistency between stereoscopic and monocular depth cues in the condition of reversed stereopsis. Thus, participants may have attempted to integrate monocular and binocular information in the initial session to then attempt to ignore binocular information to try and focus exclusively on monocular depth cues in the second session.

Correspondence: *Mercédès Aubin, M.Sc., Psychologie, Université de Montréal, 6294 24e avenue, Montréal, QC H1T3M5, Canada. E-mail: mercedes.aubin@umontreal.ca*

C. BLAIS, D. FISET, C. ROY, M. ARGUIN & F. GOSSELIN. The eyes are not the window to emotions.

Objective: Impairments in facial emotion recognition tend to be associated with the underutilization of information from the eyes of the facial stimulus (e.g. Adolphs et al., 2005; Lee et al., 2010). The eyes are important to identify complex mental states in others (Baron-Cohen et al., 1997) as well as to recognize some facial expressions, e.g. fear or anger (Smith et al., 2005). This evidence might suggest that the area of the eyes is the most important for facial expression recognition. Here, we determined, using the Bubbles technique (Gosselin & Schyns, 2001), what face area is the most important across all facial expressions; and whether this information differs between static and dynamic stimuli.

Participants and Methods: Participants (Static: 50; Dynamic: 75) were asked to categorize static and dynamic facial expressions (i.e. six basic emotions plus neutral and pain). Sparse versions of these stimuli were created by sampling facial information at random spatial locations and at five non-overlapping spatial frequency bands for the static stimuli, as well as in space-time for the dynamic stimuli (Fiset et al., 2008).

Results: Multiple linear regressions on the bubbles location and on the accuracy were performed independently for the static and dynamic versions of the task. We found that normal observers use mainly the mouth region to discriminate facial expressions for both static and dynamic stimuli. We conducted two computational analyses to determine the ideal visual information to discriminate expressions for both stimulus types. Similarly to human beings, the model found that the mouth was the most informative area for dynamic expressions. For static expressions however, the model found that the eyes area was the most informative.

Conclusions: Since facial expressions are inherently dynamic, we propose that human observers have developed a strategy whereby they put more resources on the most dynamic part of the face, i.e. the mouth area.

Correspondence: *Caroline Blais, M.Sc., Psychology, Université de Montréal, 90 Vincent d'Indy, Montréal, QC H3C 3J7, Canada. E-mail: caroline.blais@umontreal.ca*

J.H. BOLINSKY, A.T. SCHMIDT, G. HANTEN, K.D. ORSTEN, M.R. NEWSOME, M.C. POST & E.A. WILDE. Performance on Decision-Making Task Correlates with Resilience Variables in Two Groups of High-Risk Adolescents.

Objective: Resilience is the concept that some individuals have positive outcomes in the face of significant adversity. Research suggests psychosocial factors are crucial for attaining resilient outcomes, but few studies have examined relationships between cognitive variables and resilience. This study investigates the relationship between cognitive decision-making and resilience.

Participants and Methods: Two groups of high-risk youth participated in this pilot study. One group (5M, 3F; ages 14-16) comprised youth who entered the Juvenile Justice diversion program after arrest (JJ). The second group (13M, 2F; ages 15-19) comprised demographically similar adolescents participating in Youth Advocates, (YA), a community

youth service organization. The Child and Youth Resilience Measure (CYRM) indexes factors associated with resilience with 3 sub-scores. The Columbia Card Task (CCT) was used to assess risky decision-making. We report here the relationships between CYRM sub-scores and CCT scores.

Results: Results for the YA group followed the expected direction: higher CYRM scores related to less risk-taking. In this group, the correlations between CCT scores and the CYRM component scores were Interpersonal, $r=-.39$; Caregiver, $r=-.44$; and Community/Contextual, $r=-.79$. However, findings in the JJ group were either non-significant, or followed an unexpected opposite trend: higher CYRM scores related to more risk-taking behavior. For the CYRM Interpersonal, $r=.14$; Caregiver, $r=.06$; and Community/Contextual, $r=.25$. Stronger positive correlations with CCT were found for JJ group within the sub-factors (e.g., for Cultural Context within Community/Contextual, $r=0.49$).

Conclusions: These results may indicate between-groups differences in the psychosocial environment, such as deviant social influences within JJ youth. These findings provide a potential direction for future research and may have implications for evaluating effectiveness of adolescent intervention programs.

Correspondence: *Elisabeth A. Wilde, Ph.D., Physical Medicine and Rehabilitation, Neurology and Radiology, Baylor College of Medicine, 1709 Dryden Rd., Ste 1200, Houston, TX 77030. E-mail: ewilde@bcm.edu*

L.V. BOSLEY, T.D. VANNORSDALL, K. REESE, B. GORDON & D.J. SCHRETLEN. Spectrographically-aided Measures of Inter-word Intervals Provide Support for an Expanded Assessment of Clustering on Verbal Fluency Tasks.

Objective: Qualitative verbal fluency (VF) scoring systems typically capture phonemic clustering on letter word fluency and semantic clustering on category word fluency tasks. However, semantically-based clustering on letter VF and phonologically-based clustering on category VF might reveal important aspects of lexical retrieval. The Hopkins qualitative VF scoring system was developed to capture such relationships. Here we compare the intervals between successively-reported words as a function of their "relatedness" based on this scoring system to that of the widely-used method of Troyer and colleagues (1997).

Participants and Methods: Forty-one adults completed two letter-cued (S and P) and two category-cued (animals and supermarket items) VF tasks from the Calibrated Ideational Fluency Assessment (CIFA; Schretlen & Vannorsdall, 2010). Inter-word intervals were measured in milliseconds using spectrographs of audio recorded productions and classified as occurring either between or within clusters as defined by the Troyer and Hopkins coding schemas.

Results: First, the Hopkins system assigned more words in clusters on both letter and category VF tasks. Second, inter-word intervals within clusters were shorter than those between clusters. Thus, subjects reported clustered words in quicker succession than un-clustered words. Third, inter-word intervals of some clusters defined uniquely by the Hopkins system (e.g., by association in popular culture or the first three letters) were very brief, whereas those for other clusters (e.g., first sound of words on category VF) were as long as un-clustered words.

Conclusions: The Hopkins system captures additional phonological, semantic and associative relationships between successively-reported words and reflects a valid index of clustering.

Correspondence: *Laura V. Bosley, Neurology, Johns Hopkins University School of Medicine, 1629 Thames Street, Suite 350, Baltimore, MD 21231. E-mail: lvandro1@jhmi.edu*

A. CHAMPOD, G.A. ESKES, G.E. FOSTER, V. PIALOUX, J.V. BRUGNIAUX, P.J. HANLY & M. POULIN. Effects of Acute Intermittent Hypoxia on Working Memory in Healthy Adults.

Objective: Obstructive sleep apnea often causes deficits in working memory, even after treatment of the sleep disorder, but the mechanisms remain unclear. More specifically, the contribution of recurrent episodes

of hypoxia (i.e., transient reduction in blood oxygen supply) is difficult to disentangle from the impact of other common comorbid factors (e.g., daytime sleepiness). In this randomized crossover study, we tested the hypothesis that acute exposure to intermittent hypoxia alone results in decreased performance in working memory tasks in healthy adults.

Participants and Methods: Eight male participants (29–34 yrs) were tested twice on spatial and verbal n-back tasks during short-term exposure (at the beginning (AM), or after 6 hours (PM)) to intermittent hypoxia (hypoxia condition) or normoxia (SHAM condition).

Results: A 2 (difficulty level: 0-, 2-back) × 2 (time: AM, PM) × 2 (condition: hypoxia, normoxia) repeated-measures ANOVA revealed that, for the spatial n-back tasks, participants' reaction times were significantly slower in the hypoxia than in the normoxia condition across time of day and difficulty level. Furthermore, participants made significantly more errors in the spatial 2-back than in the 0-back task in the hypoxia, but not in the normoxia condition. No effect of hypoxia was seen in the verbal n-back tasks.

Conclusions: This study shows for the first time, in an experimental human model of intermittent hypoxia, that short-term exposure to intermittent hypoxia can negatively impact spatial working memory in healthy adults. Furthermore, this study provides strong evidence that intermittent hypoxia can affect cognitive functions independent of comorbid medical conditions, daytime sleepiness and sleep fragmentation. These findings provide the first step towards a better understanding of the mechanisms underlying the development of working memory deficits in sleep apnea. Early treatment of sleep apnea may be important to minimize potentially irreversible hypoxic brain damage leading to working memory deficits.

Correspondence: *Anne Sophie Champod, PhD, Dalhousie University, Brain Repair Centre, Dalhousie University, Life Sciences Research Institute, 1345 Summer Street, Halifax, NS B3H 4R2, Canada. E-mail: as.champod@dal.ca*

I. CORRIVEAU, U. FORTIER-GAUTHIER, V. JETTÉ POMERLEAU & P. JOLICOEUR. Space impairs visual attention deployment to targets: Evidences from human electrophysiology.

Objective: Previous studies in perception and visual memory showed that a ERP (evoked potentials) component, N2pc was associated with the visual spatial attention deployment to a target presented in a visual hemifield. The N2pc is a lateralized component with a negativity at posterior electrodes contralateral to the visual hemifield to which a target was presented. However, targets situated on the vertical midline activate equally the two hemispheres and thus, don't elicit a N2pc. When the attention deployment is difficult, it is possible to specify the factors that modulate this component. The main objective of this project consists to use lateralized targets and distractors to modulate this component.

Participants and Methods: Fifteen undergraduate students were asked to respond to a visual search task. Inspired from the paradigm of Hilimire and al. (2010), subjects see a circle display of 16 stimuli (15 T and 1 L). The target (T) and the distractor (L) are oriented upright or inverted. 14 other Ts are oriented 90° to the left or to the right and are present or absent. The target and the distractor are blue or grey (and vice versa for the 14 Ts). Lateralized to the left or to the right of the hemifield, the target and the distractor can be separated by 0, 2 or 4 Ts. When the stimuli disappear, the subject has to report the orientation (upright or inverted) of the target.

Results: A repeated-measure ANOVA showed that different stimuli positions modulate the N2pc amplitude. An increase of the distance between the target and the distractor creates an increase of the N2pc amplitude. Also, N2pc amplitude increases when there were no Ts between the target and the distractor.

Conclusions: The relation of competition between distractors and a target was showed by the N2pc modulation. More results on this ERP component are essentials to explain the link between it and the attention deployment to possibly use the N2pc as a measure of this deployment in everyday situations.

Correspondence: *Isabelle Corriveau, Graduate Student, Psychology, Université de Montréal, 2458 Prudential, Laval, QC H7K2T3, Canada. E-mail: isabelle.corriveau.1@umontreal.ca*

B.J. DIAMOND, A.R. MAYES & P.R. MEUDELL. Greater Physiological Activity at Encoding Predicts Better Memory at Longer Delays.

Objective: This study determined whether levels of autonomic activity (EDR) at encoding were related to subsequent recognition of verbal information and whether the strength of this association varied as a function of the delay.

Participants and Methods: The participants, who provided informed consent, consisted of nine healthy participants with a mean age of 27 (SD = 3) who were randomly assigned to three delay conditions (20-minutes, one-week and two-weeks).

Results: Recognized words across all delays exhibited significantly greater levels of EDR activity at encoding than not-recognized words ($p = .02$). As recognition scores declined over the delays, differences in EDR amplitude at encoding for recognized and not-recognized words increased ($r = -.762$, $t(5) = -2.6334$, $p = .04$) so that prediction was more reliable for words tested at two-weeks and one-week versus twenty minutes.

Conclusions: Greater levels of EDR activity at encoding were associated with better recognition and activity levels at encoding were greater for words remembered at delays of two-weeks and one-week versus twenty minutes. These findings are consistent with theories of orienting and information processing suggesting that greater use of attentional and processing resources at encoding may index information registration and effort. Strategies that enhance information registration and physiological activation at encoding (i.e., behavioral or pharmacological) and make information more salient could be used as rehabilitation techniques in order to enhance memory, particularly when tested at longer delays.

Correspondence: *Bruce J. Diamond, Ph.D, Psychology, William Paterson University, 300 Pompton Rd, Wayne, NJ 07470. E-mail: diamondb@wpunj.edu*

R. GREEN, D.J. MIKULIS, B. COLELLA, J. MALLER, A. ADNAN, L. MILLER & A. CRAWLEY. Traumatic Brain Injury as a Neurodegenerative Disorder.

Objective: A prevailing assumption concerning recovery from moderate - severe traumatic brain injury (TBI) is that neurological status remains stable after the acute events of TBI have resolved. Our research has questioned this assumption.

Participants and Methods: 50 patients underwent quantitative MRI with diffusion tensor imaging (DTI) employing fractional anisotropy (FA) at 4.5, 12 months and 24+ months post-injury.

Results: Statistically significant atrophy and white matter loss were observed over time as measured by increased ventricle to brain ratio, diminished hippocampal and corpus callosum volumes, and reduced FA values from 5 to 12 to 24 months post-injury. Imaging changes showed significant correlation with degree of environmental enrichment and with memory changes.

Conclusions: These data suggest the brain is not stable in the chronic stages of TBI. Significant and progressive atrophy was observed long after the resolution of the acute effects of injury. Moreover, this atrophy was correlated with clinical findings. The possibility of a neurodegenerative process caused by transneuronal degeneration is discussed, along with implications for treatment.

Correspondence: *Robin Green, PhD, Toronto Rehab, 550 University Avenue, Toronto, ON M5G2A2, Canada. E-mail: green.robin@torontorehab.on.ca*

C. HAWCO, J. ARMONY & M. LEPAGE. Neural Activity Related to Encoding Tasks and Levels of Semantic Relatedness: Self-initiation of task-irrelevant encoding strategies.

Objective: Numerous groups, including patients with psychosis, Alzheimer's Disease, or frontal lobe lesions, as well as healthy aging individuals, show a decrease in the self-initiation of efficient memory encoding strategies, resulting in poorer memory performance. In order to better understand the brain regions involved in elaborative encoding strategies, we performed an fMRI study in which we controlled for the use of different encoding strategies.

Participants and Methods: Twenty-three healthy young participants were presented triads of objects in which either neither, one or both objects in the bottom of the triad were related to the top object. Participants were given two encoding instructions that required them to indicate the number of semantic ('related?') or physical ('smaller?') relationships in the triad.

Results: We found increased reaction time as a function of the number of semantic relationships in the triad for both encoding conditions, indicating that semantic analysis was still performed for the non-semantic encoding task. A conjunction analysis was performed on the fMRI data to find areas with greater activity for the non-semantic > semantic encoding tasks that were also modulated by increasing semantic relationships during non-semantic encoding. We found activity in the left dorsolateral prefrontal cortex (DLPFC) and bilaterally in the supramarginal gyrus.

Conclusions: We suggest that the DLPFC is the most likely candidate region for the self-initiation of task-irrelevant elaborative encoding while the supramarginal activity is likely related to attentional effects. This could have important implications for understanding neurological changes in patients who show a deficit in self-initiated memory strategy use.

Correspondence: *Colin Hawco, Department of Neuroscience, McGill University, 3263 Evelyn, Verdun, QC H4G 2H2, Canada. E-mail: colin.hawco@mail.mcgill.ca*

K. HÉBERT, G. FOREST, C. BLAIS, F. GOSSELIN & D. FISET. The use of spatial frequency through time in gender categorization.

Objective: The human visual system analyzes the complex luminance variations that make up the visual stimulus with discrete channels, each tuned to a specific spatial frequency (SF) range. High SFs represent the fine-grained information in a stimulus, such as the eyelashes or edges of the mouth, and low SFs convey coarse information, such as luminance blobs and blurred shapes (Morrison & Schyns, 2001). The SFs useful for face processing have been extensively examined (Gaspar, Sekuler, & Bennett, 2008; Näsänen, 1999). However, how the visual brain integrates these SFs through time remains largely unknown. It is generally assumed that the information carried by different SFs is combined following a coarse-to-fine sequence (Goffaux et al., 2010).

Participants and Methods: Here, we test this hypothesis using SF Bubbles (Willenbockel et al., 2010) in a gender repetition-priming task. Six participants were asked to categorize the gender of a face displayed on the center of a computer screen. The target face was preceded by a prime that could either be of the same identity than the target, the same gender but not the same identity or not the same gender. There were five prime-duration conditions: 25, 50, 100, 200 and 400 ms. On each trial, the SFs of the prime were sampled randomly with SF Bubbles.

Results: For each prime duration condition, multiple linear regressions were performed on the random SF filters and response reaction times in order to reveal the SFs correlated with priming. In the longest prime-duration conditions, we closely replicated Willenbockel et al. (2010); a single band beginning at ~6 cycles per face (cpf) and ending at ~15 cpf was significantly correlated with the amount of priming. Interestingly, a small band of low SFs was most correlated with the amount of priming for the two shortest prime durations.

Conclusions: These results support the hypothesis of a coarse-to-fine sequence at least for gender categorization.

Correspondence: *Kim Hébert, Université du Québec en Outaouais, 283, boulevard Alexandre-Taché, Gatineau, QC J8X 3X7, Canada. E-mail: hebk03@uqo.ca*

C. HIGGINSON, A. LENZ & J. HIGGINSON. The Impact of Walking on Thinking: Preliminary Results from a Dual Task Walking Study.

Objective: A rapidly growing literature indicates that performing a cognitive task while walking (i.e., dual task walking) reduces postural stability, and increases the risk of falling, suggesting that walking is not truly automatic and may interfere with cognitive function. Although the impact of cognition on walking has received a great deal of attention, the impact of walking on cognition has not. The purpose of this study is to determine the impact of walking on a number of cognitive tasks.

Participants and Methods: Seven healthy young adults [mean (SD) age and education (yrs): 22.6 (4.2) and 16.1 (3.1), respectively] completed the Paced Auditory Serial Addition Test (PASAT), Symbol Digit Modalities Test (SDMT), and a cellular phone dialing task (Phone) while seated. Participants also completed the tasks in random order on a split-belt instrumented treadmill at a self-selected speed (SS), a fast speed (120% of SS), and with the belts at different speeds, simulating a limp.

Results: Repeated measures analysis of variance were significant for the SDMT [$F(3,18)=9.63, p=.001$] but not the PASAT or Phone. Follow-up t-tests indicated that number of correct responses on the SDMT was significantly lower while SS walking compared to seated [$t(6)=2.60, p=.021$] and while fast walking compared to SS walking [$t(6)=2.22, p=.034$].

Conclusions: Consistent with the notion that walking is not automatic, preliminary results suggest that walking reduces performance on a measure of cognitive processing speed. Interestingly, the effect appears related to walking speed.

Correspondence: *Christopher Higginson, Ph.D., Department of Psychology, Loyola University Maryland, 4501 North Charles St., Baltimore, MD 21210. E-mail: cihigginson@loyola.edu*

M. HOSOKAWA, Y. YONEDA, H. SHOJI & H. OZAKI. Phonological Working Memory in Reversal Task of Word's Mora: A Near-Infrared Spectroscopy Study.

Objective: Near-infrared spectroscopy (NIRS) during reversal task of word's mora was recorded in adults and their cerebral process of phonological working memory was examined.

Participants and Methods: 12 adult females participated in this study. We adopted 42 Japanese words with three moras (ex. /sakana/ meaning a fish) and five moras (ex. /katatumuri/ meaning a snail) as stimuli. In the visual condition, a picture corresponding to a word was presented at center of the monitor. In the auditory condition, human vocalized word was presented through speaker. Participants were asked to pronounce the presented word repeatedly in the baseline task. In the reversal task, participants were asked to pronounce a series of moras in reverse order. NIRS was recorded from 70 locations on the frontal and bilateral temporal areas during the task.

Results: During the reversal task of words with five moras, concentration of oxy-Hb at prefrontal area increased more extensively than those during the reversal task of words with three moras in visual and auditory condition. On the other hand, due to vocalization of reversed five moras in auditory condition, concentration of oxy-Hb at temporal areas was prominently increased than those due to vocalization of three moras. However, such oxy-Hb increase was not observed in visual condition.

Conclusions: These results both in the visual and the auditory conditions suggested that phonological working memory task demands subjects to increase memory load, and prefrontal activation might enhance. Furthermore, temporal cortices might be also concerned with phonological working memory driven by auditory stimuli. This research was supported by the Research Program of the Japan Society for the Promotion of Science (Grant-in-Aid for Young Scientists (B) # 21730726 to Hosokawa and Grant-in-Aid for Scientific Research (A) #20243040 to Ozaki).

Correspondence: *Miyuki Hosokawa, Department of Elementary Education, Ibaraki Christian University, 6-11-1, Omika, Hitachi 319-1295, Japan. E-mail: mhosokawa@icc.ac.jp*

J. HUANG, Y. WANG, Z. JIN, T. YANG, X. DI & R. CHAN. Functional Mapping of Dynamic Happy Facial Expression Processing in Social Interaction Context.

Objective: Dynamic happy facial expressions demonstrated a neural response involving hedonic neural system. Moreover, in our daily life, facial expressions are changing rapidly according to different context of social interaction, and the impact of the social interaction context on dynamic happy facial expression might rely on the reciprocal neural activities in the hedonic neural system, presumably leading to our automatic inference towards pleasure and happiness.

Participants and Methods: Using functional magnetic resource imaging (fMRI), dynamic happy facial expressions were examined by presenting 21 healthy volunteers video clips depicting happiness appearing and happiness disappearing facial expression in conversations with happiness inducing ('praise') or reducing ('blame') questions.

Results: Conjunction analysis indicated that happiness appearing and disappearing dynamic facial expression activated the common regions including the clusters with the weighted center of bilateral middle temporal gyrus and putamen. For the contrast between incongruent and congruent facial expressions and conversation context, right superior frontal gyrus and left inferior occipital gyrus were activated to resolve the conflicts embedded in the corresponding social interactions. We extracted the activation intensity from these activated cluster and found that dynamic happiness interacted with social interaction context.

Conclusions: In sum, the current findings highlight the impact of social interaction context on the response to the dynamic happy facial expressions in healthy volunteers.

Correspondence: *Huang Jia, Institute of Psychology, No. 4A, Datun Rd., Beijing 100101, China. E-mail: truehahuang@gmail.com*

G. KLENCKLEN, A. DUFOUR, J. KEMP & O. DESPRÉS. Implication of Working Memory in Spatial Deficits in the Elderly: an ERP Study.

Objective: The objective of the present study was to investigate whether age-related prominent deficits in spatial capacities are due to an alteration of processing in working memory (WM). We postulated that the amplitude of the P1 electrophysiological component, which is involved in the modulation of spatial attention, is reduced in older people when spatial information has to be processed.

Participants and Methods: To address this hypothesis, we recorded event related potentials (ERP) during a delayed recognition task displaying successively spatial and non-spatial visual information. On each trial, participants had to focus and remember either spatial or non-spatial information. Nineteen young (age 20–29) and eighteen elderly (age 65–78) were tested.

Results: Results indicated a decline in WM speed and accuracy in the elderly when compared to younger controls ($F(1, 35) = 19.34, p < .01$ and $F(1, 35) = 4.84, p = .03$, respectively). Moreover, similarly to younger subjects, the elderly exhibited equal performance in remembering non-spatial and spatial information ($F(2, 70) = 2.01, p = .14$). The analysis of ERP components revealed that when compared to younger controls, older adults exhibited a significant reduction of the P1 amplitude when attention was dedicated to spatial information ($t(17) = 3.15, p < .01$).

Conclusions: These results indicate that specific modifications in the WM's spatial attention modulation may be responsible, at least partially, for spatial age-related declines.

Correspondence: *Giuliana Klencklen, Laboratoire d'Imagerie & Neurosciences Cognitives, CNRS - Uds, 21, rue Becquerel, Strasbourg 67087, France. E-mail: giuliana.klencklen@etu.unistra.fr*

V. LABELLE-CHIASSEON, E. VERA, J. DOOLEY & M. BEAUCHAMP. The Role of Intelligence as a Cognitive Predictor of Moral Reasoning.

Objective: This study investigates moral reasoning (MR) as a crucial socio-cognitive function for appropriate behaviour and social decision making in adolescence. The aim was to better understand cognitive predictors of MR by exploring the relationship between intelligence and moral maturity and to determine which of its components, nonverbal or verbal, better predicts MR.

Participants and Methods: 50 healthy developing adolescents aged 13 to 17 ($M=14.8$ years, $SD=1.2$ years, 22 males) were assessed using a new visual task (So-Moral, Dooley et al., 2010) derived from Kohlberg's stages of moral development. Intelligence was assessed using the two-subtest WASI (Wechsler, 1999).

Results: IQ was significantly correlated with MR ($r=.302, p=.039$), as was matrix reasoning ($r=.356, p=.014$). There was no significant cor-

relation between the vocabulary subtest and MR ($r=.245, p=.097$). Intelligence explained 9.1% of the variance in MR ($F(1.45) = 4.505, p=0.039$). Nonverbal intelligence explained 12.6% of the variability in MR ($F(1.45) = 6.514, p=0.014$), while verbal IQ ($r^2=.06$) did not provide a significant predictive value ($p=.097$).

Conclusions: The results of this study support Kohlberg's (1969) theory that intellectual development has a formal-structural base parallel to that of MR. However, our findings suggest that the moderate relationship between these high-level capacities lies in non-verbal intellectual abilities, like reasoning, abstraction and problem-solving skills rather than verbal aptitudes. MR, as measured by the So-Moral, appears to be a distinct aspect of intellectual development and not simply the application of general cognitive and linguistic skills to moral issues. Future studies should be conducted in order to provide additional knowledge on the neural and cognitive substrates of moral reasoning.

Correspondence: *Vincent Labelle-Chiasson, University of Montreal, 752 place de chaumont, Laval, QC H7N5Y8, Canada. E-mail: vincent.labelle-chiasson@umontreal.ca*

M. LUSSIER, V. GUILBAULT, N. CASTONGUAY, A. BUGAISKA & L. BHERER. Specific Transfer Effects After Dual-task Training Compared To Active Control In Older Adults.

Objective: Improved divided attention abilities are associated with better balance, lower risk of falls and fewer car crashes in older adults. Research in laboratory settings has found that dual-task training leads to an improvement of divided attention. However, benefits outside the laboratory require that training effects transfer to a context, distant from the training situation. Very few studies have reported a far transfer effect after cognitive training.

The present study assessed transfer effects after dual-task training on performances in untrained dual-tasks that involved new stimuli (arrows and letters instead of figures and numbers), new input modalities (auditory instead of visual), and a different context (paper-pencil instead of computerized tasks). A second objective was to verify if transfer was specific to the tasks recruiting divided attention.

Participants and Methods: Sixty-nine participants aged between 55 and 65 were randomized into a dual-task training program or an active control program (internet familiarization course). Both groups completed five one-hour sessions. Pre and post-test involved a variety of neuropsychological tests and non-training dual-tasks.

Results: Results showed that participants who completed dual-task training performed better than control participants on transfer to both new stimuli and new modality dual-task conditions. They also tended to outperform control participants in the paper-and-pencil dual-task. No differences between groups were observed on neuropsychological tests recruiting executive functions (namely switching and updating).

Conclusions: Findings support both specific and transferable divided attention training benefits in older adults and training benefits go beyond those of an active control program which is the most severe form of control in cognitive training.

Correspondence: *Maxime Lussier, Graduated student, Université du Québec à Montréal, 405, rue Sainte-Catherine Est, Montréal, QC H3C 3P8, Canada. E-mail: lussier.maxime@gmail.com*

J.V. MARCUS, D. WOOLLEY, S. HOOPER & M. DE BELLIS. Direct and Indirect Effects of Brain Volume, Socioeconomic Status and Family Stress on Child Cognitive Outcomes.

Objective: This study builds upon work from a number of disciplinary perspectives to investigate how environmental factors influence children's brain development and cognition. Environmental factors such as socioeconomic status (SES) lead to individual differences in brain development. A large literature documents the detrimental effects of poverty and low SES on child development. Typically, researchers attempt to capture SES using income, parent's occupational status and years of education. However, the effects of SES are much more complex than these factors alone.

Participants and Methods: In order to understand the processes by which SES affects child brain development and cognition, this study uses Principal Components Analysis to reduce targeted informational items on SES and family stress into their core dimensions (e.g. community and educational capital, financial resources, marital conflict and conflict resolution skills). Core dimensions are used in path analyses to examine their relationship with parent IQ, a genetic proxy, and measures of brain volume, to predict child IQ in a sample of typically developing children ($n=102$).

Results: There were no intervening effects of brain volume on child outcomes. However, study findings show that parent IQ affects child IQ both directly and indirectly through the primary SES component (community and educational capital).

Conclusions: This finding demonstrates how the environment shapes child outcomes in concert with genetics through dynamic developmental processes. This paper extends the neuroscience literature by using meditational models to explore potential mechanisms through which SES operates in child development and using sophisticated measures of SES and family stress.

Correspondence: *Jade V. Marcus, M.S., Public Policy; UNC-Chapel Hill, Abernethy Hall, CB#3435, Chapel Hill, NC 27516. E-mail: heyitsjade@gmail.com*

M. NEUGNOT CERIOLI, J. BELLEROSE, E. VERA-ESTAY, J.J. DOOLEY & M.H. BEAUCHAMP. Moral Reasoning and Empathy in Adolescents.

Objective: Moral Reasoning (MR) is a high-order cognitive function essential for appropriate social behaviour, especially during adolescence when youth are confronted with new social environments. Concomitantly, empathy, another complex ability develops. Several studies demonstrate an association between the development of MR and empathy; however, doubts have been cast upon the validity of traditional MR measures, often confounded by the need for advanced reading skills. The aim of this study was to examine whether MR in adolescence is associated with empathy using a new MR measure.

Participants and Methods: 38 adolescents (M age = 14.70, $S.D$ = 1.19) completed the Index of Empathy for Children and Adolescents (self-report; Bryant, 1982) and the Socio-Moral Reasoning Aptitude Level (Dooley et al., 2010). The Rule-Breaking and Aggressive Behaviour subscales of the Child Behaviour Checklist (CBCL; Achenbach et al., 2001) and the Social subscale of the Adaptive Behaviour System Assessment (ABAS; Harrison & Oakland, 2003) were completed by parents to document external social behaviors.

Results: Adolescents with the greatest MR maturity showed the highest empathy scores ($r=.36$, $p=.03$). However, MR maturity was not correlated with rule-breaking and aggressive behaviours or the Social subscale of the ABAS ($r=.20$, $p>.05$; $r=.13$, $p>.05$; $r=-.02$, $p>.05$).

Conclusions: In typically developing adolescents, MR maturity correlates better with specific internal socio-emotional skills, as shown by the association between MR and empathy, than with global social functioning measures. Global measures such as the CBCL and the ABAS may not be specific enough to discriminate amongst healthy adolescents' socio-cognitive abilities.

Correspondence: *Mathilde Neugnot Cerioli, MPS, University of Montreal, 90 avenue Vincent d'Indy, Local D-418, Montreal, QC H2V 2S9, Canada. E-mail: mathilde.neugnot@gmail.com*

A. PARIS, H. COHEN, P.J. SNYDER & E. POURCHER. Consolidation of a new skill in Parkinson's Disease.

Objective: To date, the mechanisms underlying encoding and consolidation of a new skill remain unclear. Some studies have claimed that dopamine (DA) plays a crucial role in these processes. In the present study, we investigated the impact of DA depletion on skill learning consolidation in Parkinson's disease (PD) patients at two progression stages of the disease.

Participants and Methods: Participants with idiopathic PD at early ($n=15$; HY1-1.5) or more advanced stages ($n=18$; HY2-3) were recruited. They were compared on a hidden tactile maze learning task to young ($n=17$) and old ($n=20$) healthy controls. The four groups of subjects were tested at 0 and 3 months.

Results: The results showed that DA depletion in the striatum impacts on both encoding and consolidation of a maze task. More specifically, later-stage PD patients did not improve as much as the other groups on the tactile maze learning task. The older controls and the early-stage PD patients performed similarly. The younger controls were better than all the other groups. However, the consolidation process appears more susceptible to disease and aging. Effectively, after an interval of three months, most of the subjects were placed in a situation of re-learning. Only the younger controls did retain previously learned information about the task.

Conclusions: It is proposed that DA depletion in the striatum, however light, may negatively impact on the long-term consolidation of skill acquisition. The DA depletion that is found in aging might also be sufficient to negatively impact the consolidation of a new skill.

Correspondence: *Annie-Claude Paris, Psychology, Université du Québec à Montréal, C.P. 8888, Succursale Centre-Ville, Montréal, QC H3C 3P5, Canada. E-mail: annieclaud.paris@gmail.com*

V.J. POMERLEAU, U. FORTIER-GAUTHIER, I. CORRIVEAU, J.J. MCDONALD, R. DELL'ACQUA & P. JOLICOEUR. Seeing red: Color specific differences in attentional deployment.

Objective: Behavioral results showed differences in response times to tasks involving equiluminant targets of different colors. We investigated how target color affects perceptual and attentional mechanisms.

Participants and Methods: Four possible colors (red, green, blue, or yellow) were calibrated subject by subject through heterochromatic flicker photometry. Afterwards, visual displays were shown in which subjects ($n=12$) had to deploy attention to a target defined as any colored circle containing a line of a predefined orientation. Colors were randomly selected on each visual frame. EEG was recorded while subjects performed the visual search task, and analyses were based on event-related potentials (ERPs). Three lateralized ERP components relative to the side of the lateralized stimulus were examined: a posterior contralateral positivity (Ppc); the N2pc, reflecting the deployment of visual spatial attention, and a temporal and contralateral positivity (Ptc).

Results: Conditions in which the target was red or blue, as compared to green or yellow had an earlier N2pc. No Ppc or Ptc differences were found between colors. Repeated measure ANOVAs were used as the statistical tool. Latency differences were evaluated with the jackknife method and amplitude differences by averaging the 20 ms area around components' peaks.

Conclusions: Given that the earlier Ppc was not affected, but the later N2pc component was suggests that the Ppc may reflect more bottom up mechanisms that are similar across colors and that the N2pc reflects later attentional processing, to which different colors have different input.

This research contributes in two major ways. First, a methodological implication of the present research is that equiluminant colors do not have an equivalent effect on attentional mechanisms. Second, a theoretical implication is that the dissociation between effects of different colors on the N2pc and the Ppc may lead to better comprehension of perceptual and attentional mechanisms in the human brain.

Correspondence: *Vincent J. Pomerleau, Bsc, Psychology, Université de Montréal, 5276 Avenue Ponsard, Montréal, QC H3W 2A8, Canada. E-mail: vincent.jette.pomerleau@umontreal.ca*

J. ROBIN & M. MOSCOVITCH. The Effects of Cue Familiarity on Episodic Memory, Scene Construction, and Imagining the Future.

Objective: Many similarities between episodic memory, scene construction, and imagination of the future have been demonstrated in recent research, but no study to date has compared all three abilities using the same paradigm. The aim of this study was to explore further the similarities between episodic memory, imagination, and scene construction by comparing them directly using very similar paradigms and cues. A second aim was to determine how episodic memory, imagination and scene construction are mediated based on the familiarity of (or how much experience one has with) the cue that prompts the remembered or imagined scene or event.

Participants and Methods: The present study included 56 young, healthy subjects and compared retrieval time, and ratings of detail and of vividness for episodic memories, remembered scenes and imagined future events cued by either high or low familiarity landmarks. Objective measures of the number of details produced in describing memories of each type were also compared.

Results: Paired t-tests revealed that increased familiarity with a location resulted in faster retrieval of memories, scenes, and imagined episodes based on that location as a cue. Memories, scenes and episodes were also rated as more detailed, more vivid, and described in more detail if they were based on more familiar landmarks. Performance was correlated across different measures and across different types of memory, and effects were strongest in the scene construction condition.

Conclusions: This study demonstrates that frequent encounters with a cue affects the accessibility and phenomenological qualities of scene construction but also of episodic memory and imagination of the future, even when little spatial information is included in these memories. In addition, the consistent results across conditions, and stronger effects in the scene construction condition, provide further evidence of a relationship between, and possible interdependence of, episodic memory, imagination of the future, and scene construction.

Correspondence: *Jessica Robin, University of Toronto, 141 Alberta Ave, Toronto, ON M6H 2S1, Canada. E-mail: jessica.robin@utoronto.ca*

J. ROVET, K. WILLOUGHBY & M. MCANDREWS. Hippocampal Activation During Autobiographical Memory (AM) Retrieval in Children.

Objective: fMRI studies with adults show the hippocampus is crucial for recalling past personal events but not personal facts. However, no study has yet examined hippocampal activity during AM retrieval in typically and atypically developing children. In rodents, the hippocampus is shown to need thyroid hormone (TH) to develop normally. In early gestation, the mother is the primary TH source and in late gestation, child's thyroid supplies TH. We found that if either source was insufficient, hippocampal development was abnormal and on AM tasks, offspring of hypothyroid women (HYPO) and children with congenital hypothyroidism (CH) provide less detailed and accurate memories of personal events than controls (C). To investigate if this is reflected in functional activation of hippocampus, we used fMRI to assess their episodic and semantic AM retrieval.

Participants and Methods: Participants were 41 9-11 year olds: 15 HYPO, 7 CH, 19 C. All were assessed on an AM retrieval paradigm requiring them to judge accuracy of statements on personal events (from past interviews) and personal and general facts. Each run included 4 personal episodic, 4 personal semantic, and 4 general semantic blocks.

Results: HYPO and CH groups were combined because preliminary results revealed few differences between them. Controlling for total hippocampal volumes and accuracy, we observed on contrast between personal events and general facts that both groups showed bilateral hippocampal activation during episodic AM retrieval while the TH-deficient group had greater activity in left anterior hippocampus than C. On the personal episodic minus personal semantic contrast, TDC activated right posterior hippocampus primarily, whereas TH-deficient showed bilateral hippocampal activation that was greater than in C. Also, smaller hippocampal volumes and more severe early TH-deficiency predicted hippocampal hyperactivation.

Conclusions: Hippocampal damage early in life may increase the need for additional neural compensation during AM retrieval at a later age.

Correspondence: *Joanne Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Ave. Room 6402, Toronto, ON M5G1X5, Canada. E-mail: jrovet@sympatico.ca*

J. ROVET, S. WHEELER, E. SHEARD, J. SKOCIC & M. MCANDREWS. Functional Neuroanatomy of Associative Memory in Typically and Atypically Developing Children.

Objective: The hippocampus is critical for associative memory. However its role in children's associative memory, especially those with ab-

normal hippocampal development, is not clear. Although structural MRI studies show a link between children's memory and hippocampal size, few functional studies have been conducted. We used fMRI to assess associative memory retrieval in typically developing youth and adolescents with fetal alcohol spectrum disorder (FASD) and congenital hypothyroidism (CH), who have associative memory deficits and abnormal hippocampal development.

Participants and Methods: Participants included 21 typically developing (TD), 19 FASD, and 14 CH adolescents. All were assessed with two novel paradigms shown to engage the hippocampus in adults. Both paradigms involved an encoding phase showing novel stimuli followed by a recognition phase during fMRI acquisition. On the Objects task, they studied a set of paired stimuli in distinct locations in an imaginary grid and then at test, judged whether objects or locations were new. On the Words Pairs Task, they first formed sentences between novel word pairs at study and later judged whether pairs or individual words were seen before.

Results: TD showed left hippocampal activation for object pairs and bilateral hippocampal activation for object locations and word pairs. FASD and CH showed different patterns relative to TD. In FASD, activation was less than in TD in most contrasts, except for increased left hippocampal activation for the object-pair condition. In contrast, activation was consistently greater in CH than TD. Groups also differed in where along the long axis of the hippocampus activation occurred with FASD showing reduced posterior in pairing objects and words and CH showing greater posterior but less anterior activation than controls in pairing words.

Conclusions: Compromised hippocampal development early in life can lead to abnormal activation of the hippocampus in associative retrieval. Differential effects may reflect timing and type of exposure.

Correspondence: *Joanne Rovet, PhD, Psychology, The Hospital for Sick Children, 555 University Ave. Room 6402, Toronto, ON M5G1X5, Canada. E-mail: jrovet@sympatico.ca*

M. SAYEUR, M. LASSONDE, F. LEPORE & M. MCKERRAL. Cognitive and Behavioural Profile in Preterm Children at School-Age.

Objective: A growing number of studies have shown that prematurity (< 37 gestational weeks) affects the development of cognitive abilities, as well as learning capacities. Premature children also seem to be at higher risks for behaviour and psychiatric problems, such as attention deficit hyperactivity disorder (ADHD) or internalizing and externalizing problems. The general objective of this project was to investigate some of these aspects in preterm infants.

Participants and Methods: In order to determine the cognitive, learning and behaviour profile in school-age preterm children, we assessed 10 preterm children (mean age = 7 years 6 months) and 10 born at term children (mean age = 7 years 5 months). We used the Weschler Intelligence Scale for Children (4th ed.), a word reading subtest from the Weschler Individual Achievement Test (2nd ed.), Conners Parent Rating Scale 3 (Conners 3-P) and Child Behavior Checklist 6-18 (CBCL/6-18).

Results: No significant differences were found for global intellectual quotient (EQI), or for other WISC-IV indices (i.e. verbal comprehension, perceptual reasoning, working memory and processing speed) between preterm and born at term children. No significant differences were obtained in the word reading test, even when controlling for IQ. Finally, results showed no significant differences between groups in the Conners 3-P or the CBCL/6-18.

Conclusions: Even if our sample is small, our results tend to demonstrate that, at school age, premature children have a cognitive, behavioural and learning profile comparable to that found in born at term children.

Correspondence: *Melissa Sue Sayeur, Bachelor, Psychology, University of Montreal, 5881 St-Hubert, Montreal, QC H2S 2L5, Canada. E-mail: melissa.sue.sayeur@umontreal.ca*

J.M. SCHUH, D. MIRMAN & I. EIGSTI. Developing perspective: The influence of working memory on perspective-taking in children and adults.

Objective: Monitoring information known to a conversational partner, termed "common ground" (Clark, 1992), is critical for successful in-

teractions. Eye movement studies of common ground suggest that even young children are sensitive to a partner's perspective. Speakers must continually update representations of knowledge shared with their conversational partner, a process which likely relies on working memory (WM). While studies suggest WM capacity matures with age, little is known about how the prolonged trajectory of development influences perspective-taking. This study assessed: 1) the influence of WM on perspective-taking, and 2) the developmental effects of WM on forming such representations.

Participants and Methods: Children (ages 8-17; $n=21$) and adults (ages 18-20; $n=22$) completed a problem-solving task with a research assistant "partner" in which some information was "secret" (known only to the participant). Eye movements and behavioral responses were recorded. As a manipulation of WM load, the amount of secret information varied. Task performance was compared to standardized measures of WM.

Results: Accuracy was high across groups ($M=.93$ children, $.96$ adults). Eye-movement data indicated that all participants were slower when required to integrate secret information, $p=.02$, and this difficulty increased under high WM demands, $p=.01$. Children were slower than adults to incorporate partner perspective, as they considered "secret" information longer, $p=.01$, and had marginally greater difficulty under high WM demands, $p=.07$. Across groups, task performance was associated with standardized scores of WM, all $p's<.05$.

Conclusions: Differences for low/high WM loads suggest that WM modulates the ability to incorporate perspective, with children being particularly sensitive to WM demands. Findings support the theory of a developmental trajectory for WM that influences perspective-taking.

Correspondence: *Jillian M. Schuh, Medical College of Wisconsin, 9200 W. Wisconsin Ave, Milwaukee, WI 53226. E-mail: jillian.schuh@gmail.com*

A.G. SENI, J. THEILING, E. VERA & M.H. BEAUCHAMP. Theory of Mind as a Building Block for Moral Reasoning.

Objective: Moral reasoning (MR) is a complex socio-cognitive process fostered through learned behaviors, biological and social mechanisms, and exposure. In young children, its development appears to mirror that of theory of mind (ToM). However, research in adolescents has failed to firmly establish a similar relationship. Moreover, classic MR tasks have been confounded by the requirement for advanced reading skills and sustained attention. This study aimed to investigate the relationship between the ability to understand others' mental states (ToM) and MR in adolescents using a new visual MR task.

Participants and Methods: ToM and MR skills were assessed in healthy adolescents ($N = 50$, 22 males) aged 12 to 17 years ($\mu = 14.8$, $SD = 1.2$). MR was measured using the Socio-Moral Reasoning Aptitude Level (So-Moral, Dooley *et al.*, 2010) and ToM using a Picture Sequence Task (Brüne, 2005).

Results: MR maturity was found to be positively correlated with ToM First-Order False Beliefs (FB) ($r = 0.44$, $p = 0.001$) but not with Second-Order or Third-Order FB. Age differences in MR maturity were also statistically significant ($F = 3.92$, $p = 0.008$).

Conclusions: Findings indicate that First-Order FB may be an important building block for MR. The lack of correlation with higher-order ToM suggests that these more advanced skills may not be necessary for basic MR. Results are largely consistent with previous findings in younger children, but are strengthened by the use of visual MR and ToM tasks that reduce cognitive confounds.

Correspondence: *Anne G. Seni, Psychology, Université de Montréal, 2400 Trenton, Montreal, QC H3P 3N4, Canada. E-mail: aseni@mac.com*

D. SODUMS, A. ZUCKERMAN, S.J. BANKS, V. SZIKLAS & M. JONES-GOTMAN. Differences in Brain Structure and Activation During Material Specific Memory Tasks in People With and Without University Education.

Objective: Skills that involve maximizing the brain's potential have important effects on its function and structure: Advanced education has

been shown to increase resilience against neuropsychological insults such as aging and brain injury, and the acquisition of expertise as diverse as juggling and meditation are associated with cortical thickening in regions related to those skills. We wanted to assess whether the impact of education on structure and function of the brain was specific to material type: academic education places a great emphasis on verbal knowledge acquisition, so we hypothesized that there would be more differences in verbal memory and the structures that it involves than in nonverbal memory and its corresponding structures.

Participants and Methods: We studied brain activation during verbal and nonverbal fMRI memory tasks in two groups of healthy volunteers defined as either having university education or not, and matched for age and performance. We used two list learning tasks that featured multiple encoding and recognition components similar to those administered in our clinical battery. A high-resolution anatomical scan was acquired, from which we also compared the two groups for cortical thickness measurements in the frontal and temporal lobes.

Results: A region in the right orbitofrontal cortex was more activated in the less educated group compared with the more educated group during encoding of words. Comparisons of cortical thickness indicated significantly thinner cortex in the left superior temporal gyrus and isthmus of the left cingulate gyrus of the less compared with the more educated group.

Conclusions: We found that the more educated group showed more lateralized activation and significantly thicker cortex in regions involved in verbal memory, perhaps reflecting higher levels of efficiency specific to verbal processing. Although longitudinal studies are warranted, our results suggest that the brain changes both in structure and function in response to advanced education.

Correspondence: *Sarah J. Banks, PhD, Montreal Neurological Institute, 3801 University, Montreal, QC H2W2B1, Canada. E-mail: sarahjlbanks@hotmail.com*

K. TADROS, X. MORIN DUCHESNE, M. ARGUIN & F. GOSSELIN. The Letter Processing Strategy for Reading is Invariant Across the Cerebral Hemispheres.

Objective: Words are read less efficiently when they are presented in the left visual hemifield (initially processed by the right hemisphere) than in the right hemifield (left hemisphere). Visual acuity decreases as eccentricity increases, which impacts word recognition. This effect is thought to be unequal between the hemifields because of the way letter positions vary in their information value (IV) for word identification. For instance, the first letter in a word is the one carrying the most information for its accurate identification. It is also the most eccentric letter when a word is presented in the left visual field and the least eccentric when it is presented in the right one. On its own, this may cause a negative bias for the identification of words in the left hemifield regardless of the reading capacity of the right hemisphere.

Participants and Methods: Our goal is to explore letter identification biases for words presented to the left and right hemifields as a function of eccentricity by varying the IV of letter positions. Stimuli were five-letter pseudo-words containing one of five known bigrams, either at the beginning or at the end of the letter sequence – the "bigram portion" of the word being of lower IV. After a bigram training period, participants were presented pseudo-words to the left or right visual field, followed by a cue indicating the letter to identify.

Results: We found that reading strategy was unaffected by manipulation of the IV of letter positions. However, we discovered that for left hemifield displays, the first letter, i.e. the most eccentric, was among the most accurately identified. Moreover, the patterns of letter identification as a function of position were identical for the left and right hemifields.

Conclusions: This argues against the hypothesis of letter eccentricity exerting a negative bias for words presented to the right hemisphere. Interestingly, our findings suggest a visuo-attentional window dispatched for word processing that is invariant to the hemifield stimulated.

Correspondence: *Karine Tadros, Psychology, Université de Montréal, 5560 ave Coolbrook, Montreal, QC H3X 2L5, Canada. E-mail: karine.tadros@gmail.com*

B. TOUSIGNANT, K. SIROIS, M. JACOB-TARDIF, ÉMILIE. CHAMARD & P.L. JACKSON. Relationship Between Social Cognition and Executive Functions in Healthy Adolescents.

Objective: Objective. Social cognition refers to the combination of mental processes through which social cues are perceived and processed during social interactions. It includes basic processes such as emotion perception, and more complex processes such as understanding the mental states of others, also known as mentalizing. Research indicates that social functioning relies strongly on social cognition, as well as on other higher order cognitive processes, notably executive functions (EF). Although social cognition and EF seem related, the nature and the extent of this link are not clear. The purpose of this study was to investigate the relationship between social cognition and EF at a developmental stage in which social relationships are particularly important, namely adolescence.

Participants and Methods: Method. Thirty healthy participants (ages 14-21 years) took part in a two-hour interview in which a social cognition battery developed in our laboratory and numerous EF tests (e.g. D-KEFS tower, d2, digit span, Stroop) were administered.

Results: Results. The results indicate that neuropsychological tests of EF measuring inhibition, attention and working memory had a modest but significant relationship with performance in one of the mentalizing tasks ($r^2 = .27$), while the relationships with all other social cognition tasks were weak (r^2 ranged from .03 to .06).

Conclusions: Conclusions. Our findings suggest that EF in adolescents may only be related to mentalizing. However, our results also failed to show a strong association between EF and social cognition. This lack of association supports the importance in clinical practice to conduct distinct assessments of these two underlying components of social functioning.

Correspondence: *Béatrice Tousignant, Bachelor, Psychologie, Université Laval, 525, boul. Hamel, bureau H-406, Québec, QC G1M 2S8, Canada. E-mail: beatrice.tousignant.1@ulaval.ca*

E. VUOKSIMAA, J. JOUTSI, L. MUSTELIN, U. KUJALA, R.J. ROSE & J. KAPRIO. Is Sports Participation Related to Cognitive Abilities Among Young Adults?

Objective: A long-standing debate asks whether increased physical activity is related to better cognitive functioning. While many studies have focused on the elderly, we studied the association between physical activity and cognitive performance in young adulthood.

Participants and Methods: Our sample included 812 twins from a population-based FinnTwin12 study. We investigated the association between physical activity (as measured with sport and work indexes from the Baecke questionnaire) and cognitive functioning assessed across various cognitive domains in young adulthood, at age 21 – 25, supplemented with earlier cognitive data collected at age 14. We used sex and age as covariates. The clustering of data (as twins are nested in families) were taken into account for obtaining robust standard errors.

Results: By performing a series of regression analyses, we found that physical activity at work was inversely ($p < 0.05$) related to verbal ability, visuo-spatial ability, processing speed, executive functions and auditory working memory whereas sports participation was positively related ($p < 0.05$) to visuo-spatial ability, processing speed, executive functions and auditory working memory. The association between processing speed and sports participation remained when we controlled for current general cognitive ability and processing speed ability at age 14. Similarly, the association between executive functions and sports participation remained when we controlled for current general cognitive ability and executive functioning at age 14.

Conclusions: Our results suggest that an increased level of sports participation is related to better cognitive functioning in young adulthood, even after controlling for cognitive performance in adolescence.

Correspondence: *Eero Vuoksimaa, PhD, University of Helsinki, P.O. Box 41 (Mannerheimintie 172), Helsingin yliopisto 00014, Finland. E-mail: eero.vuoksimaa@helsinki.fi*

Electrophysiology/EEG/ERP

T. BOONSTRA, E. STRONGIN, S. LILLEY, E. GEDGE, S. BARBAT, K. SWITZER, A. MCMAHON, B. WRIGHT, M. GOLLA, J. IKANGA, K. LEWITZKE, C. MARTIN, M. KADRICH, D.A. MACDONALD & D.E. DEERING. The Five Factor Model and the Brain: Personality and Resting Brain States via qEEG.

Objective: Resting brain qEEG has been used for the diagnosis of a variety of clinical disorders ranging from epilepsy to ADHD. While the technology has proven promising, research suggests that brainwave measurements are influenced by personality factors (e.g. higher levels of extraversion and neuroticism are linked with quantity and location of alpha wave activity). The present study sought to examine the relation of personality as represented by the Five Factor Model and resting brain states in a sample of 20 undergraduate students. It was expected that neuroticism would be associated with higher frontal and posterior right brain activity and extraversion with higher left frontal and right posterior activity.

Participants and Methods: Twenty undergraduate students (6 males, 14 females, mean age = 19.70 years) completed the NEO Personality Inventory Revised. Afterward resting brainwave patterns were measured using eyes-open and eyes-closed conditions via qEEG using the Mindset 24 system.

Results: Correlational and regression analyses provide general support for research expectations.

Conclusions: Findings indicate that personality traits should be taken into consideration when using qEEG for clinical purposes.

Correspondence: *Douglas A. MacDonald, Ph.D., Psychology, University of Detroit Mercy, 4001 W. McNichols, Detroit, MI 48221-3038. E-mail: macdonda@udmercy.edu*

J. IKANGA, D.A. MACDONALD, A. MCMAHON, S. LILLEY, E. GEDGE, S. BARBAT, K. SWITZER, B. WRIGHT, M. GOLLA, E. STRONGIN, T. BOONSTRA, K. LEWITZKE, C. MARTIN, M. KADRICH & D.E. DEERING. Spirituality and Resting Brain Activity in a Sample of University Students.

Objective: Translational imaging research has suggested that there is a relationship between self-reported spiritual states of consciousness and activation of a variety of brain structures in several cortical areas (e.g., frontal, parietal, and temporal lobes). However, there are limited investigations done on the association of self-reported spiritual beliefs, attitudes, and behaviors and nervous system functioning while the brain is at rest. The study aimed at exploring the association of the resting brain states to self-reported spirituality. It was generally expected that people high versus low on spirituality would demonstrate significant differences in brainwave patterns.

Participants and Methods: A sample of 20 undergraduate students comprised of 6 males and 14 females (mean age 19.70 years) completed a multidimensional measure of spirituality called the Expressions of Spirituality Inventory. Subsequently, resting brain wave patterns were measured via qEEG using both eyes-open and eyes-closed conditions.

Results: Correlational, regression, and ANOVA analyses suggest that people who reported higher levels of spirituality do demonstrate different resting state brainwave patterns but that the association is complex.

Conclusions: qEEG can be used to identify differences in brainwave patterns for people who report higher levels of spirituality. The findings hold implications for how spiritual beliefs and spiritual practices (e.g., prayer, meditation) may be understood as impacting brain functioning.

Correspondence: *Douglas A. MacDonald, Ph.D., Psychology, University of Detroit Mercy, 4001 W. McNichols, Detroit, MI 48221-3038. E-mail: macdonda@udmercy.edu*

D.B. BURTIS, C. WANG, J. MO, M. DING, J. WILLIAMSON & K.M. HEILMAN. Electrophysiological Correlates of Constrained Monocular Viewing.

Objective: Right eye patching, in some patients has been used to treat left hemispatial neglect. It has been posited that each eye primarily proj-

ects to the contralateral superior colliculus that activates the ipsilateral hemisphere and monocular viewing with the left eye (patching the right eye) relatively increases right hemisphere activation and thus reduces neglect. The purpose of this study was to learn in normal subjects how eye patching influenced alpha activity in the posterior cortical region of the left and right hemisphere.

Participants and Methods: The participants were 14 healthy individuals, (4 women), (mean age 23.4). We recorded EEG activity with a 128 lead electroencephalogram when each subject had their left, right, or neither eye patched. The subjects were instructed to fixate on a crosshair presented on a monitor.

Results: There was a significantly increase in alpha rhythm power (decreased activation) in the right (versus left) posterior cortical regions with left eye patching. With right eye patching this asymmetry was reduced, but not reversed.

Conclusions: During monocular occlusion of the right (versus the left) eye, there is greater EEG activation (less alpha power) in the right parietal region and this alteration of hemispheric activation may help some patients with posterior injury allocate their attention leftward.

Correspondence: *David B. Burtis, D.O., University of Florida, 7719 SW 60th Place, #1004, Gainesville, FL 32608. E-mail: dbrandon.burtis@mail.ufl.edu*

A. CLAWSON, P.E. CLAYSON & M.J. LARSON. Behavioral and Electrophysiological Indices of Conflict Adaptation in Individuals with Major Depressive Disorder.

Objective: Previous research indicates that individuals with major depressive disorder (MDD) display alterations in neural and electrophysiological activation in brain regions putatively involved in conflict processing and cognitive control. We examined the influence of these characteristic deficits on conflict adaptation, a cognitive control process wherein previous-trial congruency modulates current-trial performance, in individuals with MDD compared to controls.

Participants and Methods: High-density electroencephalogram recordings were collected from 52 participants with a clinical diagnosis of MDD and 52 demographically-similar controls during completion of a modified version of the Eriksen Flanker Task. Behavioral [response times (RTs), error rates] and electrophysiological (N2 amplitudes) data were analyzed using separate 2-Group (MDD, controls) x 2-Previous-trial Congruency (congruent, incongruent) x 2-Current-trial Congruency (congruent, incongruent) ANOVAs.

Results: Results of the ANOVAs for RTs and error rates revealed significant Previous-trial Congruency x Current-trial Congruency interactions for both groups. There were no significant group differences in magnitude of conflict adaptation. Similarly, there were no significant main effects of group or Group x Congruency interactions for N2 amplitudes. Correlations between BDI scores and behavioral and electrophysiological mean conflict adaptation scores were also not significant.

Conclusions: Overall, behavioral and electrophysiological results indicated that participants with MDD process conflict similar to controls. These results suggest that deficits associated with MDD may not alter conflict adaptation processes. Future research is necessary to examine the influence of the cognitive and behavioral characteristics of MDD on other cognitive control component processes.

Correspondence: *Ann Clawson, Brigham Young University, 6575 S. 2475 E., Salt Lake City, UT 84121. E-mail: clawson.ann@gmail.com*

A. CLAWSON, P.E. CLAYSON, M. SOUTH & M.J. LARSON. Cognitive Control and Conflict Adaptation Similarities in Children and Adults.

Objective: Conflict adaptation effects refer to alterations in cognitive control based on previous trial conflict. These effects are reflected in fronto-central activation following conflict to improve performance on the next trial. Activation within these areas may change with maturity; thus, the purpose of the current study was to examine the development of behavioral and electrophysiological indices of conflict adaptation effects in children relative to adults.

Participants and Methods: We examined developmental differences in response time [RT], error rate, and electrophysiological (N450 and conflict SP event-related potentials [ERP]) indices of conflict adaptation in 21 typically-developing children and 26 adults. High-density ERP recordings were collected while participants completed a color-naming, single-trial version of the Stroop.

Results: Children and adults showed significant behavioral and electrophysiological conflict adaptation. Children exhibited significantly slower RTs, increased error rates, and increased overall ERP amplitudes relative to adults. Subsequent analyses on data z-scored for each group revealed no differences in magnitude of conflict adaptation for RTs, error rates, or ERPs.

Conclusions: Children and adults followed similar behavioral and ERP patterns according to current- and previous-trial conflict, reflecting significant conflict adaptation effects and indicating that greater overall ERP amplitudes in children did not significantly alter conflict-processing abilities. Evidence from RTs, error-rates, and conflict SP amplitudes suggest that children and adults similarly respond to conflicting information and that immature neural connections do not impair conflict processing in children. Future research including a broader age-range and full developmental continuum may help identify subtle developmental changes in these processes.

Correspondence: *Ann Clawson, Brigham Young University, 6575 S. 2475 E., Salt Lake City, UT 84121. E-mail: clawson.ann@gmail.com*

J. DIETZ, J. JONES, W.M. PERLSTEIN, M.S. OKUN & D. BOWERS. Detecting Emotional Significance: The Late Positive Potential in Parkinson's Disease.

Objective: Parkinson patients are often described as exhibiting deficits in processing emotional stimuli. The basis is unclear, with some arguing for more perceptual/arousal deficits and others arguing for executive deficits (i.e., working memory). A previous study examined electrocortical correlates of very early perceptual processing (200-300ms) and found that both PD and controls exhibited comparable responsivity (i.e., EPN) to emotional pictures. In the present study, we examined a later (420-720 ms) EEG component that has been associated with emotional significance/arousal, the late positive potential (LPP). We hypothesized that if PD patients are able to detect significance of emotional pictures, then the LPP will be larger when viewing emotional vs neutral pictures.

Participants and Methods: Fourteen individuals with idiopathic PD and 8 healthy controls viewed standardized pleasant, neutral, and unpleasant images from the International Affective Pictures System while EEG recordings were obtained (64 channel; Electrical Geodesics Inc.). The PD patients were in midstage of disease severity and were tested on medication. Exclusion criteria were dementia, psychiatric disturbance, and other neurologic disorders.

Results: For both PD and controls, emotional pictures (pleasant, unpleasant) prompted larger LPP's than neutral pictures ($F(3,18)=7.53, p<.01, \eta p^2=.56$). These differences were significant at Cpz and Pz sites. The Group X Emotion interaction was nonsignificant.

Conclusions: Both PD and controls exhibited enhanced cortical processing in parieto-occipital regions for emotional (relative to neutral) visual stimuli. These findings with a small cohort of PD patients add to the literature by suggesting that PD-related deficits in emotional processing likely take place beyond the level of perceptual/arousal processing.

Correspondence: *Jenna Dietz, M.S., University of Florida, PO Box 100165, Gainesville, FL 32605. E-mail: jdietz@phhp.ufl.edu*

E. DIONNE, O. COLLIGNON, P. VANNASING, J. TREMBLAY, E. AVOLI, M. LEFRANÇOIS & M. LASSONDE. The Use of Event-Related Potentials in the Study of the Development of Audiovisual Multisensory Integration Abilities in Infants and Children.

Objective: Infancy is a period of change in brain structure and function reflected by the increase of processing capacities of the developing child. No previous studies have documented the developmental effects

of infants' multisensory integration (MSI). Two contrasting views of multisensory development have been debated: the early and late integration model. The first model suggests that sensory integration demonstrates how infants detect redundant aspects of the environment across sensory modalities while in the second model, sensory integration is a product of development in which the different sensory systems are segregated from one another. This study aims to explore the developmental trajectory of audio-visual integration in infants and children using event-related potentials (ERPs). Studying normal infant development is difficult because physiological and behavioural indices of infant cognition are technically difficult to obtain. Furthermore, electroencephalography will provide an insight into brain implicit responses to external events. This study compares the abilities of infants aged between 3 months and 9 years-old to integrate auditory and visual inputs in order to determine if MSI is innate or acquired.

Participants and Methods: We recorded the cerebral activity of 24 healthy infants and children aged from 3 months to 9 years old through electroencephalogram (EEG). Three conditions were presented pseudo-randomly: an auditory condition (1000-Hz tone), a visual condition (black and white checkerboard), and the simultaneous presentation of the auditory and visual conditions.

Results: MSI is measured by comparing the sum of the responses to auditory and visual stimuli with the simultaneous presentation of the same two stimuli. Our results suggest that the development of MSI is tied to sensory experiences acquired during postnatal life.

Conclusions: This experiment allowed us to investigate whether MSI is innate or acquired during the child's development as well as the age at which this phenomenon takes place.

Correspondence: *Emmanuelle Dionne, Master's in Psychology, Psychology, Université de Montréal, 1 Cours des Princes, Montreal, QC H3E 1W9, Canada. E-mail: manu_dionne@hotmail.com*

J. FAIR, S.W. LIEBEL, D.K. BJORN & M.J. LARSON. OCD and Cognitive Control: Electrophysiological and Behavioral Markers of Regulative and Evaluative Control.

Objective: Cognitive control separates functionally and temporally into regulative and evaluative processes. Regulative control may include maintaining context (rules/instructions) to guide decisions, while evaluative control could involve monitoring performance while completing a task. The neural bases of regulative and evaluative control are in the pre-frontal cortex (DLPFC) and anterior cingulate (ACC) respectively and can be measured using EEG. As various cognitive performance deficits are found in OCD patients, we used event-related potentials (ERPs) to dissociate regulative and evaluative cognitive control processes using a color Stroop task.

Participants and Methods: High-density ERPs were recorded while individuals with OCD and matched healthy control participants performed a color Stroop task with 25% congruent, 25% neutral, and 50% incongruent randomly presented trials. Stimulus-locked ERPs were separately averaged for congruent and incongruent trials based on either "color" or "word" cues. Trials were examined for behavioral (response time [RT] and error rate) and electrophysiological (N450 and conflict slow potential [CSP] components of the ERP) reflections of cognitive control.

Results: There was no significant effect of cue or congruency in terms of OCD vs. controls. Furthermore, a Cue x Congruency x OCD Severity ANOVA failed to reach significance for the N450 or CSP. Behaviorally, there was a significant Cue x Congruency x Severity interaction for error rates ($p = .020$) but not for RT.

Conclusions: While electrophysiological indices of conflict detection (N450) and regulative processes (CSP) may not vary between OCD and control in this sample, differences in error rates are observed. Results are congruent with previous cognitive control research using a Stroop task and with literature indicating that functional impairment varies with OCD symptom severity. Findings also suggest greater deficits in behavioral indices of cognitive control in a sample of OCD participants. Correspondence: *Joseph Fair, M.S., BYU, 244 TLRB, Provo, UT 84602. E-mail: jfair03@gmail.com*

T.J. FARRER, P.E. CLAYSON & M.J. LARSON. Performance Monitoring Following Mild Traumatic Brain Injury: An Event-Related Potential Study.

Objective: Recent literature suggests that individuals with mild traumatic brain injury (mTBI) exhibit abnormalities in ERP indices of cognitive control. Few studies, however, have examined performance monitoring processes thought to be impacted in individuals with mTBI. The neural bases of performance monitoring can be measured using the error-related negativity (ERN) and post-error positivity (Pe) components of the event-related potential (ERP). The present study sought to confirm previous findings of an attenuated ERN and elevated Pe in individuals with mTBI using clear diagnostic criteria for mTBI.

Participants and Methods: Thirty-six individuals with mTBI and 46 demographically-matched controls completed a modified color-naming Stroop task while ERPs were recorded. Average time post injury to assessment was 7+8 months. Separate repeated-measures ANOVAs were used to examine the behavioral (response times [RT] and error rates) and ERP (ERN and Pe amplitudes) indices of performance monitoring. Pearson's correlations were calculated to measure the relationship between ERP components and measures of injury severity.

Results: On behavioral measures there was no significant difference between groups. Both groups showed slower RTs and increased errors to incongruent relative to congruent trials. Likewise, both groups showed more negative ERN and more positive Pe amplitude to incongruent relative to congruent trials though there was no significant main effects or interactions between groups on ERN and Pe amplitudes. No correlations with injury-related indices were significant.

Conclusions: Findings suggest that individuals with mTBI do not differ from controls in behavioral and electrophysiological measures of performance monitoring. Implications and comparison with the general cognitive control literature are discussed.

Correspondence: *Thomas J. Farrer, M.S., Psychology, Brigham Young University, 1001 Kimball Tower, P.O. Box 25543, Provo, UT 84602-5543. E-mail: thomasfarrer@yahoo.com*

R. FROST, J.N. BECKSTRAND, M.J. LARSON, J.F. FOLEY & R.O. HOPKINS. EEG Theta Power and Working Memory in Patients with Multiple Sclerosis.

Objective: Multiple sclerosis (MS) is a common neurodegenerative disease that has concomitant memory deficits. Electroencephalographic assessment is common in neurological practice. Peak theta frequency (PTF) measures signal density in the 4-8Hz range and is associated with memory functioning and anatomically related to the entorhinal cortex. This study assessed the relationship between PTF and memory function in patients with remitting-relapsing MS in order to determine the potential utility of a physiological index of MS-related cognitive functioning.

Participants and Methods: Twenty-six patients with remitting-relapsing MS underwent EEG analysis. Data from spontaneous eyes-closed EEG was compared with matched healthy controls from a normative database. Quantitative EEG (QEEG) was analyzed using Neuroguide software at frontal, temporal and central electrode sites. Cognitive function was assessed using the RBANS.

Results: Of the 26 patients, 23 were female; with a mean age of 48.5±8 years and mean length of disease of 8.9±4.9 years. There was no difference in PTF between groups. For MS subjects, list recall scores negatively correlated with PTF at frontal (F3: $p = .034$; F4: $p = .035$), central (C3: $p = .009$; C4: $p = .049$), and temporal (T5: $p = .050$) electrode sites. None of the other subtest or domain scores were significantly correlated with PTF.

Conclusions: Lower peak theta frequency was associated with better performance on list recall scores in MS individuals, but groups did not differ in overall PTF. PTF may be a good physiological marker of memory deficits in MS that can be used to track brain behavior relationships over time.

Correspondence: *R Brock Frost, Psychology, Brigham Young University, 120 Wymount Terrace, Provo, UT 84603. E-mail: brock.frost@gmail.com*

K. GAGNON, J. MONTPLAISIR, H. BLAIS, M. LAFORTUNE, M. LASSONDE, P. GAUDREAU & N. GOSSELIN. Sleep spindles amplitude following sport-related concussions as a marker of cerebral dysfunction.

Objective: Athletes with concussion often report sleep-wake disturbances. Increased waking electrophysiological (EEG) delta activity associated with poor sleep quality was previously reported in concussed athletes. However, very few studies focused on sleep markers of cerebral dysfunctions in this population. This study aimed at determining whether sleep spindle characteristics, known to correlate with cognitive functions, were sensitive to concussion and whether sleep spindles were associated with cognitive performances and clinical characteristics.

Participants and Methods: Ten concussed athletes and 13 non-concussed athletes were included. Concussed athletes had a history of 4.6 ± 2.1 concussions with at least one concussion during the last year. Subjects were recorded for two consecutive nights in the laboratory. They completed questionnaires related to sleep quality and symptoms as well as neuropsychological tests the morning following the second night of sleep. Sleep spindles were automatically identified on the C3 lead. Groups were compared for spindle characteristics using Student t-tests. Associations between spindle characteristics, neuropsychological results, and clinical characteristics were tested using Pearson's correlation coefficients.

Results: Concussed athletes showed a significant decrease in spindle amplitude compared to control subjects ($t(21)=2.34$, $p<0.05$). A correlation was found between spindle amplitude and time elapsed since concussion ($r=0.65$, $p=0.04$), where higher spindle amplitudes were associated with longer delays. Spindle characteristics (spindle density and amplitude) were also associated with Color trail 2 execution time ($r=-0.65$ and -0.69 respectively, $p<0.05$).

Conclusions: This study suggests that sleep spindles are sensitive markers of cerebral dysfunctions associated with sports concussion, at least in the acute/post-acute stage of concussion.

Correspondence: *Katia Gagnon, B.Sc., Center for advanced research in sleep medicine, Hôpital du Sacré-Coeur de Montréal, 5400, boulevard Gouin Ouest, Montréal, QC H4J 1C5, Canada. E-mail: k.gagnon@live.ca*

M. GERMAIN, A. MENDREK & M. LAVOIE. The Effect of Estrogen on Brain Activity During a Mental Rotation Task.

Objective: Current research suggests that women's brain activity differ between the phases of the menstrual cycle. It's well established that performance on certain task are influenced by the level of estradiol and testosterone. One of these tasks is the mental rotation of 3-D objects. Neuroimaging studies also showed differences in brain responses related to that specific test in correlation with hormonal level. However, few Event-Related Potentials (ERP) studies had investigated this topic. Our aim is to document the role of estradiol in cortical activity in relationship with a mental rotation test.

Participants and Methods: ERPs were recorded in eight normal women and repeated two times, one when the level of estrogens was low at the follicular phase of the cycle and one when the level was high at the luteal phase of the cycle. Hormonal level was controlled by blood samples. The frontal N200, P300 and the parietal LPC were compared between the two levels of estrogens.

Results: Like previous research, we found that mental rotation effects are prominent over the parietal region. Our results show a hemispheric LPC asymmetry when the estrogen level was low for the rotation condition. When estrogens level was high, women use both hemispheres.

Conclusions: In conclusion, the level of estrogens has a major effect on the functional brain lateralization during a mental rotation effort.

Correspondence: *Martine Germain, master, Research center, Hospital Louis-H Lafontaine, 7401, Hochelaga E. St., Montreal, QC H1N 3M5, Canada. E-mail: martine_cg@yahoo.com*

D.A. GOOD, M. GOEBEL & M.J. LARSON. Happy Being Watched: The Effect of Positive Affect on Performance Monitoring During Observation.

Objective: Neural activity associated with performance monitoring is heightened during observation. It is commonly assumed that anxiety re-

lated to observation is associated with heightened neural response; however, no known studies have tested this hypothesis. We specifically examined the effects of positive affect, negative affect, and fear of evaluation on the error related negativity (ERN) component of the event-related potential during observation. We hypothesized that negative affect would predict amplitude change on markers of performance monitoring during observation.

Participants and Methods: Ninety individuals completed a modified Erikson Flanker task while high-density ERPs were recorded-once alone and once while being observed by a confederate. A 2-Observer x 2-Accuracy (correct and error) repeated measures analysis of variance (ANOVA) was used to evaluate main effects and interactions and a multiple regression analysis was used to evaluate the amount of variance accounted for by measures of positive and negative affect (Positive and Negative Affect Scale, Brief Fear of Negative Evaluation scale, and the Beck Depression Inventory - 2nd Edition).

Results: The ANOVA confirmed a significant main effect of observer [$F(1,89)=17.61$, $p<0.000$], main effect of accuracy [$F(1,89)=216.55$, $p<0.000$], and interaction of observer and accuracy [$F(1,89)=12.87$, $p=0.001$]. Multiple regression analysis indicated that positive affect was uniquely predictive of ERN amplitude change between alone and observed trials. Negative affect and fear of evaluation were not predictive of change.

Conclusions: Findings suggest that positive affect may act as a buffer that modulates changes in vigilance applied to an experimental task under observation. Thus, positive affect, not negative affect, is uniquely associated with alterations in performance monitoring associated with observation.

Correspondence: *Daniel A. Good, Brigham Young University, 372 E 400 N, Orem, UT 84062. E-mail: dag1978@hotmail.com*

C. MARIE-PIERRE, K.P. O'CONNOR & M.E. LAVOIE. Effects of Obsessive-Compulsive Disorder symptoms intensity on Event-Related Potentials associated with emotional memory.

Objective: Obsessive-Compulsive Disorders (OCD) is characterized by recurrent intrusive thoughts accompanied by repetitive, seemingly purposeful behaviors, sufficiently severe to interfere with daily functioning. Some studies have linked OCD to cognitive dysfunction related to attention and memory, but other has been more equivocal. Recent studies showed that emotional information influences memory that in turn influences brain activity underlying recollection. However, emotional memory of pictures in OCD groups has never been explored with electrophysiological measures. The current project aimed at investigating the impact of OCD severity on episodic emotional memory and Event-Related-Potentials (ERPs).

Participants and Methods: EEG data, obtained from 28 electrodes was recorded in 30 patients with OCD, separated on their symptom severity (median split at 29) with the Yale-Brown Obsessive Compulsive Scale to constitute the OCD+ ($n=15$) and the OCD- ($n=15$). They were compared to 15 controls matched on gender and age. The episodic memory task consisted of presenting 100 old and 100 new images divided into four categories (unpleasant-high arousal, unpleasant-low arousal, pleasant-high arousal and pleasant-low arousal) selected from the International Affective Picture System.

Results: Results showed that both OCD groups have delayed RTs and gave less correct responses than healthy participants, which is consistent with previous research with anxiety disorder patients. The ERP posterior old/new effect is significantly reduced only for the most severely affected group. Pleasant emotional pictures elicit reduced anterior old/new effect among OCD+ patients. The insertion of depressive or anxious symptoms as a covariable did not influence the result.

Conclusions: Our finding imply that, first, the processing of emotional valence interact with episodic memory in OCD+ groups and secondly symptom severity is an important factor to take into account for future research. Correspondence: *Marc E. Lavoie, Ph.D, Department of Psychiatry, University of Montreal, Centre de Recherche Fernand-Séguin, 7331 Hochelaga, Montreal, QC H1N3V2, Canada. E-mail: marc.lavoie@umontreal.ca*

N. PAQUETTE, P. VANNASING, M. LEFRANÇOIS, F. LEFEBVRE, M. ROY, M. MCKERRAL, R. BÉLAND, F. LÉPORE & M. LAS-SONDE. Developmental indices of auditory and language processing as revealed by high density electrophysiology.

Objective: In recent years, studies of human cognitive development have highlighted the use of auditory event-related potentials (AERPs) and mismatch negativity (MMN) in infants and children as it allows the examination of complex cognitive processes such as language discrimination and attention without requiring a specific behavioral response from the child. During development, important maturational changes occur in the brainstem pathways and auditory cortex that should be reflected by differences in the electrophysiological signals. Thus, the aim of this study was to examine the maturational changes of the MMN and the AERPs in response to both speech and non-speech stimuli in an attempt to study language and attention respectively.

Participants and Methods: Using an oddball paradigm, AERPs were recorded in 38 healthy participants at different developmental stages (3-7 years old, 8-13 years old, and young adults) using a 128-channel Geodesic Sensor Net and system. Permutation analyses were conducted on four electrodes of interest (Afz, Fz, FCz, Cz) for each individual and condition in order to assess the significance of the electrophysiological responses.

Results: Group analyses revealed significant differences in the MMN latency in response to the verbal stimuli with the two younger groups responding later than the older one whereas no group differences were found in response to the non-speech stimuli. Moreover, when comparing activation elicited by speech and non-speech stimuli in each group, we found that non-speech stimuli elicited a stronger negative deflection of the MMN at an earlier latency than speech stimuli.

Conclusions: These results suggest distinct developmental pathways of cortical activation in response to speech and non-speech stimuli that may be related to language and attention processing respectively.

Correspondence: *Natacha Paquette, Université de Montréal, 2005, Blv St-Joseph, app 8, Montréal, QC H2H 1E5, Canada. E-mail: natacha.paquette@umontreal.ca*

C. SÖDERHOLM, M. KARRASCH, A. ALAFUZOFF, U. ELLFOLK, M. LAINE & C.M. KRAUSE. Lateralized Valence-Related Differences in Electrophysiological Correlates of Successful Word Encoding.

Objective: Emotional valence affects both neural and behavioral correlates of memory encoding, but little is known about its effect on oscillatory responses during successful word encoding.

Participants and Methods: We studied event-related spectral perturbations (ERSP) in female university students ($N = 8$, mean age = 24.5) during wordlist learning. EEG was recorded from 21 scalp electrodes during the acquisition of 15 wordlists of negative, positive, or neutral valence. The ten-word lists were presented once. Afterwards, recognition memory was probed.

Results: The electrophysiological correlates of the encoding of the subsequently remembered words were analyzed. The behavioral memory performances between the valence categories did not differ. However, lateralized valence-related differences in the ERSP-responses were found in fronto-parieto-temporal electrodes, with more effects for positive than for negative or neutral words. Successful encoding of positive words elicited significantly more synchronization in the alpha and beta frequency ranges than encoding of neutral words. The differences appeared throughout the late time window (~ 1000-2500 ms) in the left hemisphere, whereas in the right hemisphere these differences appeared during ~ 800-1300 ms. The ERSP-responses elicited during successful encoding of negative words differed to a lesser degree from those elicited during encoding of neutral words. Short-lasting desynchronization in the alpha and beta frequency ranges was observed in both hemispheres. Additionally, in the right hemisphere, more synchronization in the ~ 700-800 ms time-window was elicited in the alpha and beta frequency ranges.

Conclusions: These findings suggest that valence modulates the lateralized electrophysiological correlates of successful memory encoding despite the lack of simultaneous effects in behavioral memory performances.

Correspondence: *Carina Söderholm, MA (Psych.), M SocSc, Department of Psychology and Logopedics, Abo Akademi University, Fabriksgatan 2, Turku 20500, Finland. E-mail: carina.soderholm@abo.fi*

G.A. STEFANATOS, A.T. DEMARCO & T. COSTANZO. Auditory Analysis in Residual Acquired Epileptiform Aphasia.

Objective: Acquired epileptiform aphasia (AEA) is a childhood disorder characterized by a loss of language that emerges in association with epileptiform electroencephalographic (EEG) abnormalities. The language disturbance is typically characterized by severe modality-specific impairment of auditory language comprehension resembling word deafness. It is associated with pronounced deficits in frequency modulation (FM) analysis evident in grossly abnormal steady-state potentials to rapidly presented FM pulses (FM-SSAEPs). The status of SSAEPs in individuals who show resolution of the verbal auditory agnosia recovery is unclear. We therefore examined SSAEPs in two partially recovered cases of AEA.

Participants and Methods: FM-SSAEPs were recorded in 2 children with AEA who no longer demonstrated the characteristic verbal auditory agnosia but continued to have below average comprehension of connected meaningful speech (sentences). We also utilized a newly developed auditory-evoked-steady-state-oddball-potential (AESOP) paradigm which elicits neurophysiological mechanisms produced during the processing of new auditory objects.

Results: FM-SSAEPs were normal in amplitude but delayed in latency or phase by approximately 50ms. Normal AESOPs are characterized by a negativity around 160ms followed by a positivity at 270ms. In one case of AEA, AESOPs were similar to controls' in the right hemisphere, but attenuated in amplitude by 50% over the left hemisphere. In the other case, AESOPs were not detected.

Conclusions: The findings suggest continuing dysfunction of neural mechanisms underlying the processing of rapid transitional frequency information in sound in residual AEA. The steady-state oddball paradigm utilized here provides additional information that may have clinical utility over and above that of the FM-SSAEPs.

Correspondence: *Gerry A. Stefanatos, D. Phil., Communication Science & Disorders, Temple University, 1701 N. 13th St., Philadelphia, PA 19122. E-mail: stefang@temple.edu*

Imaging (Functional)

J. TREEM, A. RABINOWITZ, B. JERSKEY, S. DEONI, D. AHERN, S. SALLOWAY & S. CORREIA. Brain Correlates of a New Scoring Metric for Trail Making Test B.

Objective: To evaluate the regional brain correlates of a new "efficiency score" for Trail Making Test part B (TMT-Be, see submitted abstract, Ahern et al.) designed to extend the TMT-B floor for use in research.

Participants and Methods: 33 participants (mean age 78; 64% female) with mild cognitive impairment (MCI) or Alzheimer's disease (AD) underwent MRI and a neuropsychological battery including TMT-B. Cortical thickness was computed using FreeSurfer (Desikan-Killiany atlas). We correlated standard TMT-B scores (TMT-Bs) and TMT-Be scores with cortical thickness in a priori criterion regions: bilateral rostral mediofrontal (RMF) cortex and anterior corpus callosum (ACC) volume and control regions (bilateral transverse middle temporal cortex).

Results: TMT-Be correlated significantly with cortical thickness in left and right RMF ($r = -.39$, $p < .05$, $r = -.43$, $p < .05$), and ACC ($r = -.15$, $p < .05$). TMT-Bs also correlated significantly with the left and right RMF ($r = -.36$, $p < .05$, $r = -.37$, $p < .05$) and ACC ($r = -.37$, $p < .05$). Neither metric exhibited significant correlations with control regions. For those individuals who scored at the floor for TMT-Bs (max time = 300s), there was a trend towards significant correlation between TMT-Be and ACC ($r = -.59$, $p = .08$).

Conclusions: As expected, TMT-Be and TMT-Bs correlated significantly with frontal cortical and white matter regions, but not with non-frontal

control regions. Consistent with the intent of TMT-Be, there was a trend toward a significant correlation between TMT-Be and anterior white matter among those who scored at the TMT-B floor. These results support the validity of TMT-Be as a research measure of executive functioning in the context of dementia-related brain changes.

Correspondence: *David Ahern, Ph.D., Warren Alpert Medical School of Brown University, 333 Atwells Ave, #208, Providence, RI 02903. E-mail: david_ahern@brown.edu*

L.A. BARQUERO, S.S. BURNS, N. DAVIS, S.L. RIMRODT, J.J. PEKAR & L.E. CUTTING. Neurobiological Outcomes Associated with Intervention in Children with Reading Disability.

Objective: Children with reading difficulties (RD) who receive evidenced-based reading intervention exhibit changes in brain activity. This study acquired functional imaging scans in children before and after an intensive, short-term phonics-based intervention to investigate whether this type of intervention is correlated with changes in pattern of activation.

Participants and Methods: Thirty-six children and adolescents (ages 8-17) participated in the study: children with typical reading achievement (TA; n=17), children with RD who received a 15-hr phonics-based reading intervention as part of the study (RD; n=10), and children with RD who served as no-treatment controls (NTRD; n=9). In two scanning sessions (pre-intervention and post-intervention), fMRI data were acquired with a 3T scanner during a single word reading task in which participants made real word versus pseudoword determination indicated by button press. Whole-brain analyses (p-value of .001 and a cluster size of 70) were performed and group contrasts were created for pre- and post-scan.

Results: Participants who received intervention showed a significant increase in activation at post-scan during pseudoword reading in the left middle temporal gyrus/superior temporal gyrus (BA 39), an area known to be associated with reading. In contrast, the TA and NTRD groups showed no significant changes in reading-related areas from pre-scan to post-scan.

Conclusions: These findings suggest that short-term, intensive phonics instruction may be associated with functional change in left hemisphere reading-related regions. ROI analyses of fMRI data may be a useful tool in revealing changes in additional brain regions.

Correspondence: *Laura A. Barquero, M.S., Special Education, Vanderbilt University, Box 228, Peabody College, Vanderbilt University, Nashville, TN 37203. E-mail: laura.barquero@vanderbilt.edu*

E.M. BRICENO, L.J. RAPPORT, S.L. WEISENBACH, K.E. HAZLETT, B.D. HAASE, A. VEDERMAN, M. STARKMAN, L. BIELI-AUSKAS, J. ZUBIETA & S.A. LANGENECKER. That Doesn't Appear Neutral to Me: Potential Activation Confounds in Study of Facial Emotion Recognition in Depression.

Objective: In event-related fMRI paradigms of facial emotion recognition, activation in response to emotional faces is often evaluated by subtracting activation for neutral faces. This approach may be problematic in studies of Major Depressive Disorder (MDD) considering known accuracy decrements and negative biases in MDD. This study evaluated the circuitry underlying processing of emotional relative to neutral faces in women with and without MDD, hypothesizing hyperactivity in MDD as compared to control women for emotional stimuli.

Participants and Methods: Twenty-four women with MDD and 22 healthy control women completed the Facial Emotion Perception Task during fMRI. Participants viewed faces of five different emotions, including neutral. To amplify response bias, participants were forced to select from only four emotions (happy, sad, angry, fearful) that best matched the depicted emotion.

Results: Emotional faces minus neutral faces resulted in activation for numerous bilateral fronto-temporal and subcortical regions (p < .05, FDR corrected). Controls demonstrated increased activation in bilat-

eral middle and superior frontal areas relative to the depressed group for all emotions (p < .05, FDR corrected). These effects were driven by less activation in the depressed group (p < .05, FDR corrected) for all emotions versus neutral. No significant group differences were present in response time or classification tendencies of neutral stimuli (ps > .15).

Conclusions: Neutral faces may present an increased emotional-cognitive challenge for depressed women relative to controls. Neutral faces may not reflect similar baseline activation for depressed and control women; subtraction from neutral may obfuscate conclusions regarding disrupted emotion processing circuitry in depression.

Correspondence: *Emily M. Briceno, M.A., Psychology, Wayne State University, 5057 Woodward 7th Floor, Detroit, MI 48202. E-mail: emilybriceno@wayne.edu*

C. BROWN, M. KAO, J. CLARK, S. JALA & L.S. MILLER. Syntactic Encoding BOLD Activation Negatively Predicts RAVLT Immediate Verbal Memory.

Objective: Syntax marks one organizational short-term memory tool, but its association with traditional verbal memory measures is unclear. The purpose of this study was to examine the relationship between syntactic encoding activation and immediate verbal memory measure performance. We hypothesized that left frontal (Brodmann's Area (BA) 44 and 46) syntax encoding activation would be associated with scores on a standardized measure of immediate verbal memory.

Participants and Methods: 32 young adults (mean age = 20.47, s.d. = 1.93) from a university community were presented phrases within the fMRI scanner. As part of a larger language study, they made syntactic (present versus past tense) judgments and memorized target nouns. Left frontal syntax response activation was analyzed using FSL. Participants also completed the Rey Auditory Verbal Learning Test (RAVLT).

Results: The number of syntactic encoding voxels activated across left language regions (BA 44, BA 45, BA 46, BA 47) was negatively associated with RAVLT Immediate Memory ($\beta = -3.83$, $t = -2.27$, $p < .05$). When BAs were entered as separate predictors, BA 44 demonstrated a negative relationship with RAVLT Immediate Memory ($\beta = -.578$, $t = -2.32$, $p < .05$). Other BAs did not reach significance.

Conclusions: Results support syntax encoding as potentially related to short-term verbal memory. Those experiencing fewer activated voxels during syntactic encoding across BAs and in BA 44 demonstrated higher RAVLT Immediate Memory. This favors viewing syntax as an organizational tool potentially indicative of short-term verbal processing efficiency, and consequently associated with efficient immediate word list recall.

Correspondence: *Courtney Brown, M.S., Department of Psychology, University of Georgia, Psychology Building, University of Georgia, Athens, GA 30602. E-mail: cbrown07@uga.edu*

J. BURCIAGA, P.K. SHEAR, W. WEBER, M.P. DELBELLO, J. ELIASSEN & C. ADLER. Patterns of Brain Activation in Response to a Marijuana-Specific Cue-Reactivity Task in Bipolar and Healthy Adolescents.

Objective: Bipolar Disorder (BPD) is highly comorbid with marijuana abuse/dependence. Although the effect of drug craving on brain activation has been well established in substance abusing populations, this research often excludes individuals with BPD.

Participants and Methods: To address this gap in the literature, this study examined fMRI measures of brain activation in response to a cue-reactivity task in adolescents with BPD who did (n=10) and did not (n=9) have comorbid marijuana (MJ) abuse and those with no individual or family history of a mood disorder with (n=6) or without (n=8) MJ abuse. We expected both MJ using groups to exhibit increased activation in response to MJ pictures in brain regions associated with drug craving, compared to the non-MJ groups. Participants were administered the Wechsler Abbreviated Scale of Intelligence (WASI), the Marijuana Craving Questionnaire (MCQ), a cue-reactivity task consisting of neutral and marijuana-related images, and a recognition memory task (MT) based on the cue-reactivity task.

Results: Higher IQ was significantly associated with better MT performance but not with brain activation in all groups combined. Both MJ using groups reported significantly more craving than the non-MJ groups both pre- and post-scan. The only significant brain activation associated with MJ use was in the right anterior cingulate. The MJ groups displayed increased activation in response to MJ images compared to neutral images, while both non-MJ groups displayed decreased activation.

Conclusions: This study identified activation changes elicited by MJ images in those with MJ abuse/dependence. There was not, however, evidence of differential response as a function of comorbid BPD.

Correspondence: *Joaquin Burciaga, MA, Psychology, University of Cincinnati, 4150 Edwards Building One, P.O. Box 210376, Cincinnati, OH 45221-0376. E-mail: joaquinburciaga@gmail.com*

D.E. EAGAN, M.M. GONZALES, T. TARUMI, H. TANAKA & A.P. HALEY. Gender Differences in the Effect of Body Mass on Task-related Brain Activation.

Objective: Higher body mass index (BMI) in midlife is linked to changes in functional brain activation and increased risk for late-life dementia. Some evidence indicates that overweight women are at greater risk for cognitive decline than overweight men, but a few studies have suggested that increased abdominal fat provides a cognitively protective source of endogenous estrogen in post-menopausal women. Studies of the interaction between sex, BMI, and cognition overwhelmingly rely on neuropsychological measures, which may fail to capture subtle brain changes occurring in midlife. We utilized functional magnetic resonance imaging (fMRI) to determine if BMI alters brain activation differently in middle-aged men and women performing a verbal 2-Back task. Post hoc analyses explored the role of sex hormones as mediators of this interaction.

Participants and Methods: Forty-six cognitively normal middle-aged adults (19 men) underwent neuropsychological assessment, sex hormone assay, and fMRI.

Results: Multiple linear regression revealed that women with higher BMI displayed significantly lower task-related activation in the right superior frontal gyrus (BA 46 and 9) compared to men, ($F(5,45)=4.024, p=0.005$), irrespective of age and level of education. Linear regression indicated that neither estrogen nor testosterone mediated the relationship between task-related activation and BMI in women or men.

Conclusions: In conclusion, higher BMI in middle-aged women was related to alterations in brain activation during a working memory task not found in men. However, this association was not mediated by sex hormones.

Correspondence: *Danielle E. Eagan, MA, Psychology, The University of Texas at Austin, 108 E. Dean Keeton, SEA 4.110, Austin, TX 78722. E-mail: deeagan@gmail.com*

O. FLOREA, M. LEFRANÇOIS, H. NGUYEN, E. AVOLI, J. TREMBLAY, P. VANNASING, M. LASSONDE & F. LEPORÉ. Cortical Localization of Auditory Responses Using Functional Near-Infrared Spectroscopy (fNIRS).

Objective: Near-infrared spectroscopy (NIRS) is a non-invasive imaging technique that allows for measurements of hemodynamic changes related to cortical processing. We have successfully used NIRS to lateralize language related regions or identify seizure foci in children and adults (Gallagher, 2007; Machado, 2011). In this study, NIRS was used to investigate the cortical activations evoked by auditory stimuli in healthy individuals.

Participants and Methods: Fourteen volunteers (7 women, age 28 ± 5 years) were tested with a multi-channel NIRS system (ISS, USA). During the imaging recording, subjects listened to noise bursts while keeping their eyes shut. The stimuli were presented through speakers located either to the left or right on the horizontal meridian at one meter from the participant's midline.

Results: Participants demonstrated oxygenated hemoglobin activations in the temporal cortex bilaterally, in response to the auditory stimuli. Group analyses show that the response was significantly higher in the right temporal cortex for both sound conditions ($T(13) = 2.2, p = 0.05$).

Conclusions: fNIRS is thus an interesting tool in the study of auditory processes, due to its excellent spatial and temporal resolution that permits the localization of functional activations in response to different stimulations, including the differentiation of subtle hemodynamic changes between hemispheres. Further advantages of fNIRS lie in the resistance to movement artifacts and its non-invasive character. Moreover, it is rather inexpensive compared to other imaging techniques. Studies are in progress to apply this novel approach in the investigation of central auditory processing and its disorders.

Correspondence: *Olivia Florea, Université de Montréal, 7396 rue de Normandie # 3, Montréal, QC H2R2T9, Canada. E-mail: oliviaflorea@gmail.com*

L.B. GABRIEL, K.K. MEYERS, A.L. WELDON, B.D. HAASE, M.T. KASSEL, D.T. HSU, D.C. NOLL, B.J. MICKEY, J.K. ZUBIETA & S.A. LANGENECKER. To Go or Not to Go? Differential Activation during Response Inhibition in Major Depressive Disorder.

Objective: Major depressive disorder (MDD) can be the result of a disruption in frontal brain circuitry, characterized by the inability to set shift and inhibit past negative memories, thoughts, and feelings. Individuals with MDD were hypothesized to have bilateral frontal hyperactivation and slower response time during behavioral inhibition, as both are thought to be the manifestation of greater effort extended on the part of individuals with MDD to maintain similar accuracy as healthy individuals.

Participants and Methods: The current study uses a computer-based inhibitory control (IC) paradigm, the Parametric Go/No-go (PGNG), and functional MRI to illuminate differences in neural activation during response inhibition for MDD compared to healthy control participants. Twenty-six participants with MDD (Females, $n = 18$) and 26 of their healthy control counterparts (Females, $n = 17$) were administered the PGNG task.

Results: A repeated measures ANOVA was conducted and indicated no difference in "Go" and "No-go" target accuracy between the two groups. However, significantly slower response times as well as bilateral frontal hypoactivation in right inferior frontal gyrus were found in the MDD group compared to healthy controls.

Conclusions: Such a reduction in response time demonstrates increased interference in set-shifting, and/or psychomotor slowing, both common symptoms of MDD. Likewise, the unexpected hypoactivation suggests that the MDD group has an overall decrement in functioning within IC circuitry. Further research is needed to better inform the source and consequences of this neural circuit dysfunction.

Correspondence: *Laura B. Gabriel, University of Michigan, Rachel Upjohn Building 4250 Plymouth Rd., Ann Arbor, MI 48109. E-mail: lbethgab@med.umich.edu*

L. GHAZI SAIDI & A. ANSALDO. The Neural Correlates of Cross-linguistic Transfer Effects: Phonological Similarities across Distant Languages.

Objective: In bilingualism, CLT is the influence of the languages previously acquired on the target language. At the lexical level, facilitative CLT effects have been described with cognates (formally and semantically similar or identical words), and clangs (formally similar words with different meanings (Ringbom, 2007)). This study examined the behavioral and neural correlates of CLT, as a function of phonological similarities in a group of Persian speakers (L1) learning French as a second language (L2).

Participants and Methods: Twelve Persian native speakers were enrolled in an intensive computerized French lexical-training program, and were tested after consolidation learning phase. Accuracy rates and response times as well as event-related fMRI BOLD responses to naming cognates, non cognates and clangs were computed.

Results: Phonologically similar words across languages activate the left IFG, as observed in L1, whereas phonological distant words activate the left IFG and its right homologous, thus reflecting additional effort in the processing of phonologically distant words.

Moreover, processing words that do not share both semantic and phonological features across languages recruits working memory and executive function processing structures.

Conclusions: These results suggest that despite consolidation, the factor of cross-linguistic distance between L1 and L2 modulates the executive load, on the basis of the degree of phonological overlap between L1-L2 items. Thus, to compensate for more effortful processing demands resulting from partial overlap between L1 and L2 items, the system recruits executive function supporting structures in order to manage interference and competition between L1 and L2.

Correspondence: *Ladan Ghazi Saidi, Ph.D. candidate, CRIUGM, S0S5, St.Laurent, Apt.204, Brossard, QC, QC J4X 1Z7, Canada. E-mail: ladan.ghazi.saidi@umontreal.ca*

K. HAZLETT, B.D. HAASE, A.C. VEDERMAN, E. AVERY, R.C. WELSH, S.L. WEISENBACH, J. ZUBIETA & S.A. LANGE-NECKER. Cortisol Response to Stress is Related to Elevated Fronto-Limbic Response during Emotion Processing.

Objective: Excessive reactivity to stressful situations and emotional stimuli may be a risk factor for psychiatric illness. The present study investigated variations in cortisol response to being scanned in an fMRI environment and their relationship to regional brain responses during emotion processing. It was hypothesized that cortisol would influence the activity of regions involved in the pathophysiology of depression and anxiety.

Participants and Methods: Sixteen women and 9 men (M age = 34) completed an explicit facial emotion categorization task, with a control task requiring categorization of animals. All were healthy and free of Axis I or II disorder (SCID-IV). Block design analyses of Faces minus Animals were conducted. Average salivary cortisol across the pre and post session and percent decline from pre to post session were used as predictors in two regression analyses.

Results: Consistent with prior research, the Faces minus Animals contrast indicated activation in a bilateral fronto-limbic network. Greater cortisol reactivity during scanning was associated with increased activation for this contrast in the rostral anterior cingulate and medial prefrontal cortex. Those with greatest declines in cortisol from pre-scan values exhibited increased activation for Faces minus Animals in subgenual anterior cingulate, posterior hippocampus, fusiform gyrus bilaterally.

Conclusions: These results suggest that fMRI is a stress challenge for some individuals, and that those individuals tend to show increased activation in areas known to be abnormally activated among individuals with mood and related disorders. Studies of this type may assist in understanding acute cortisol reactivity to stress as a risk marker for illness.

Correspondence: *Kathleen Hazlett, Marquette University, 1725 East Kane Place, Apt 208, Milwaukee, WI 53202. E-mail: kathleen.hazlett@marquette.edu*

M.T. KASSEL, S.J. WALKER, S.L. WEISENBACH, B.D. HAASE, M. PECINA, C.M. CONSIDINE, D.C. NOLL, J. ZUBIETA & S.A. LANGENECKER. Differential Impact of Distraction in Serial Position Curves with the Semantic List Learning Task (SLLT) in Women with and without Major Depressive Disorder (MDD).

Objective: Previous fMRI studies of MDD and memory impairment have demonstrated perturbation of frontal lobes and hippocampi, regions that facilitate memory encoding and recall. However, these studies have not been sensitive to serial position curve effects nor included distraction to minimize recency effects. We hypothesized MDD patients to show weakened encoding with distraction present.

Participants and Methods: Participants were females (MDD, n=15; HC, n=19). The in-scanner SLLT consists of 15 lists of 14 semantically related words. A distractor task is presented after each list, followed by instructions to silently recall the words from the previous list. Participants performed a post-scan free recall task with semantic cues provided. Groups were compared on different phases of the serial position curve for recall performance and fMRI BOLD activation (in contrast to Silent Rehearsal).

Results: Performance: Primacy and middle recall were not significantly different between groups, however recency recall was significantly greater for HC than MDD (p=.02).

Activation: For Primacy, HC exhibited greater activation than MDD in right precuneus, inferior parietal lobule, and posterior hippocampus, whereas MDD exhibited greater activation in left fusiform and dorsal anterior cingulate. For Recency, HC exhibited greater activation in the same regions as for Primacy, plus right cerebellum and bilateral dorso-medial prefrontal cortex.

Conclusions: The performance and functional activation differences between groups during the recency phase suggests that encoding for patients with MDD may be more susceptible to distraction during encoding relative to healthy controls. The addition of distraction for memory encoding tasks may better simulate real-life conditions in evaluating memory dysfunction in clinical disorders.

Correspondence: *Michelle T. Kassel, BA, Psychiatry, University of Michigan, Rachel Upjohn Building, 4250 Plymouth Rd, Ann Arbor, MI 48109-2701. E-mail: mikassel@med.umich.edu*

K. KRISHNAN, T. PRICE, A. ARENIVAS, C. CULVER, C. BOSWORTH, N. KULKARNI, R. DIAZ-ARRASTIA & C. MARQUEZ DE LA PLATA. Time and Frequency Analysis of Default Mode Network Connectivity after TAI.

Objective: Traumatic Axonal Injury (TAI) is a common mechanism of injury in 40-50% of patients hospitalized with TBI. TAI results in compromise to several white matter structures with subsequent compromise to temporal coherence of BOLD signal within Default Mode Network (DMN). The degree of coherence within DMN can also be assessed by evaluating changes in synchrony of BOLD fluctuations. This is the first study to examine integrity of DMN in patients with TAI in temporal and frequency domains, and investigate their relationship with white matter integrity (WMI).

Participants and Methods: Seventeen patients with chronic TAI and 25 controls were studied. Pearson correlation coefficients were used to describe the temporal relationship between DMN nodes using BOLD time series. Functional connectivity (FC) in frequency domain was evaluated by identifying primary frequency bands for DMN nodes among controls. Four DMN nodes were identified: posterior cingulate cortex (PCC), medial frontal cortex (MFC), left and right parietal cortices (LPC & RPC), which resulted in six functional connections (edges). Corpus Callosum (CC), a WM tract injured after TAI was reconstructed using DTI tractography, and defined using fractional anisotropy (FA).

Results: Independent sample t-tests demonstrated significant group differences in CC FA. FC within time domain was correlated to FC within frequency domain for all DMN edges in both groups. However, all edges were deemed compromised in the frequency domain while only 67% were deemed compromised in the time domain. CC FA was correlated with FC in PCC-MFC within both domains, and with PCC-LPC and PCC-RPC within time domain only (p<0.05).

Conclusions: Among a sample of patients with compromised CC as a result of TAI, DMN compromise was found using both frequency and time-based analyses. While the frequency and time data are strongly correlated, examining the differences may be essential for understanding whether integrity of this resting-state network could be a useful prognostic marker after TAI.

Correspondence: *Kamini Krishnan, UT Southwestern Medical Center, 2200 W. Mockingbird Lane, Dallas, TX 75235. E-mail: kxk042000@utdallas.edu*

V.M. LEAVITT, G.R. WYLIE, H.M. GENOVA, N.D. CHIARAVALLOTI & J. DELUCA. A longitudinal investigation of resting-state functional connectivity in the default network of multiple sclerosis patients with memory decline.

Objective: Resting-state functional connectivity (RSFC) allows examination of the integrity of connections across neural networks subserving cognitive function. The brain's default network (DN) has been implicated in memory systems among numerous neurological populations. Individuals with multiple sclerosis (MS) demonstrate deficits in memory. Here, the aim was to determine whether DN RSFC declines over time in MS patients with memory decline. Longitudinal data were examined from neuropsychological assessment and fMRI scans at baseline and 3-year follow-up.

Participants and Methods: MS patients underwent neuropsychological assessment and fMRI scans at baseline and 3-year follow-up. DN RSFC was derived during post-processing of fMRI data from patients with memory decline over 3 years (Selective Reminding Test, Total Recall). RSFC was derived by placing a seed in the posterior cingulate cortex (PCC); correlations were computed across the entire brain. To control for multiple comparisons, a cluster threshold was set at 400 contiguous voxels significant at $p < .05$. This allowed identification of regions correlated with PCC. T-tests assessed baseline to follow-up differences in RSFC.

Results: MS patients with memory decline showed decreased RSFC from baseline to follow-up among critical nodes of the DN: left and right parahippocampal gyri and PCC.

Conclusions: DN RSFC may be a neurophysiological marker of memory function in MS patients. Future research investigating the link between memory decline with change in DN RSFC is warranted. DN RSFC may represent a vital target for novel treatments of memory impairment in MS.

Correspondence: *Victoria M. Leavitt, PhD, Kessler Foundation, 300 Executive Drive, West Orange, NJ 07052. E-mail: vleavitt@kesslerfoundation.org*

M.R. MADORE, J.B. ALLENDORFER, M. LAMY, D. FLECK, M. CERULLO, J. ELIASSEN, P. SHEAR, C. ADLER, M. DELBELLO, M. SMITH & S. STRAKOWSKI. Functional Connectivity of the Cerebellar Vermis in Bipolar Disorder.

Objective: Individuals with bipolar disorder (BPD) experience affective instability and also may demonstrate cognitive deficits including inattention and volumetric reductions in the cerebellar vermis, particularly in the superior posterior vermis (area V2), vermal area 3 (V3) and flocculonodular vermal areas. The aim of the current study was to examine the vermis' role in attentional and emotional processing abilities in patients with BPD experiencing affective instability and to assess functional connectivity between the vermis and cognitive/emotional regions known to be dysfunctional in BPD.

Participants and Methods: We hypothesized that the vermis is functionally associated with emotional (ventral) networks, similar to the role of the cerebellum in motor control. Fifty-seven participants with BPD in a manic or mixed mood state, ages 18 to 45 years were scanned using fMRI. Participants were excluded for medical/neurological disorder that could influence fMRI results or history of mental retardation or estimated IQ score of < 85 . During the scan, they completed a continuous performance task (CPT-END).

Results: Functional connectivity analysis revealed several connections including, but not limited to: V1 positively correlated bilaterally with the cingulate gyri and anti-correlated to the insula bilaterally; V2 positively correlated with the right cuneus and anti-correlated with the caudate bilaterally; V3 positively correlated with the left posterior cingulate and anti-correlated with the left insular lobe.

Conclusions: The connectivity pattern suggested that vermal activation was associated with activity in emotion regulating regions and cognitive control regions. Examining functional connectivity patterns in BPD can help elucidate the neurobiological substrates of BPD and other disorders of mood regulation.

Correspondence: *Michelle R. Madore, M.A., Psychology, University of Cincinnati, Mail Location 0376, Cincinnati, OH 45221-0376. E-mail: madoremr@gmail.com*

K.K. MEYERS, A.L. WELDON, L.B. GABRIEL, S.J. WALKER, D.T. HSU, D.C. NOLL, B.J. MICKEY, J. ZUBIETA & S.A. LANGE-NECKER. Hypoactivation of Inhibitory Control Circuitry is more Pronounced in Major Depression than in Major Depression comorbid with an Anxiety Disorder.

Objective: Inhibitory control is a regulatory mechanism for thoughts and emotions supported by lateral and medial prefrontal and inferior parietal regions. Disruption in this circuit may contribute to mood dysregulation in Major Depressive Disorder (MDD). A greater tendency for dysregulation may occur in MDD alone relative to MDD with comorbid anxiety (MDD+A). The present study compares MDD, MDD+A, and healthy control (HC) groups on a parametric Go/No-Go task during functional magnetic resonance imaging. We hypothesized slowed reaction times among MDD relative to healthy controls (HC) and MDD+A, as well as differing activation among MDD and MDD+A (hypo- and hyperactivation, respectively) relative to HC within this circuit.

Participants and Methods: Fifty-seven participants were studied (HC: $n=32$; MDD: $n=9$; MDD+A: $n=16$) and screened for other comorbid psychiatric and medical illnesses. All volunteers were non-medicated at the time of fMRI. Images obtained were processed with standard event-related analyses.

Results: Both MDD groups were slower than HC in target response times. Effects of group on activation were observed. For targets, HC showed greater activation relative to both MDD groups in dorsal anterior cingulate, bilateral anterior insula, and left inferior parietal lobule. Greater MDD+A activation relative to MDD for rejections and commissions was found in right inferior frontal gyrus, bilateral rostral anterior cingulate, and bilateral inferior parietal lobule.

Conclusions: The activation differences observed in the present study may indicate differential disruption of inhibitory control mechanisms based upon MDD subtype. When individuals with MDD and MDD+A are combined for analyses of inhibitory control circuitry in Major Depression, incongruities by MDD subtype may obscure differences from healthy controls.

Correspondence: *Kortni K. Meyers, B.A., Psychiatry, University of Michigan, 510 Miller Ave., Ann Arbor, MI 48103. E-mail: kortmeyer@med.umich.edu*

K.L. MOFFETT, K. CASE, K. GOPINATH, P. GANDHI, A. GOYAL, I. LEVY, Y. FANG, R. BRIGGS, J. HART, A. MOORE & B. CROSSON. Subcortical Involvement in Gulf War Syndrome 2.

Objective: Approximately one quarter of 1991 Persian Gulf War Veterans experience cognitive and physiological sequelae that continue to be unexplained by known medical or psychological conditions. One specific group of studies identified three unique syndrome groups to explain these symptoms. The most functionally impaired veterans belong to the Gulf War Syndrome 2 (GWS 2) group, for which subcortical damage due to toxic nerve gas exposure is the suspected cause.

Participants and Methods: Utilizing functional magnetic resonance imaging (fMRI) during a covert category generation task, whole-brain functional activity was compared between 25 GWS 2 veterans and 28 age-matched Healthy Deployed (HD) controls.

Results: Results of voxel-wise t-tests revealed that GWS 2 veterans had significantly less activity in multiple subcortical regions such as the thalamus and the subthalamic nucleus, as well as in various task-related cortical areas such as the visual cortex.

Conclusions: These results further demonstrate a subcortical involvement in GWS 2 and highlight the importance of further research into the neurological mechanism of GWS 2 with the intention of forging future rehabilitation strategies and treatments for these veterans.

Correspondence: *Kristin L. Moffett, M.S., Clinical and Health Psychology, University of Florida, 2701 NW 23rd Blvd., Apt A4, Gainesville, FL 32605. E-mail: kmoffett@php.ufl.edu*

J. PERAZA, A. CSERVENKA, M.M. HERTING & B.J. NAGEL. Over-activation in Emotion Regulating Brain Regions among Youth with a Family History of Alcoholism.

Objective: Adults with alcohol use disorders (AUDs) show less activation in limbic brain areas, such as the amygdala, during subliminal processing of emotional facial expressions. It is unknown if these atypical patterns exist prior to alcohol abuse, and thereby may represent a neurobiological risk factor for use. Since adolescents with a family history of alcoholism (FHP) are at heightened risk for developing AUDs, and few studies have investigated the neural substrates of emotional processing in FHP adolescents, we chose to examine neural activity to subliminal emotional stimuli in this at-risk population.

Participants and Methods: We examined brain response to a masked faces paradigm in 14 FHP and 15 FHN (mean age=13.7±1.5) largely alcohol-naïve youth using functional magnetic resonance imaging.

Results: Comparing negatively-valenced to neutral subliminal face stimuli, a two-sample t-test revealed that FHP youth showed more activation during emotional stimuli than FHN controls in left subgenual, left medial frontal, right fronto-polar, and right anterior orbitofrontal cortex (corrected for multiple comparisons, $p < .05$).

Conclusions: While atypical activation in the amygdala was not observed in FHP youth, regions of group difference, particularly the subgenual area, have been implicated in emotion regulation, and are known to have reciprocal connections with limbic structures. Therefore, results of the current study may suggest FHP youth require compensatory activation in these cortical areas to regulate emotion compared to FHN youth, even when emotional stimuli are subliminal. These findings of atypical emotional processing in FHP youth may confer heightened risk for developing an AUD, via atypical limbic functioning.

Correspondence: *Jennifer Peraza, M.A., Oregon Health and Science University, 3181 SW Sam Jackson Park Road, Mail Code: UHN-80R1, Portland, OR 97239. E-mail: peraz3470@pacificu.edu*

S. RIMRODT, C. MARBREY, R. PATEL, B. PRYOR, N. ROBERTS, A. SIVAPURAPU & L.E. CUTTING. Repetition Task and Word Learning in Skilled Adult Readers.

Objective: Repeated reading of words is proposed to approximate the cognitive task of word learning (Grill-Spector et al., 2006). In order to examine patterns of word learning in adults, we exposed them to repetitions of words and pronounceable pseudo-words. Preliminary data analyzed in the context of neurobiological correlates obtained from fMRI imaging data, are reported.

Participants and Methods: Eight adult (18-24 years) skilled readers (WRMT-R N/U Word Attack (WA) SS=90-124) completed a word/pseudo-word repetition task with real word accuracy >70%. Stimuli were presented four times each, one word at a time, in pseudo-randomized order. Participants pressed a right or left-hand button to indicate whether each stimulus was a word or a pseudo-word. SPSS repeated measures analysis assessed reaction time (RT) by stimulus type (word vs. pseudo-word) and repetition (R1, R2, R3, R4) covarying WA. SPM8 repeated measures ANOVA assessed differential fMRI activation between R1 and R4 (words and pseudo-words separately) covarying WA.

Results: RT significantly improved with repetition (R1=595ms to R4=580ms; $p=.044$). Distinct patterns of RT change noted for words (R1=594ms similar to R2=595ms before decreasing to R4=575ms) versus pseudo-words (R1=596ms increased to R2=617ms before decreasing to R4=584ms). Significant WA*repetition interaction ($p=.045$) suggests differential impact of reading skill even among average readers. Imaging analysis shows significant (corrected $p<.05$) decreases in activation for words from R1 to R4 in right insula and right frontal regions.

Conclusions: Preliminary results suggest that word repetition approximates word learning, words and pseudo-words are handled differently, and reading skill level may be a factor. Neuroimaging suggests associated brain activation changes.

Correspondence: *Sheryl Rimrodt, Monroe Carell Jr. Children's Hospital, Vanderbilt University, DOT 11101, 2200 Children's Way, Nashville, TN 37213. E-mail: sheryl.l.rimrodt@vanderbilt.edu*

D. SAFI, R. BÉLAND, D. NGUYEN, P. VANNASING, J. TREMBLAY, O. FLOREA, O. MORIN-MONCET & M. LASSONDE. Overt Reading of Irregular Words and Non-words: A Functional Near Infrared Spectroscopy Study.

Objective: Functional near infrared spectroscopy (fNIRS) has become increasingly established as a promising technique for monitoring functional brain activity. To our knowledge, no study has yet used fNIRS to investigate overt reading while insuring a full coverage of the cerebral regions implicated in reading processes. Our study aimed at validating a protocol using fNIRS for the assessment of overt reading.

Participants and Methods: Sixteen healthy French-speaking adults underwent one session of fNIRS recording while performing overt reading of 13 blocks of irregular words (IW) and non-words (NW). Sources ($n=55$) and detectors ($n=16$) were placed bilaterally over frontal, temporal, parietal, central and occipital regions. Two wavelengths were used: 690nm, sensitive to deoxyhemoglobin concentration changes (HbR), and 830nm, sensitive to oxyhemoglobin concentration (HbO) changes.

Results: For each participant, a two-tailed paired t-test was performed for total hemoglobin concentration (HbT) to compare activation between reading tasks and baseline. HbT was computed by summing changes in HbO and HbR. HbT concentration was significantly higher than baseline for both IW and NW reading in frontal, temporal and occipital regions bilaterally for all participants. We further ran three separate ANOVAs, one for each region, with the within-factors Stimuli (IW vs. NW) and Hemisphere (left vs. right). In the frontal region, results revealed a significant main effect of Stimuli with higher HbT values for NW than IW ($F(1,11) = 5.162, p = .044$). In the temporal region, a near to significant effect was found for Hemisphere ($F(1,11) = 0.117, p = .065$) with higher HbT values found in the left hemisphere.

Conclusions: Our findings confirm that fNIRS is an appropriate technique to assess the neural correlates of overt reading. We conclude that phonological decoding in NW reading has for effect to increase activation bilaterally in the frontal lobes and that overall, the left hemisphere is more recruited in the activation of both reading tasks.

Correspondence: *Dima Safi, Ph.D. candidate, Université de Montréal, 3460 Place Décelles, ap.39, Montréal, QC H3S1X4, Canada. E-mail: dima.safi@umontreal.ca*

Z.J. SCHWAB & W.D. KILLGORE. Sex Differences in Functional Brain Responses to Food.

Objective: There are significant sex differences in the rates of eating disorders, and emerging evidence suggests that men and women may show differential responses to food stimuli within brain regions that are critically involved in appetite regulation and eating behavior. Here, we examined sex differences in neural responses to images of foods.

Participants and Methods: Forty healthy adults (22 men) ranging in age from 18 to 45 underwent functional magnetic resonance imaging (fMRI) while viewing images of appetizing high-calorie and low-calorie foods. In SPM5, contrast images of brain activation (high-calorie foods > low-calorie foods) were created in a first level analysis and then compared between men and women in a two-sample t-test, while controlling for BMI ($p<.005, k\geq 10$).

Results: Men showed greater activation in response to high calorie foods than women in the anterior insular cortex (bilateral) and prefrontal cortex. Women showed greater activation in the right amygdala.

Conclusions: The brain responses of men and women to appetizing food imagery were significantly different in regions involved in gustatory and visceral responses (anterior insula), emotional salience (amygdala), and behavioral control (prefrontal cortex). Whereas women tended to activate a primary node in the emotional salience network when viewing enticing foods, men showed greater activation of inhibitory and visceral sensation regions, raising the possibility that observed sex differences in the prevalence of eating disorders may be related to differential activation of this neurocircuitry.

Correspondence: *Zachary J. Schwab, BS, McLean Hospital, Harvard Medical School, 115 Mill St., Belmont, MA 02478. E-mail: zschwab@mclean.harvard.edu*

I. SIMARD, I. SOULIÈRES & T.A. ZEFFIRO. Are the Raven's Progressive Matrices Visuospatial or Verbal?

Objective: Raven's Progressive Matrices (RPM) were designed as a non-verbal measure of fluid intelligence. Though the content of its component reasoning problems is completely visuospatial, as problem complexity increases, reasoners report using logical verbal rules and hypothesis testing to find solutions. Our aim was to determine to what extent both visuospatial and verbal/logical representations are involved in solving RPM problems.

Participants and Methods: With functional MRI, we studied 18 adults solving 60 RPM problems in one self-paced session.

Results: Problem solving engaged an extended bilateral frontoparietal network, similar to that found in other studies of abstract reasoning using verbal or non-verbal material. We then classified the RPM problems according to reasoning complexity and problem type. Solving analytical problems resulted in greater activity than solving gestalt problems in posterior parietal cortex, left anterior prefrontal cortex (BA10) and posterior middle frontal gyrus (BA6). Some of these regions are known to be involved in relational integration and visuospatial processing. Increasing problem complexity was associated with increased activity in bilateral angular gyrus, left middle frontal gyrus, right cerebellum and left precuneus, areas believed to be involved in verbal and logical representation, as well as explicit hypothesis testing. Conversely, increasing complexity was associated with activity decreases in bilateral lingual and right fusiform gyri, areas involved in visuospatial representations.

Conclusions: These results are consistent with the idea that both verbal/logical and visuospatial strategies are used when solving RPM, with their relative balance depending on problem complexity. Inferences about neural mechanisms related to language delay or cognitive deficits should include consideration of the facts that different reasoning strategies can be used to solve particular RPM problems, and that different problem types may be associated with different optimal processing strategies. I. Soulières^{1,2}, I. Simard¹ & T.A. Zeffiro² (1) Fernand-Seguin Research Center, Hôpital Rivière-des-Prairies, Montréal, QC, Canada, (2) Neural Systems Group, Massachusetts General Hospital, Boston, MA.

Correspondence: *Isabelle Simard, bachelor, Recherche TN, Hôpital Rivière-des-Prairies, 7070, boul. Perras, Montréal, QC H1E 1A4, Canada. E-mail: isabelle.simard.3@umontreal.ca*

D.P. TERRY, M.J. DIDDAMS, C.C. FARACO, D.M. SMITH, A.L. WATTS & L.S. MILLER. Absence of Long-term Neuropsychological and Functional MRI Differences after Multiple Concussions.

Objective: Mild traumatic brain injuries (MTBI), or concussions, have been associated with several cognitive symptoms, including deficits in response inhibition, working memory, and motor performance. The effects of multiple concussions on neuropsychological functioning and brain activation following a minimum of 6 months after any traumatic events were examined.

Participants and Methods: Twenty right-handed male athletes with history of at least two concussions and twenty age/pre-morbid IQ/athletic-experience matched controls underwent neuropsychological assessment and fMRI scanning where they performed block-design versions of a color-word Stroop task, an operation-span working memory (OSPAN) task, and a finger-tapping task. Images were preprocessed using SPM8 and analyzed using whole-brain and a priori ROI analyses at the liberal threshold of F.W.E. $p=0.10$.

Results: No main effect of group was exhibited on any index scores in the Repeatable Battery for the Assessment of Neuropsychological Status ($p=0.09-0.94$) or on reaction time during functional tasks ($p=0.22-0.87$). Accuracy was similar across groups during the Stroop task and the working memory condition of the OSPAN task ($p=0.50-0.86$), but the concussed group performed lower on arithmetic during the OSPAN task ($p=0.009$). Despite expected activation patterns within each group, there were no activation differences between groups on any functional tasks using whole-brain or ROI analyses at F.W.E. $p=0.10$. Exploratory post-hoc analyses at uncorrected $p=0.001$ were only significant for the Stroop task, where the control group had more activation in left occipital areas.

Conclusions: Surprisingly, there were minimal differences between our two closely matched groups. Results point to the relative plasticity of younger adults' cognitive abilities following concussion.

Correspondence: *Douglas P. Terry, B.S., Psychology, University of Georgia, 1090 Barnett Shoals Rd, Apt 50S, Athens, GA 30605. E-mail: dpterry@uga.edu*

A.L. WELDON, B.J. MICKEY, W. YAU, K.K. MEYERS, D.T. HSU, S.F. TAYLOR, M.M. HEITZIG, J. ZUBIETA & S.A. LANGENECKER. Diminished Incentive Responsiveness in Major Depressive Disorder (MDD) is not Related to Decreased Reactivity of Nucleus Accumbens.

Objective: Previous studies have evaluated the link between incentive processing and mood disorders, including activation in the nucleus accumbens (NAcc) as an indicator of reward anticipation. We hypothesized decreased behavioral performance and decreased NAcc activation in Major Depressive Disorder (MDD) for anticipation of a gain incentive.

Participants and Methods: Participants were 13 healthy controls (HC, 3 male) and 14 MDD (3 male) subjects enrolled at the Michigan Depression Center, with no differences between groups for gender, age or education. Subjects performed the monetary incentive delay (MID) task during fMRI. The MID offers actual small and large monetary gains and losses based upon performance. Response windows are individually titrated at pre-scan practice and twice during imaging to ensure optimal performance. Scans were collected on a 3T GE Sigma scanner with forward-reverse spiral acquisition.

Results: MDD subjects had significantly poorer performance for all trial types (win, loss, null, $p's < .03$) than HC. Both groups showed bilateral NAcc activation for win trials compared to null. Whole-brain corrected comparison revealed increased activation in right thalamus and left dorsal ACC in MDD compared to HC, and also in bilateral NAcc ROIs (uncorrected).

Conclusions: Despite a small sample, results suggest there is increased anticipatory NAcc activation for positive outcomes in MDD subjects in the presence of decreased success in attaining monetary rewards and avoiding monetary losses. This finding implies that in MDD, there may be a disconnection between the NAcc activation thought to be alerting to potential rewards, and the cortical circuitry that prepares and executes behavioral responses to obtain rewards.

Correspondence: *Annie L. Weldon, B.S., Psychiatry- Neuropsychology, Univ Michigan, 716 W. Huron St., Ann Arbor, MI 48103. E-mail: annewel@med.umich.edu*

Imaging (Structural)

K.A. AGBAYANI, W.N. HAVINS, C. KARMONIK, Z. XUE, A. VERMA, M. KAWAI, R.G. GROSSMAN & M.F. DULAY. DTI Tractography of the Cingulum Bundle and Uncinate Fasciculus and Impaired Memory and Language in Epilepsy.

Objective: Individuals with complex partial seizures (CPS) often present with language and memory impairments. The goal of this study was to relate performance on memory and language tasks to the structural integrity of unilateral cingulum bundle (CB) and uncinate fasciculus (UF) using diffusion tensor imaging (DTI) tractography in individuals with CPS.

Participants and Methods: Seventeen individuals (mean age = 36 years; 9 females, 8 males) diagnosed with video-EEG confirmed intractable CPS (8 left-sided focus, 9 right-sided focus; mean disease duration = 15.2 years) underwent DTI and neuropsychological assessment. Fractional anisotropy (FA) was computed for the CB and UF by manual tracings using TrackVis.

Results: One-way ANOVA indicated that patients with impaired memory or language (e.g., those with a z-score -1.26 below normative data) had lower mean FA values of the CB and UF. For example, the nine patients with impaired list-learning ability had a lower mean CB FA value (impaired mean CB FA = 0.60 [SD = 0.03]; intact mean CB FA = 0.51 [SD = 0.05]; $F[1, 15] = 13.64$, $p = 0.002$) and lower mean UF FA

value compared to the patients with intact list-learning. Decreased FA of the left CB was significantly correlated with poorer verbal list-learning ($r = .53$, $p = .028$), visual-constructional memory ($r = .60$, $p = .01$) and confrontation naming ($r = .63$, $p < .01$). Decreased FA of the right CB was similarly associated with both verbal and visual recognition memory. Poorer verbal ($r = .62$, $p < .05$) and visual ($r = .58$, $p < .05$) memory was associated with decreased FA of the left UF, but not the right UF.

Conclusions: Results suggest that disruption of frontal and temporal white matter pathways is related to memory and language difficulties. Results may be helpful in understanding structural and functional reorganization that occurs in brain networks of individuals with CPS.

Correspondence: *Kristina A. Agbayani, BA, University of Houston, 7009 Almeda Rd., Apt. 835, Houston, TX 77054. E-mail: kaagbayani@gmail.com*

S. AMIRTHAVASAGAM, E. JEFFAY & K. ZAKZANIS. Structural Neuroimaging Findings in Persons with Borderline Personality Disorder.

Objective: As individuals with borderline personality disorder (BPD) exhibit deficits in affect regulation and impulse control, research in the past decade has proposed temporolimbic volume decrease as a biological substrate for these symptoms. The current meta-analysis set out to synthesize findings from magnetic resonance imaging (MRI) studies that observed hippocampal/amygdalar volumes in BPD-control comparisons.

Participants and Methods: Ten publications were included for calculations of mean effect size (M) totaling 176 patients with BPD and 192 healthy controls.

Results: The analysis found a moderate to substantial disparity between BPD-control for hippocampal (left $M = -0.54$; right $M = -0.74$) and amygdalar (left $M = -0.90$; right $M = -0.44$) volumes. Moreover, major depressive disorder (MDD) and age were found to have a moderating role for right hippocampal volume, as well as anxiety disorders on left hippocampal volume.

Conclusions: Overall, though our findings demonstrate structural changes in the temporolimbic regions of the borderline brain, they are too modest to represent a biological marker.

Correspondence: *Elyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A8, Canada. E-mail: eliyas.jeffay@utoronto.ca*

J. BERTRAND, C. BEDETTI, R. POSTUMA, O. MONCHI, D. GÉNIER-MARCHAND, T. JUBAULT & J. GAGNON. Color discrimination and cortical alterations in Parkinson's disease.

Objective: Parkinson's disease (PD) is classically characterized by motor symptoms. Non-motor manifestations such as color discrimination deficits have also been widely reported in PD. Some studies indirectly linked these dysfunctions to retinal abnormalities found in PD but others suggested a cortical contribution. The aim of this study was to link the color discrimination deficits in PD to cortical anomalies.

Participants and Methods: Twenty-six PD patients without dementia performed the Farnsworth-Munsell 100 hue test (FM-100) and neuroanatomical magnetic resonance including T1, T2, and DTI sequences from which measures of cortical thickness and radial diffusivity were estimated.

Results: The analysis revealed a correlation between a low performance on the FM-100 and thinning of the left superior parietal lobule ($p < 0.001$ uncorrected). In addition, an increased radial diffusivity in the fronto-occipital fasciculus, the splenium and posterior portion of the body of the corpus callosum and a small portion of the inferior longitudinal fasciculus correlated with poor color vision discrimination ($p < 0.05$ voxelwise corrected).

Conclusions: These results suggest that colour discrimination deficits in PD are associated with cortical gray and white matter alterations in regions known to be involved in colour integration, perceptual decision-making and spatial attention. This study was supported by the CIHR and the FRSQ.

Correspondence: *Josie-Anne Bertrand, Psychology, Université de Montréal, 90 Vincent d'Indy, Montréal, QC H2V 2S9, Canada. E-mail: jo_030@hotmail.com*

K. BLACKMON, E. HALGREN, W.B. BARR, C. CARLSON, O. DEVINSKY, J. DUBOIS, B.T. QUINN, J. FRENCH, R. KUZNIECKY & T. THESEN. Individual differences in verbal abilities associated with regional blurring of the left gray and white matter boundary.

Objective: Blurring of the cortical gray and white matter border on MRI is associated with normal aging, pathological aging, and the presence of focal cortical dysplasia. However, it remains unclear whether normal variations in signal intensity contrast at the gray and white matter junction reflect the functional integrity of subjacent tissue. This study explores the relationship between verbal abilities and gray and white matter contrast (GWC) in healthy adults.

Participants and Methods: A sample of 32 right-handed community-recruited volunteers were scanned at 3T MRI and administered standardized measures of verbal expression and verbal working memory. GWC was estimated by calculating the non-normalized T1 image intensity contrast above and below the cortical gray/white matter interface. Spherical averaging and whole-brain correlational analyses were performed.

Results: We found a strongly lateralized and regionally specific profile with reduced verbal expression abilities associated with blurring in left hemisphere inferior frontal cortex and temporal pole. Reduced verbal working memory was associated with blurring in widespread left frontal and temporal cortices. Sulcal regions exhibited higher contrast compared to gyral regions.

Conclusions: Such lateralized and focal results provide support for GWC as a measure of regional functional integrity and highlight its potential role in probing the neuroanatomical substrates of cognition in healthy and diseased populations.

Correspondence: *Karen Blackmon, Ph.D., Neurology, New York University, 190 E 7th St., Apt. 518, New York, NY 10009. E-mail: karen.blackmon@nyumc.org*

E. LONDEN, K. BLACKMON, W.B. BARR, C. CARLSON, J. DUBOIS, O. DEVINSKY, R. KUZNIECKY, E. HALGREN & T. THESEN. A neuroanatomical substrate for anxiety symptoms in temporal lobe epilepsy.

Objective: Functional and structural neuroimaging studies implicate involvement of an amygdala-orbitofrontal network in anxiety expression. Individuals with temporal lobe epilepsy (TLE) may be particularly vulnerable to anxiety given the predominance of limbic abnormalities in this disorder. We investigated structural variations in mesial temporal and prefrontal regions associated with anxiety symptoms in a sample of adults with TLE.

Participants and Methods: Participants included 23 men and women with TLE who were candidates for resective surgery and 28 normal controls. Both groups completed a 3T MRI scan, Beck Anxiety Inventory (BAI), and Beck Depression Inventory-II (BDI-II). A subset of the TLE sample experienced fear auras prior to seizure onset, suggesting focal onset in the amygdala. Freesurfer post-processing was used to estimate the volumes of subcortical structures and cortical thickness in specific regions of interest, which were regressed on mood inventory scores, accounting for age and gender.

Results: BAI scores in the TLE sample were significantly higher than control subjects. In the TLE group, females reported greater anxiety symptoms than males, and higher self-reported anxiety was associated with smaller amygdala volumes and thicker left lateral orbitofrontal cortex. The fear aura group had significantly higher BAI scores and smaller amygdala volumes than other TLE participants and a group of age- and gender-matched controls. Results were specific to anxiety, but not depression symptoms.

Conclusions: These results replicate prior findings in healthy controls and suggest that TLE patients, particularly those with fear auras, may be especially vulnerable to interictal anxiety symptoms. Importantly, the correspondence of these results with prior studies suggests that reduced amygdala volumes may serve as a potential biomarker for anxiety vulnerability in neurological populations.

Correspondence: *Karen Blackmon, Ph.D., Neurology, New York University, 190 E 7th St., Apt. 518, New York, NY 10009. E-mail: karen.blackmon@nyumc.org*

R. BREWSTER, T.Z. KING & D.L. ROBINS. White Matter Quality Between the Amygdala and Fusiform Gyrus Predicts Socialization Skill in a Mixed Sample of Participants with ASDs and Controls.

Objective: Difficulty interpreting facial expressions is one aspect of social deficits seen in Autism Spectrum Disorders (ASDs). A white matter network connecting the amygdala and fusiform gyrus is theorized to contribute to facial expression interpretation. We examined white matter quality between these structures and its relationship to socialization skill in a mixed sample of participants with ASDs and controls.

Participants and Methods: White matter quality (Fractional anisotropy determined from Diffusion Tensor Imaging data; FA), Socialization Skill (Vineland Adaptive Behavior Scales subscale; SS), and Matrix Reasoning (negative control task and WASI subscale; MR), were obtained on 9 participants with ASDs (mean age=15.00, SD=4.53; 33% female) and 12 controls (mean age=14.27, SD=3.26; 40% female). Regression analyses examined the relationship between measures.

Results: FA between the amygdala and fusiform gyrus was a significant predictor of SS in the combined group ($\beta=.46$, $p=.046$, $R^2=.21$). FA and MR were not related. Mean SS z-scores (ASD=-1.65, SD=2.02; Control=-0.07, SD=0.96) were significantly lower for participants with ASDs ($t(19)=2.20$, $p=.042$, Cohen's $d=0.99$).

Conclusions: Lower FA between the amygdala and fusiform gyrus presents a possible marker to estimate socialization skill in a mixed group of participants with ASDs and controls. Mean socialization skill scores were significantly lower for participants with ASDs. Consistent with previous findings (Conturo, 2008; Smith, 2009), white matter quality between the amygdala and fusiform gyrus emerges as an important factor in understanding social deficits.

Correspondence: *Ryan Brewster, Georgia State University, 1114 Westshire Place NW, Atlanta, GA 30318. E-mail: rbrewst@gmail.com*

K.S. CHIOU, E.J. BRYER, J. SLOCOMB & E.G. HILLARY. A Long-Term Longitudinal Examination of Brain Volume Change and Cognitive Functioning in Moderate to Severe Traumatic Brain Injury.

Objective: Quantitative brain volume changes have been established following traumatic brain injury (TBI) and are related to cognitive functioning (Bigler, 2007). However, less is understood about the trajectory of these changes as longitudinal studies remain sparse. Existing studies confirm a loss of brain volume over time (Bendlin, et al., 2008), but the course of long-term changes and resulting cognitive consequences beyond one year post-injury have not been examined. This study utilized voxel based morphometry (VBM) to investigate the influence of differing brain tissue volume and amount of change during different points of recovery on long-term cognitive outcome.

Participants and Methods: Using a 3T scanner, structural MRI data were collected from 7 participants with moderate and severe TBI at four timepoints (3, 6, 12, and an average of 48 months post-injury). Cognitive functioning was assessed at the fourth timepoint. Whole-brain gray and white matter (GM and WM) volumes were calculated from high resolution T1 scans. Volume changes were plotted and correlations analyses conducted.

Results: A trend of decreasing GM and WM was observed over time. WM volumes at 6 and 12 months post-injury, and GM at 48 months post-injury were significantly correlated with executive tasks. Only changes in volume occurring between 12 and 48 months post-injury were significantly correlated with cognitive functioning.

Conclusions: These findings suggest that long-term cognitive outcome is better predicted by brain volume during later stages of recovery, highlighting time as an important variable during the process of recovery. Further, gray/white matter changes over time may differentially influence cognitive functioning.

Correspondence: *Kathy S. Chiou, MS, Psychology, The Pennsylvania State University, 610 Moore Building, University Park, PA 16802. E-mail: ksc167@psu.edu*

H.B. CUNNINGHAM, D. PENNEY, R. DAVIS, J.J. TANNER, P.T. NGUYEN, N. SCHWAB, I. MALATY, M.S. OKUN, D. BOWERS, D.J. LIBON & C.C. PRICE. Clock Drawing in PD: What Makes the Clock Drawing Test Tick?

Objective: Processing speed is a hallmark characteristic of Parkinson's disease, yet behavioral-anatomical contributions to cognitive versus motor speed remains poorly understood. We examined the hypothesis that PD impacts cognitive slowing (millisecond "think" time) more than motor slowing ("ink" time) during the clock drawing test, and the relative contribution of subcortical, white matter, and cortical thickness to both time measures.

Participants and Methods: With IRB approval, non-demented idiopathic PD (n=37) and matched non-PD peers (n=39) completed a structural MR protocol and a clock drawing task using Digital Clock Drawing Test tools and software. MRI diffusion and volumetric regions of interest (frontal parietal thickness, thalamic, caudate volumes) were post-processed by trained and reliable raters ($r>.90$) aided by free-ware. Analyses controlled for head size. Regression analysis examined structural contribution to think and ink time on clock drawing.

Results: Groups matched on demographics. Clock drawing total think time was significantly longer than total ink time for PD and controls ($p's<.01$). For PD, thalamic volumes predicted total think time ($\beta=-.48$, $p=.008$). For controls, parietal thickness predicted total think time ($\beta=-.68$, $p=.006$). Ink time did not relate to any anatomical variables of interest.

Conclusions: Processing speed on the clock drawing task is largely dominated by think time for both PD and controls, but with different neuroanatomical contributions. PD think time related to thalamic volume, an essential structure for information filtering that can become compromised as part of the degenerative process. For controls, longer think time is associated with thinner parietal lobes, which are important structures for visuospatial/construction.

Supported by NINDS K23NS060660(CP)

Correspondence: *Holly B. Cunningham, University of Florida, 3813 SW 34th Street Apt 25, Gainesville, FL 32608. E-mail: holly@ufl.edu*

M.J. DIDDAMS, D.P. TERRY, C.C. FARACO & L.S. MILLER. Diffusion Tensor Imaging of Multiple Sport-related Concussive Injuries 6+ Months Post-concussion.

Objective: The effects of mild traumatic brain injury (mTBI), or concussion, have proven difficult to visualize with conventional MR and CT structural imaging. Diffusion tensor imaging (DTI) provides an alternative method of measuring microstructural white matter changes due to mTBI, but has previously focused primarily on the acute stage. This study examines the effects of multiple concussions on several diffusivity measures following a minimum of 6 months after any traumatic events.

Participants and Methods: Ten right-handed male athletes with history of at least two concussions and ten age, pre-morbid IQ, and athletic activity matched controls underwent neuropsychological assessment and DTI scanning. Images were preprocessed using FSL and analyzed with a voxel-wise comparison using Tract-Based Spatial Statistics to examine group differences in fractional anisotropy (FA), mean diffusivity (MD), radial diffusivity (RD), and axial diffusivity (AD). Subjects' diffusivity data was projected onto a mean FA tract skeleton before applying the voxelwise cross-subject statistics to both the whole brain and four a priori ROIs (the uncinate fasciculus, internal capsule, corpus callosum, and superior fronto-occipital fasciculus).

Results: Even at the trend level ($p<0.1$), no significant differences were found between groups in FA, MD, RD, or AD at the whole brain level or in any ROI. Further, t-tests showed no group differences for any index scores in the Repeatable Battery for the Assessment of Neuropsychological Status ($p=0.09-0.94$).

Conclusions: No significant differences were found between our two closely matched groups, suggesting that these young athletes' brains may have a resilience or capacity for recovery from white matter damage.

Correspondence: *Maxwell J. Diddams, BioImaging Research Center, University of Georgia, 300 N. College st, Northfield, MN 55057. E-mail: diddamsm@carleton.edu*

S.W. DUVALL, J. POMMY, R.A. YEO, A. CAPRIHAN, J. PHILLIPS, J. LOWE & R. OHL.S. Neuroanatomical Differences in Very Low Birth Weight (VLBW) and Full Term Preschoolers: A Voxel-Based Morphometry (VBM) Study.

Objective: Previous studies show neuroanatomical differences in older VLBW children with areas of gray matter reductions (temporal, frontal, parietal, cerebellum, caudate and putamen) and gray matter increases (parts of the frontal and temporal lobes, cingulate, fusiform gyri and parts of cerebellum) relative to controls. However, little research has examined potential brain volume differences in preschoolers; which could potentially illuminate the developmental trajectory of important group differences.

Participants and Methods: Neuroimaging data was obtained during sleep for 33 subjects, 11 full term and 22 VLBW preschoolers (mean=43.9 months). MRI scans occurred on a Siemens 3 T Trio TIM scanner. Sagittal T1-weighted anatomical images were obtained with a multi-echo 3D MPRAGE sequence. VBM analyses used SPM8 with a matched-sex template for five year-olds generated from Template-omatic for subsequent segmentation and normalization. Comparisons were performed with a two-sample t-test analysis; with age and sex as covariates. Uncorrected threshold p values were set at 0.001 with a voxel extent threshold of 10 or greater.

Results: Gray matter was negatively correlated with group (full term>VLBW) for bilateral temporal (middle, fusiform, superior), frontal paracentral, putamen, right inferior parietal and right cerebellum anterior lobe. Gray matter was positively correlated with group (VLBW>full term) for bilateral frontal (superior), occipital (lingual), right cerebellum, right occipital (fusiform, middle), left frontal (middle), left anterior cingulate, and left parahippocampal areas.

Conclusions: Structural brain differences exist between VLBW and full term preschoolers. Overall, structural volumes in the temporal and parietal areas were decreased and volumes in the frontal and occipital areas were increased in the VLBW group relative to controls. This pattern of results is consistent with the findings of prior studies in older children and adolescents. Correspondence: *Susanne W. Duvall, MS, Psychology, University of New Mexico, 1 University of New Mexico, Logan Hall, Albuquerque, NM 87131. E-mail: suduvall@unm.edu*

C.C. FARACO, A.N. PUENTE, A.L. WATTS & L.S. MILLER. RBANS Visuospatial/Constructional Scores and Anisotropy Changes in the Inferior Longitudinal Fasciculus in MCI Compared to Normal Older Adults.

Objective: The RBANS is designed to assess cognitive decline across individuals experiencing neurologic disease or injury, including dementia. Various studies have proven it to be useful in the neuropsychological screening of adults with dementia as well as those with mild cognitive impairment (MCI). With the advent of neuroimaging, it is important to determine the neuropathological changes that are indicated by reduced scores on the various RBANS indices. Here we took the 5 index scores from the RBANS and regressed them across diffusion tensor imaging (DTI) data from a group of controls and MCI adults to examine whether these indices indicated white matter related changes in MCI.

Participants and Methods: 33 adults (22 normal; 11 MCI) from the local community underwent a neuropsychological evaluation and MRI scanning. DTI data was processed using FSL's TBSS, and RBANS index scores were used as regressors to determine whether there were significant differences in the relationship between fractional anisotropy (FA) and radial diffusivity (RD) across white matters tracts of normals and MCI adults.

Results: Results indicated that only visuospatial/constructional (VSC) scores showed a significant difference ($p < .05$) in their relationship to FA of the right inferior longitudinal fasciculus (ILF) near the middle and superior temporal gyri. Neither immediate memory, delayed memory, attention, nor language scores were indicative of white matter changes across the groups.

Conclusions: Difference in FA seen in the ILF as related to VSC brings up some possibilities in regards to the neuropathological changes indicated by RBANS scores. Namely, that VSC skills as measured by the RBANS may be more prone to the influence of localized changes to white matter integrity, specifically in the right ILF. The absence of any notable FA or RD differences as related to the other 4 index scores across groups may suggest that these RBANS indices reflect global processes that propagate through various regions.

Correspondence: *Carlos C. Faraco, M.S., Biomedical and Health Sciences, University of Georgia, 310 McDuffie Dr., Athens, GA 30605. E-mail: cfaraco@uga.edu*

W. HAVINS, K.A. AGBAYANI, C. KARMONIK, Z. XUE, A. VERMA, M. KAWAI, R. GROSSMAN & M. DULAY. Cingulum Bundle (CB) and Uncinate Fasciculus (UF) Integrity and Neuropsychological Performance in Individuals with Temporal Lobe Epilepsy (TLE) and Comorbid DSM-IV Psychiatric Disorders.

Objective: Research suggests that the structural integrity of the CB and UF, white matter tracts that connect temporal and frontal lobes, may be related to cognitive and emotion processing. We compared the integrity of the CB and UF and neuropsychological performance between TLE patients with and without DSM-IV diagnosed depressive or anxiety disorders.

Participants and Methods: 21 patients (mean age of 35.4 years; 9 males) with intractable TLE (11 left-side foci; mean disease duration of 14.7 years) underwent DTI and neuropsychological evaluation. The BDI-II, BAI, and Mini International Neuropsychiatric Inventory defined psychological status. TrackVis software was used to manually trace CB and UF mean fractional anisotropy (FA).

Results: 29% of individuals met DSM-IV criteria for major depression, and 24% for an anxiety disorder. One-way ANOVA indicated that patients with major depression had reduced FA of the left CB compared to non-depressed patients (depressed mean FA=.49, not=.58; $F[1,16]=12.5$, $p=.003$), which approached significance for right CB FA ($p=.07$). Patients with an anxiety disorder had significantly reduced FA of the left CB (anxiety mean FA=.49, not=.57), right CB (anxiety mean FA=.52, not=.61), and left UF (anxiety mean FA=.44, not=.49; all $p's < .05$) compared to those without an anxiety disorder. Patients with major depression had significantly poorer scores on measures of cognitive speed, flexibility, naming, and recognition memory (all $p < .05$) compared to the non-depressed. Controlling for age and disease duration, poorer mood state was significantly correlated with reduced FA of left and right CB ($r=-.68$ and $-.56$, respectively, p values $< .05$).

Conclusions: CB and UF integrity is reduced and neuropsychological performance is impaired to a greater degree in individuals with TLE and comorbid DSM-IV psychiatric disorders compared to individuals without a psychiatric disorder. Results suggest that white matter integrity plays a role in emotional and cognitive impairments in individuals with TLE.

Correspondence: *Whitney Havins, B.A., University of Houston, 2305 Watson, Houston, TX 77009. E-mail: wharins615@gmail.com*

A.L. JEFFERSON, G. CHAPMAN, J. SPARLING, D. SEICHEPINE, K. GIFFORD, N. CANTWELL, B. MARTIN, V. DOBRMYSLIN & D. SALAT. A Semi-Automated Method for Quantifying Infarcts in Older Adults With and Without Dementia.

Objective: Infarcts are associated with worse cognition among older adults, particularly in the presence of Alzheimer's disease (AD) neuropathology. However, the gold standard for measuring infarcts via manual rating is a timely process. We sought to develop an efficient and reliable semi-automated method for quantifying infarcts among older adults.

Participants and Methods: Participants included 30 randomly selected individuals from the Alzheimer's Disease Neuroimaging Initiative, including 10 normal controls (76 ± 7 years), 10 mild cognitive impairment (MCI) participants (75 ± 9 years), and 10 AD participants (80 ± 8 years). A semi-automated process was used to quantify infarcts. 1.5T generated T1-, T2-, & PD-weighted images were coregistered and masked to the white matter in FreeSurfer, subtracting the subcortical

ribbon and periventricular region. After defining tissue abnormalities, a 3mm size threshold was applied to create infarct seeds, which were grown to include adjacent voxels meeting a lower threshold. The resulting infarct label was confirmed by 2 independent raters, blinded to clinical information.

Results: The automated algorithm produced numerous false-positive findings (31.7±9.7 infarcts/participant), which were manually removed. The raters' confirmation of infarcts was similar (i.e., rater one: 2.7±3.9 infarcts/participant; rater two: 2.5±4.1 infarcts/participant), resulting in strong inter-rater reliability for both number of infarcts ($r=0.98$, $p<0.0001$) and infarct volume ($r=0.98$, $p<0.0001$).

Conclusions: Data suggest our semi-automated method for infarct identification and volume quantification is reliable. Future studies are needed to better understand how infarcts relate to cognitive trajectory and diagnostic conversion in older adults at risk for decline.

Supported by: AG030962, HRC-08-88733, AG13846, AG034962, AG036697, American Federation for Aging Research

Correspondence: *Angela L. Jefferson, PhD, Boston University School of Medicine, 72 East Concord Street, B-7800, Boston, MA 02118. E-mail: angelaj@bu.edu*

M.A. LANCASTER, S. DURGERIAN, M. SEIDENBERG, J.L. WOODARD, K.A. NIELSON, J. SMITH, M.A. MATTHEWS, A.M. BUTTS, N.C. HANTKE & S.M. RAO. Longitudinal White Matter Changes and Cognitive Decline in Healthy Elderly.

Objective: Diffusion Tensor Imaging (DTI) studies have shown that significant alterations in white matter (WM) integrity differentiate healthy older adults from persons with Mild Cognitive Impairment (MCI) and Alzheimer's disease (AD). Most studies have been cross-sectional and have not related longitudinal DTI changes to cognitive change. We report changes in WM integrity and cognition in healthy older adults occurring over 18 months.

Participants and Methods: Sixty-seven cognitively intact elders underwent neuropsychological testing and DTI at baseline and after 18 months. Groups were based on change from baseline to follow-up on the Rey Auditory Verbal Learning Test (recall sum across trials 1-5, delayed recall) and Mattis Dementia Rating Scale-2. Declining participants ($N=22$) showed a minimum of 1 SD reduction on at least one cognitive measure, while Stable participants ($N=45$) showed comparable scores at both time points. WM regions-of-interest were derived from Freesurfer. RM-ANOVAs were conducted for fractional anisotropy (FA) in regions frequently identified in DTI studies of MCI and AD including transentorhinal cortex, temporal lobe, and posterior cingulate.

Results: Groups did not differ at baseline in age, education, cognition, FA, or WM volume. Significant 18-month reductions in FA were found for the Declining group only in the right hippocampal gyrus ($p=.005$), left middle temporal lobe ($p=.015$), and left fusiform gyrus ($p=.030$).

Conclusions: FA reduction was associated with cognitive decline in initially asymptomatic individuals in temporal lobe regions implicated in the pathogenesis of AD. Future research should examine WM changes in other brain regions and determine whether DTI diffusivity measures are related to cognitive decline.

Correspondence: *Melissa A. Lancaster, Rosalind Franklin University of Medicine and Science, 3615 N. Whipple St #3, Chicago, IL 60618. E-mail: melissa.lancaster@my.rfums.org*

L. LANGEVIN, C. BEAULIEU, B. GOODYEAR, S. CRAWFORD & D. DEWEY. Examining Common Structural Alterations of Cortical White Matter in Motor and Attention Disorders.

Objective: Attention Deficit Hyperactivity Disorder (ADHD) and Developmental Coordination Disorder (DCD) affect between 6-8% of children. ADHD is commonly found to co-occur with DCD and other neurodevelopmental disorders. Neuroimaging studies have suggested white matter alterations may underlie the symptomatology of these disorders; however this has not been fully elucidated. Our objective was to examine common alterations in behavioural function and white matter circuitry in children affected by isolated or co-occurring DCD, ADHD and other neurodevelopmental disorders.

Participants and Methods: Healthy and affected children ($n=80$, age range 8-17 years; mean 11.7 ± 2.9) participated in a neuropsychological assessment, and an MRI scan. The MRI scan was comprised of three functional tasks measuring response time, accuracy, and errors (misses and false alarms). A DTI scan was also completed to obtain structural information for brain white matter. Deterministic tractography was conducted using a multiple region of interest (ROI) approach.

Results: A k-means cluster analysis used for the neuropsychological measures revealed six clusters which were validated. Significant differences emerged among the clusters for overall misses in children affected by more than one disorder ($*p<.05$). DTI tractography analysis revealed increased diffusion in the corpus callosum for both DCD and ADHD groups compared to controls ($*p<.05$).

Conclusions: Similar alterations in behaviour and white matter structure were found within this sample of participants. These results are consistent with a common neurobiological basis among ADHD, DCD, and other neurodevelopmental disorders. Relating structural variations to co-occurring disorders will contribute to earlier identification and intervention for individuals affected by neurodevelopmental disorders. Correspondence: *Lisa Marie Langevin, Ph.D, Behavioural Research Unit, Alberta Children's Hospital, Fourth floor, BRU, 2888 Shaganappi Trail NW, Calgary, AB T3B 6A8, Canada. E-mail: lisamarie.langevin@albertahealthservices.ca*

M. MATSUI, A. UEMATSU, C. TANAKA, M.M. TANAKA, K. NOGUCHI, T. TAKAHASHI, H. NISHIJO & M. SUZUKI. Age-related volumetric changes of hippocampus and amygdala from healthy infants to adults.

Objective: It is important to know typical development of amygdala as well as hippocampus to examine whether human brain grows in healthy way. Nonetheless, the typical developments of amygdala and hippocampus have been still unclear because little studies measured amygdala and hippocampus in long life span from infancy. The purpose of this study was to make typical volumetric trajectories of amygdala and hippocampus from infancy to early adulthood by predicting sexual dimorphism and laterality.

Participants and Methods: Magnetic resonance imaging was performed on one hundred and thirty six healthy people aged one month to 25 years. Both amygdala and hippocampus were manually outlined based on the tracing guidelines. From the estimated cubic models, the peak ages and the local maximal volumes of each given regions were calculated in each of the whole, female, and male group. In addition, from the best characterized model, the differentiation (=growth change) were calculated every month.

Results: The present sample showed significant age-related changes in the volumes of all of the given regions. The developmental trajectories of the brain regions were best characterized by cubic model, showing robust changes in the beginning of life. The female group reached the local maximal volume faster than the male group in all regions but left hippocampus. In addition, all of the peak ages came at the timing of puberty (9-13 years old). In addition, sex differences and hemispheric differences in developmental trajectories were also found.

Conclusions: This study suggests the importance in the periods of infancy and early adolescence for neural developments. The findings of both sex and hemispheric differences could be one of the useful criterions to determine whether or not the brain is typically and normally developing. In addition, it will be helpful to understand the mechanisms of diseases whose onsets generally come at adolescence and whose prevalence is different between females and males.

Correspondence: *Mie Matsui, Ph.D., Department of Psychology, University of Toyama, 2630 Sugitani, Toyama 930-0194, Japan. E-mail: mmatsui@las.u-toyama.ac.jp*

I.B. MEIER, A. NARKHEDE, F.A. PROVENZANO, J.A. LUCHSINGER, J.J. MANLY, J.Z. WILLEY, A. VISWANATHAN, S. RAMIREZ-MARTINEZ, S.M. GREENBERG & A. BRICKMAN. Lobar microbleeds are associated with white matter hyperintensities and memory in older adults.

Objective: Recent work showed that white matter hyperintensities (WMH) are associated with incident Alzheimer's disease (AD) when

distributed in parietal lobes. Although WMH are thought to reflect ischemic changes, their association with AD suggests that they also reflect beta amyloid deposition. Microbleeds are hypointense areas on T2*-weighted images and putative markers of cerebral amyloid angiopathy (i.e., vascular amyloid) when distributed in lobar regions. It remains unclear, however, to what extent microbleeds are associated with cognition and with regional distribution of WMH. We sought to determine whether lobar microbleeds are associated with cognition and with regional WMH volume; here, we present preliminary results.

Participants and Methods: Magnetic resonance imaging with T1-weighted, T2*-weighted, and FLAIR sequences was acquired among participants in an ongoing study of aging and dementia. To date, microbleeds have been rated in 67 participants (age=85.00+/-15.43 years, 73% women). The group was divided into those with no lobar microbleeds (n=51), 1 lobar microbleed (n=8), and 2 or greater (n=8). Regional WMH volumes were derived with in-house software. Participants received a neuropsychological battery and summary measures for memory, language, executive functioning, and visuospatial functioning were derived. Cognition and regional WMH were compared across the three groups with MANOVA, controlling for age.

Results: Individuals with 2 or more lobar microbleeds had greater WMH volume, particularly in posterior regions, and poorer memory function. Mediation analysis suggested that parietal WMH volume mediated the association between lobar microbleeds and memory.

Conclusions: These preliminary results suggest a link between WMH and amyloid angiopathy. The association of lobar microbleeds and memory functioning among older adults appears to be mediated in part by parietal lobe WMH, raising the possibility that amyloid angiopathy may play a role in this process.

Correspondence: Adam M Brickman, Ph.D., Taub Institute, Columbia University, 630 West 168th Street, New York, NY 10032. E-mail: amb2139@columbia.edu

Y. MOLINA, R. CORREIA, D. FERREIRA, B. SEGURA, A. MACHADO, A. NIETO & J. BARROSO. Quantitative white matter and gray matter indexes and their relationship with frontal lobe performance in healthy middle-age and aging.

Objective: In normal aging, frontal lobes show age-related volume decrements compared with other brain regions. Moreover, aging is related to cognitive impairment in frontal functions. We aimed to study whether there is an association between neuroimaging data and frontal lobe functions.

Participants and Methods: Our sample comprised 30 participants. The middle-aged group (n=15) was from 40-56 years old and the elderly group (n=15) from 63-81 years old. They were submitted to neuropsychological assessment that comprised: phonetic, semantic and action fluency, Stroop test, premotor functions (Luria's motor alternations and motor coordination). Diffusion tensor imaging and 3D structural MRI data were acquired on a 3T Signa Excite HD and processed with FSL software.

Results: There were significant differences between groups in all neuropsychological tests. Greater fractional anisotropy (FA) and smaller gray matter (GM) volumes were found in the oldest group, particularly in anterior brain regions. Positive correlations between the most significant clusters of the FA indexes and of GM's volume and the following variables were also found: phonetic fluency (FA: $r=.421$; GM: $r=.480$); semantic fluency (FA: $r=.606$; GM: $r=.727$); action fluency (FA: $r=.383$; GM: $r=.479$); Stroop test (FA: $r=.363$; GM: $r=.490$); right motor alternation (FA: $r=.417$; GM: $r=.606$); left motor alternation (FA: $r=.495$; GM: $r=.607$); motor coordination (FA: $r=.423$; GM: $r=.543$).

Conclusions: Neuroimaging data showed a gradient of anteroposterior impairment mostly affecting frontal lobes. Also, neuropsychological results evidence frontal functions deficits. Therefore, our results support the hypothesis of anteroposterior decline in normal aging, from a functional and anatomical perspective, as well as from the relationship between both.

Correspondence: Yaiza Molina, Graduate, Department of Psychobiology and Methodology of Behavioural Sciences, University of La Laguna, Campus de Guajara, Faculty of psychology, La Laguna 38205, Spain. E-mail: ymolina@ull.es

P.T. NGUYEN, J.J. TANNER, W. TRIPLETT, T.H. MARECI & C.C. PRICE. Reliability and Validity of Diffusion Imaging Methods Assessing Caudate to Frontal Lobe Function.

Objective: Diffusion tensor imaging (DTI) examines white matter. Although effective at tracking directional regions, it is limited in regions with crossing fibers. The Mixture of Wishart (MOW) method is designed to provide better estimations of white matter. The present study examined a) reliability of both methods (DTI, MOW) and b) method's ability to identify dissociations in verbal fluency versus visuospatial function relative to left frontal-caudate connectivity.

Participants and Methods: Reliability for white matter and gray matter quantification in 10 separate MRI sessions was assessed in an individual. FA values of the corpus callosum, frontal white matter, and a phantom were also acquired. DTI and MOW metrics for left frontal-caudate connections were acquired in a separate sample of 16 non-demented Parkinson's and 17 matched-controls. All participants completed verbal fluency (COWA) and the judgment of line orientation (JLO).

Results: Diffusion and gray matter structural volumes were reliable (CV range = 1.4 to 2.0) across trials, although DTI and MOW edge weight values had two time points with noteworthy amounts of variance. Left hemisphere frontal lobe to caudate connections revealed a dissociation between COWA and JLO for both diffusion methods ($r = .28/.27$ and $r = .01/-.07$, respectively).

Conclusions: Gray matter volumes and FA values were consistent across all trials, although diffusion edge weight values displayed variability in two time points. Results suggest a relationship between left frontal lobe to caudate connectivity and verbal fluency, regardless of which diffusion method is used. No differences were found between the two imaging methods. Further studies are needed to fully assess the reliability and full utility of the DTI and MOW methods.

NINDS K23NS060660

Correspondence: Peter T. Nguyen, M.S., University of Florida, 1700 SW 16th Ct., P-2S, Gainesville, FL 32608. E-mail: peternguyen@phhp.ufl.edu

P.T. NGUYEN, M.A. FAUST, K.M. O'SULLIVAN, J.J. TANNER & C.C. PRICE. A Comparison of Three Dorsolateral Prefrontal Cortex Regions.

Objective: The dorsolateral prefrontal cortex (DLPFC) is a cortical region associated with executive tasks on fMRI. However, as a functionally activated region, there is heterogeneity in the literature regarding the DLPFC's anatomical boundaries. This has implications for examining DLPFC - cognitive associations with structural imaging investigations. The current study examined rater reliability for manually acquiring left DLPFC regions using three published neuroanatomical guidelines (Tisserand, 2002; Ranta, 2009; Al-Hakim, 2006). It was hypothesized that techniques that provide with convenient landmarks (e.g., Tisserand) would result in highest reliability.

Participants and Methods: A set of 10 T1-volumetric scans were chosen from a larger database. Inter-rater reliability: Two raters used ITK-SNAP (<http://www.itksnap.org>) to acquire DLPFC ROIs based on anatomical boundaries of three methods. Intra-rater reliability: Raters independently measured each brain twice for each technique (60 per rater). Dice similarity coefficients (DSC) were calculated and averaged to examine three-dimensional spatial overlap of the ROIs.

Results: Inter-rater and Intra-rater values were lowest for the Ranta method and highest for the Tisserand method. DSC values for intra-rater reliability of all three DLPFC methods ranged from .897 to .942. Inter-rater reliability ranged from .830 to .926. Although the methods share a central region, volumes between methods did not correlate (r-values ranged from .129 to .375).

Conclusions: DLPFC regions can be reliably acquired manually, regardless of neuroanatomical definition used. The next step is to examine the validity of DLPFC regions on the bases of its functional associations. Increased validity of DLPFC boundaries may provide a method for assessing DLPFC differences without necessitating fMRI sequences. NINDS K23NS060660

Correspondence: *Peter T. Nguyen, M.S., University of Florida, 1700 SW 16th Ct., P-28, Gainesville, FL 32608. E-mail: peternguyen@phhp.ufl.edu*

J.J. TANNER, K.M. O'SULLIVAN, P.T. NGUYEN, W. TRIPLETT, T.H. MARECI & C.C. PRICE. Reliability of Automated Versus Manual Regions of Interest: Implications for Fiber Tracking.

Objective: Examining brain-behavior relationships requires consistent and accurate imaging methodology. We compared commonly used automated segmentation software (FreeSurfer) to rater-cleaned structures for differences in a) volume and b) resulting fiber connectivity measurements. We focused on two important subcortical structures that contribute to cognitive and motor profiles of Parkinson's disease (PD) and are necessary for tracking frontal-subcortical fiber connectivity: globus pallidus and caudate. **Participants and Methods:** One male (age=37) received 10 3T MRI within a 30-day period. We acquired two T1s and diffusion-weighted imaging (DWI). ROIs of the caudate and globus pallidus (GP) were acquired from FreeSurfer and then corrected for errors by a manual rater. DWI imaging was processed using a mixture of in-house software and outside freeware; fiber tracking was based on a mixture of Wishart method. Coefficient of variation (COV), spatial overlap (Dice Similarity Coefficient; DSC), and edge weight (EW; fiber connectivity strength) statistics were calculated.

Results: Intra-rater reliability was high for all ROIs: (DSCs>0.92). Inter-rater reliability was established between the trained rater and FreeSurfer (DSCs>0.80). There was stability in calculated volumes across all brains: GP (FreeSurfer: COV=1.8%; Rater: COV=3.3%) and caudate (FreeSurfer: COV=1.7%; Rater: COV=1.9%). For fiber tracking, EW between caudate and GP was most stable for cleaned ROIs (COV = 19.25%). EWs for fully automated ROIs and a mixture of automated and cleaned ROIs showed more variability (COV range = 37% to 46%).

Conclusions: Segmented GP and caudate volumes were reliable and stable using automated FreeSurfer methods. For fiber tracking, however, while FreeSurfer provides reasonable output for tracking, higher reliability was identified using rater cleaned ROIs. We recommend cleaned ROIs for fiber tracking.

Supported by NINDS K23NS060660(CP)

Correspondence: *Jared J. Tanner, MS, Clinical & Health Psychology, University of Florida, P.O. Box 100165, Gainesville, FL 32610. E-mail: jjtanner@phhp.ufl.edu*

J.A. RAO, L. WANG, S. WEINTRAUB, M. MESULAM & E. ROGALSKI. Hippocampal Volume in SuperAging: A Preliminary Report.

Objective: SuperAgers are 80+ year-old individuals who perform equivalently to 50-65 year-olds on episodic memory tests and are intact in all other cognitive domains. Because of the hippocampus' critical role in episodic memory, examining SuperAgers' hippocampal volumes may provide insight into their exceptional episodic memory skills. Decreased hippocampal volume has been observed over the lifespan in healthy individuals, more significantly in MCI and Alzheimer's disease, and is predictive of the conversion from MCI to AD. In this preliminary study, we hypothesized that SuperAgers' exceptional episodic memory performance is mediated by hippocampal volumes that would more closely resemble those of healthy 50-65 year-olds than cognitively intact 80 year-olds with age-appropriate memory.

Participants and Methods: Hippocampal volumes were calculated from structural MRI scans with a combination of automated and manual methods using Analyze software. Sample consisted of five SuperAgers (mean age = 83), five healthy 50-65 year-olds (mean age = 59), and five cognitively intact 80 year-olds (mean age = 82). Left and right hippocampi were adjusted for intracranial volume and averaged.

Results: A significant hippocampal volume group effect was observed ($p = 0.017$). Post-hoc analyses indicated that the two 80 year-old groups had smaller hippocampal volumes than the 50-65 year-old group. No difference in hippocampal volumes was observed between the two 80 year-old groups.

Conclusions: Contrary to our prediction, the exceptional episodic memory of SuperAgers may not be explained by slowed hippocampal atrophy. Although more subjects are needed, this finding suggests that hippocampal volume may not be the only promoter of preserved memory in high functioning elders.

Correspondence: *Julia A. Rao, M.S., Clinical Psychology, Northwestern University, 320 E Superior St., Searle 11-467, Chicago, IL 60611. E-mail: jarao@u.northwestern.edu*

T. RICKARDS, C. STERLING, M.J. GRAHAM, V.W. MARK, G. USWATTE, E. TAUB & D. DAVIS. Motor Functioning in Children with Cerebral Palsy: A Diffusion Tensor Imaging Study.

Objective: To elucidate the relationship between integrity of the corticospinal tract (CST) and global white matter areas and motor ability in upper extremity functioning in a population of children with hemiparesis due to cerebral palsy (CP).

Participants and Methods: Ten children (38.6±19.0 months) with congenital hemiparetic CP were administered measures of upper-extremity functioning. Diffusion Tensor Imaging (DTI) was performed; the FA values obtained were used to assess CST and whole brain white matter (WM) integrity. Real-world hemiparetic arm use was measured with the Pediatric Motor Activity Log (PMAL) and the limb preference measure of the Pediatric Arm Function Test (PAFT).

Results: There was a difference in FA values between the ipsilesional and contralesional hemispheres ($t(8)=2.166, p = 0.058$) and tractography-based DTI showed a difference between the two CSTs ($t(8)=3.921, p = 0.004$). FA value of the contralesional and ipsilesional CST correlated with spontaneous hemiparetic arm use ($r(7)=-.768, p < .05$; $r(7)=-.762, p < .05$). Greater FA value asymmetry between the CSTs was marginally correlated with poorer real-world hemiparetic arm use ($r(7)=-.636, p = 0.09$). Also, those with distorted and displaced CSTs had worse motor scores than those with unaltered CSTs.

Conclusions: Children with CP who have greater global WM integrity and greater bilateral WM integrity of the CSTs exhibit greater use of their hemiparetic arm more frequently. WM integrity may be an important component to examine in other rehabilitation areas: for example, more purely "cognitive" (e.g. memory) or aphasia applications.

Correspondence: *Tyler Rickards, B.S., University of Alabama-Birmingham, 606 patton chapel trail, Hoover, PA 35226. E-mail: tyler.rickards@gmail.com*

K. SMITH & T. KING. White Matter Connectivity and Word Reading in Typically Developing Young Adults.

Objective: FMRI studies of word decoding have established a reliable network of left hemisphere regions responsible for skilled reading including the Inferior Frontal Gyrus (IFG) and the temporoparietal area. The purpose of this study was to examine white matter connections between two reading areas: IFG defined as Broca's area and the Angular gyrus within the temporoparietal region.

Participants and Methods: Participants included 19 undergraduates screened for psychiatric and neurological conditions, average age 21.64 (SD=4.89), 68% female, 26% Caucasian, 37% African American, 5% Asian and 32% Other. Diffusion tensor imaging data from a Siemens 3T MRI was processed using the FSL FDT toolbox. Probabilistic tractography was used to generate a connectivity distribution between two left hemisphere seed masks: Broca's area and Angular gyrus, obtained from the Jülich Histological Atlas. Average Fractional Anisotropy (FA) of tract output (50% threshold) was calculated. Word reading was measured by Letter-Word Identification of the WJ-III.

Results: Tract mean FA value was .35 (SD=.05) and mean word reading (WJ-III Letter-Word Identification) standard score was 101.37 (SD=7.55). Bivariate correlation between FA and word reading scores was significant ($r=.45$, $p=.05$). FA did not correlate with Grooved Pegboard, a task unrelated to reading ($r=.23$, $p>.05$).

Conclusions: The significant association between white matter integrity between Broca's area and the Angular gyrus and word reading skill suggests connectivity between these regions may be important for reading. Examining the white matter integrity between functional reading areas will be important for understanding the organization of the reading system within the brain for typical readers and populations with reading difficulty.

Correspondence: *Kristen Smith, B.A., Psychology, Georgia State University, 140 Decatur St, Atlanta, GA 30303. E-mail: kmscl27@gmail.com*

M.A. SUGARMAN & J.L. WOODARD. Structural Correlates of Verbal Working Memory and Delayed Episodic Recall.

Objective: Alzheimer's disease is characterized by cortical and hippocampal atrophy, in addition to episodic and working memory impairment. Hippocampal atrophy correlates with memory performance in older adults with or without dementia. We investigated the relationship between volumetric measurements of several brain regions and indices of verbal working memory and delayed episodic memory performance.

Participants and Methods: Study participants included probable Alzheimer's patients ($n=15$, Age=69.4 years) and age, gender, and education matched cognitively intact controls ($n=13$, Age=70.4 years). All participants completed three 5- and 10-word working memory word rehearsal tasks, followed by a delayed free recall of the word lists. Structural magnetic resonance imaging scans for each participant were analyzed using Functional MRI of the Brain's Integrated Registration and Segmentation Tool (FIRST), producing volumetric measures of total white and gray matter (corrected for total intracranial volume), hippocampus, caudate, thalamus, putamen, amygdala, accumbens, pallidum, and brainstem.

Results: For all participants, total gray matter, combined white and gray matter, hippocampus, and brainstem volume were all significantly correlated with the number of unique words verbally rehearsed during the working memory task and delayed episodic recall performance. Caudate volume was only correlated with episodic memory ($r>=.33$ and $<=.60$ for all significant correlations).

Conclusions: These results suggest that volumetric measures of global atrophy and atrophy of the hippocampus, brainstem, and caudate may be valid measures of memory functioning and impairment in older adults. The observed effects are detectable with an automated segmentation procedure and do not require time-intensive manual tracing, which is an advantage of this tool.

Correspondence: *Michael A. Sugarman, BS, Psychology, Wayne State University, 10505 Borgman Ave, Huntington Woods, MI 48070. E-mail: mike.sugarman@wayne.edu*

Paper Session 7: Traumatic Brain Injury (Adult)

Moderator: Elisabeth Wilde

3:15–4:45 p.m.

H.M. GENOVA, J. LENGENFELDER, G. VOELBEL, G. WYLIE, M.J. HOPTMAN, J. DELUCA & N. CHIARAVALLOTI. Longitudinal Relationship between White Matter Integrity and Cognitive Decline in Chronic Traumatic Brain Injury (TBI).

Objective: One of the most troubling forms of disability following a moderate to severe TBI is long-term, chronic cognitive dysfunction. Cognitive outcome in chronic TBI however, is quite variable and a full understanding of this variability has eluded scientists for decades. There is a paucity of research on the relationship between white matter integrity and longitudinal cognitive patterns in TBI.

Participants and Methods: In the current study, we examined the relationship between cognitive performance and Fractional Anisotropy (FA) in white matter tracts between two time points, separated by 3 years in a sample of individuals with moderate to severe chronic TBI.

Results: We found reductions in FA from Time Point 1 to Time Point 2 in the TBI sample in several white matter regions, including the corpus callosum. Cognitive performance across the two time points was variable; some individuals showed a significant decline in the domains of processing speed, working memory and new learning. Additionally, we used tractography to isolate white matter tracts and found that FA in the genu of the corpus callosum at time point 1 correlated significantly with longitudinal cognitive decline in several tests including digit span, trail-making and CVLT.

Conclusions: These findings indicate that cognitive decline continues to occur in some chronic TBI subjects, and that this decline may be related to white matter reductions over time. These findings indicate the predictive ability of DTI which could contribute to our understanding of the long-term cognitive effects following TBI and help to develop rehabilitation strategies to improve cognition.

Correspondence: *Helen M. Genova, Ph.D., Kessler Foundation Research Center, 300 Executive Dr., Suite 70, West Orange, NJ 07052. E-mail: hgenova@kesslerfoundation.org*

E.J. BRYER, J.D. MEDAGLIA, S. ROSTAMI & F.G. HILLARY. Patterns of Brain Activation in Individuals with Mild TBI During Executive Working Memory Tasks.

Objective: Approximately 1.7 million people are affected by TBI annually in the United States. Individuals with TBI often have deficits in processing speed and working memory following injury and there is a growing literature using functional imaging studies to document these deficits. The purpose of this meta-analysis is to observe the trends in results from brain imaging studies examining working memory dysfunction after TBI. Findings in this literature to date have been inconsistent, demonstrating both hypo- and hyper-activation of prefrontal cortex.

Participants and Methods: Across twelve research studies, a total of 196 individuals who sustained mild TBI were assessed with functional MRI as they performed executive tasks. Frequencies and regions of hypo- and hyper-activity were recorded.

Results: 50% of individuals with mild TBI exhibited hypo-activity in regions in the prefrontal cortex; hypoactivity was only observed in tasks that were discrete in nature such as the presentation of standard stimuli and during periods of attentional disengagement. 75% of individuals with mild TBI experienced hyper-activity when performing continuous tasks. Similar trends were observed as cognitive load increased to include more difficult tasks featuring encoding, sequencing and processing of novel stimuli. Areas commonly involved with hyper-activation included the hippocampus, cerebellum and parietal, prefrontal, and temporal cortices.

Conclusions: The distinction between hypo-activation and hyper-activation during working memory tasks in individuals with mild TBI was dependent on the type and load of the executive task. Findings here may help to explain what have appeared to be inconsistent results in the literature. Understanding the relationship between activation patterns and regions of neural recruitment associated with varying cognitive loads may lead to innovative treatment options oriented at complex neurobehavioral recovery from TBI.

Correspondence: *Emily J. Bryer, Psychology, The Pennsylvania State University, 237 Panofsky Hall, University Park, PA 16802. E-mail: ejb5192@psu.edu*

J.L. PONSFORD, K. SINCLAIR, S.W. LOCKLEY & S.M. RAJARATNAM. Light Therapy for Treatment of Fatigue and Sleepiness Following Traumatic Brain Injury.

Objective: Fatigue and sleep disturbances are common and persistent complaints following Traumatic Brain Injury (TBI), affecting daily function and quality of life. Effective treatment is not well established. Short

wavelength (blue) light exposure has demonstrated potency for acute subjective and physiological alerting effects, circadian phase shifting and mood enhancement. The present study investigated the effects of 4 weeks of short-wavelength light therapy (LT) on fatigue and excessive daytime sleepiness (EDS) following TBI.

Participants and Methods: Using a randomised, placebo-controlled design, a 4-week, 45min/day 'at-home' treatment with short wavelength (blue) light therapy was compared with yellow light therapy or treatment as usual in 27 individuals (9,9,9) with TBI who self reported fatigue and/or EDS. Subjective assessments on the Fatigue Severity Scale (FSS) and Epworth Sleepiness Scale (ESS) were completed at baseline (week 0), mid-way through and at the end of LT (weeks 4 & 6), and again 4 weeks following cessation of LT (week 10).

Results: After controlling for age, gender and baseline anxiety and depression, the mean decrease in fatigue on FSS (from baseline) across the 4-week treatment phase was highest in the blue group, compared with yellow or treatment as usual at week 4 ($p=.03$) and week 6 ($p=.02$). The mean decrease in EDS on ESS was also highest in the blue group compared with other groups at week 4 ($p=.04$), although group differences were not significant at week 6 ($p=.57$).

Conclusions: Preliminary findings suggest that short wavelength light may be effective in alleviating fatigue and EDS following TBI. The trial is ongoing.

Correspondence: *Jennie L. Ponsford, PhD, Monash University, Wellington Road, Clayton, Melbourne, VIC 3800, Australia. E-mail: jennie.ponsford@monash.edu.au*

K. DAMS-O'CONNOR, L.E. GIBBONS, E.B. LARSON & P.K. CRANE. Late-life Re-injury and Dementia among Individuals with Traumatic Brain Injury.

Objective: The long-term consequences of traumatic brain injury (TBI) are poorly understood, and the relationship between TBI and dementia remains unclear. The current study measures risk for late-life re-injury and dementia associated with self-reported TBI with loss of consciousness (TBIwLOC).

Participants and Methods: Ongoing longitudinal population-based prospective cohort study (Adult Changes in Thought (ACT) study). 4225 individuals who were aged 65 and older and dementia-free at baseline were followed for an average of 7.4 years (range 0-16 years). 606 (14%) reported a lifetime history of head injury with loss of consciousness at the time of enrolment. Data were collected on self-reported TBIwLOC after study entry, incident all-cause dementia by DSM criteria, and possible or probable Alzheimer's disease by NINCDS-ADRDA criteria.

Results: A lifetime history of TBIwLOC reported at the baseline study visit was associated with increased risk for TBI during follow-up, particularly among individuals who reported first injury after age 55 ($p<0.0001$). Report of a TBIwLOC at baseline was not associated with elevated risk for developing subsequent dementia, controlling for age, gender, education and carrying APOE ϵ 4, though there was a suggestion that recent TBI may be hazardous for people with any APOE ϵ 4 alleles ($p=0.06$).

Conclusions: Individuals with lifetime history of TBIwLOC were at increased risk of subsequent TBIwLOC, but were not at increased risk of dementia. People with recent TBIwLOC and APOE ϵ 4 appeared to be at higher risk of dementia, though not statistically significant. Further investigation of the consequences of recurrent TBIwLOC in community-based samples is warranted.

Correspondence: *Kristen Dams-O'Connor, Ph.D., Rehabilitation Medicine, Mount Sinai School of Medicine, One Gustave Levy Place, Box 1240, New York, NY 10029. E-mail: kdams13@gmail.com*

S.R. MCCAULEY, M. SHERER & T. HART. Neuropsychological Correlates of Early Impaired Self-Awareness Following Traumatic Brain Injury.

Objective: Impaired self-awareness (ISA) is a common sequelae following traumatic brain injury which negatively impacts participation in

rehabilitation and limits post-acute functional outcomes including employment. Previous studies have reported conflicting relations between ISA and several areas of cognitive functioning. To clarify this issue, we used a prospective design to assess persons with moderate-to-severe traumatic brain injury during inpatient rehabilitation.

Participants and Methods: Participants were persons with moderate or severe TBI admitted to one of two inpatient brain injury rehabilitation programs during the study period. Most participants were also enrolled in the TBI Model Systems national database study. We assessed 165 persons with a brief neuropsychological test battery including: Logical Memory, Rey Auditory Verbal Learning Test, Wisconsin Card Sorting Test, the Modified Six Elements Test, Dual Task Procedure, Trail Making Test, and the Controlled Oral Word Association Test.

Results: The battery was subjected to a principal components analysis which yielded four factors: 1) memory, 2) strategic multitasking, 3) alternating attention, and 4) concept formation. Spearman correlations between the Awareness Questionnaire (AQ) total score and the neuropsychological factor scores revealed significant associations for the factor scores of memory ($p < .0001$) and strategic multitasking ($p < .0001$). Multivariate linear regression analysis indicated that only the memory ($p < .005$) and strategic multitasking ($p < .04$) factor scores were significant predictors of early ISA after accounting for variables of injury severity, demographics, and functional independence.

Conclusions: Episodic memory and executive functions are important factors contributing to early ISA.

Correspondence: *Stephen R. McCauley, PhD, Physical Medicine and Rehabilitation, Baylor College of Medicine, 1709 Dryden Rd. Ste. 1200, Houston, TX 77030. E-mail: mccauley@bcm.edu*

Symposium 10: Recent Advances in the Study of Fatigue

Chair: Helen Genova

Discussant: John DeLuca

3:30–5:00 p.m.

H.M. GENOVA, J. DELUCA, P. ARNETT, G. WYLIE, H.M. GENOVA & D. COOK. Recent Advances in the Study of Fatigue.

Symposium Description: Fatigue is a significant and prevalent symptom in multiple clinical populations, including Multiple Sclerosis (MS), Traumatic Brain Injury (TBI) and Chronic Fatigue Syndrome (CFS). However, for over 100 years, scientists have had difficulty identifying an objective measure of fatigue. In the current symposium, recent advances in the study of cognitive fatigue will be presented, including the examination of induced fatigue and neural activity using various functional imaging techniques. Further, the relationship between brain structure and fatigue will be examined in clinical populations. First, a model for studying cognitive fatigue in sports concussion will be discussed involving a relationship between increased self-reported fatigue, decreases in task performance and changes in EEG activity. A discussion will follow examining cognitive fatigue in individuals with moderate to severe TBI, and neural networks of fatigue investigated using fMRI during n-back performance. MS findings will be discussed in which cognitive fatigue was induced using a processing speed task, while fMRI was used to correlate self-reported fatigue with changes in BOLD activation. Diffusion Tensor Imaging (DTI) findings will be discussed relating self-reported fatigue and white matter integrity in MS. Finally, CFS-related fatigue will be examined using both structural and functional neuroimaging methods. Interestingly, using common neuroimaging methodology to induce fatigue across several clinical samples yields consistent findings, indicating that these new advances are helping to uncover a "fatigue neural network" which includes regions such as the basal ganglia. A general discussion will follow as to the potential of neuroimaging methods to be used as a fatigue biomarker.

Correspondence: *Helen M. Genova, Ph.D., Kessler Foundation Research Center, 300 Executive Dr., Suite 70, West Orange, NJ 07052. E-mail: hgenova@kesslerfoundation.org*

P. ARNETT, F.H. BARWICK & S.M. SLOBOUNOV. Multimodal Assessment of Fatigue During a Typical Sports Concussion Neuropsychological Testing Battery.

Objective: Mental fatigue, a poorly understood symptom of sports-related concussion, ideally requires assessment across multiple modalities. Our study aimed to examine mental fatigue effects among ten neurologically normal, athletically active participants undergoing typical concussion testing as a template for examining mental fatigue in concussed athletes.

Method: Fourteen neurologically normal volunteers were initially recruited from a large state university. Self-reported fatigue, neuropsychological (NP) performance, and electroencephalographic (EEG) activity were measured. EEG measures in frequency domain (e.g., relative power of theta, alpha & beta bands) were examined over the course of NP test administration.

Results: Over the course of testing we found significantly increased (a) self-reported fatigue, (b) errors on the Stroop Interference Test, (c) and relative power of theta activity during the Stroop Interference Test in frontal-central and parietal regions. Also, there was evidence for migration of alpha activation from the occipital to anterior (left parietal and pre-central) regions during the Stroop Interference task administered at the beginning compared with the end of testing.

Conclusions: Our results supported predictions related to subjective fatigue and cognitive performance and provided some support for predictions related to EEG activation patterns during NP testing. Neurologically intact and athletically active college students demonstrated fatigue effects after undergoing a typical sports concussion assessment battery, including an increase in subjectively experienced fatigue, a decrease in cognitive task performance accuracy, and modulation in EEG activity. Broader implications of our findings for sports concussion testing and understanding neural fatigue will be discussed.

Correspondence: *Peter Arnett, 0522 MOORE BLDG, University Park, PA 16802-3106. E-mail: paa6@psu.edu*

G. WYLIE, H.M. GENOVA, J. DELUCA & N. CHIARAVALLOTI. An investigation of cognitive fatigue in Traumatic Brain Injury using functional magnetic resonance imaging.

Objective: Cognitive fatigue has been shown to be one of the most prevalent, debilitating, and persistent sequelae of a Traumatic Brain Injury (TBI). Despite this, research has failed to find the underlying causes of such fatigue. In previous work, we have investigated the use of changes in the BOLD signal over time as an objective measure of cognitive fatigue, with strongly encouraging results.

Methods: In the current study, we extended our previous work and inter-related subjective and objective measures of fatigue by relating brain activity changes during performance of the n-back task (using fMRI) and subjective fatigue (assessed by self-report measures).

Results: Our results showed that subjective reports of fatigue correlated with changes in brain activity in several regions that have been shown to be associated with fatigue. These included medial frontal areas and areas in the basal ganglia.

Conclusions: These findings represent the first evidence, to our knowledge, for an objective measure of cognitive fatigue in TBI that correlates with subjective fatigue, using fMRI. This is critical, as an objective measure of fatigue has eluded scientists for over a century. The development of an objective measure of fatigue will allow fatigue to be manipulated and studied, thus opening the door to valuable advances in public health.

Correspondence: *Glenn Wylie, 300 Executive Dr., Suite 70, West Orange, NJ 07052. E-mail: dcook@education.wisc.edu*

H.M. GENOVA, G. WYLIE, N. CHIARAVALLOTI & J. DELUCA. Examination of Cognitive Fatigue in Multiple Sclerosis Using Neuroimaging.

Objective: Fatigue is highly prevalent in MS. Cognitive fatigue, specifically, is poorly understood, as self-reports of fatigue have consistently failed to correlate with behavioral performance on cognitive tasks. In the current study, we examined the relationship of self-reported fatigue during performance of cognitively fatiguing task and BOLD activity, measured by fMRI. Additionally, the relationship between self-reported fatigue and white matter integrity in MS was also examined using Diffusion Tensor Imaging (DTI).

Methods: Cognitive fatigue was induced through performance of a cognitively fatiguing task, a modified version of the Symbol Digit Modalities Task (mSDMT). After each of the 4 blocks of the mSDMT, subjects were asked to report their fatigue using a Visual Analogue Scale of Fatigue (VAS-F). The relationship between the BOLD signal and subjective ratings of fatigue were assessed using a regression analysis (deconvolution). Changes in subjective fatigue were included as amplitude modulated regressors. This resulted in coefficients of fit that represent where subjective reports of fatigue predicted changes in the BOLD response.

Results: Findings indicated that there were significant relationships between BOLD activation and self-reported fatigue in basal ganglia and parietal regions during performance of the task. Additionally, self-reported fatigue was related to white matter integrity in several tracts including the anterior limb of the internal capsule.

Conclusions: Findings indicate that fMRI and DTI are appropriate tools for studying cognitive fatigue. Further, a neural network of fatigue was found to exist in several brain regions including the basal ganglia.

Correspondence: *Helen M. Genova, 300 Executive Drive, Suite 70, West Orange, NJ 07052. E-mail: hgenova@kesslerfoundation.org*

D.B. COOK. Can Functional Neuroimaging Data Serve as a Biomarker for Chronic Fatigue Syndrome?

Objective: This presentation will provide an overview of brain imaging research in chronic fatigue syndrome (CFS) with a particular emphasis on functional neuroimaging studies using fatigue provocation to better understand the neurobiology of fatigue. Studies employing various brain imaging modalities in CFS will be reviewed. Research employing cognitive tasks to induce feelings of fatigue will be detailed.

Methods: Literature concerning brain imaging and chronic fatigue syndrome was critically reviewed. For the fatigue provocation study, nine CFS patients and eleven controls completed a finger tapping task, a simple auditory monitoring task and a challenging working memory task, designed to induce mental fatigue, while undergoing functional magnetic resonance imaging (fMRI). Fatigue was measured prior to scanning and following each task during fMRI data collection.

Results: Studies examining brain structure, perfusion and metabolism in CFS have been equivocal. Studies of gray matter volume have consistently reported atrophy. fMRI data demonstrated that mental fatigue was significantly related to brain activity during the fatiguing cognitive task but not during non-fatiguing tasks. CFS participants did not differ from controls for either non-fatiguing tasks, but exhibited significantly greater activity in several cortical and subcortical regions during the fatiguing cognitive task.

Conclusions: Resting state studies of CFS have not reported consistent abnormalities in brain structure or perfusion, but gray matter volume appears reduced. Results using fatigue provocation demonstrate that ratings of mental fatigue are significantly related to brain activity associated with mentally fatiguing cognition and that chronic levels of fatigue are associated with exaggerated neural responses in several brain regions.

Correspondence: *Dane B. Cook, 2033 Gymnasium-Natorium, 2000 Observatory Dr, Madison, WI 53706. E-mail: dcook@education.wisc.edu*

**Poster Session 9:
Aging/HIV, AIDS, and Infectious Disease**

3:30–5:00 p.m.

Aging

K.A. AGBAYANI & M. HISCOCK. Patterns of Age-Related IQ Changes after Adjustment for the Flynn Effect.

Objective: Studies of cognitive decline with age are often cross-sectional in nature, and findings from such studies thus are potentially confounded by cohort, or Flynn, effects. Previous studies have found that the Flynn effect accounts for at least 48%, and as much as 100%, of the difference between norms for 20- and 70-year-olds on the Wechsler intelligence tests. The purpose of the current study is to obtain a true aging effect (TAE) for each of the 11 subtests of the Wechsler intelligence tests by replicating and comparing norms for different age groups and adjusting them for the Flynn effect.

Participants and Methods: The following age groups were compared: 16- and 66-year-olds, 16- and 74-year-olds, and 30- and 50-year-olds. Individual subtest scores from Wechsler Adult Intelligence Scale-Revised (WAIS-R) and Wechsler Adult Intelligence Scale-Third Edition (WAIS-III) norms were obtained for each age group in order to decompose changes in performance into a component attributable to the Flynn effect and a component attributable to aging.

Results: The Flynn effect was found to account for 100% of the difference in normative performance on the WAIS-R and WAIS-III between each of the age groups compared. When collapsed across versions of the Wechsler tests and divided into Verbal and Performance scales, an overall TAE of +2.3 scaled score units (+11.5 IQ points) per 50 years was found for Verbal subtests, as compared with an overall TAE of -0.7 scaled score units (-3.5 IQ points) for Performance subtests.

Conclusions: Results are consistent with previous findings of a large contribution of the Flynn effect to age differences in norms for the Wechsler IQ tests. The Flynn effect appears to be masking overall gains by older age groups on Verbal scale subtests while exaggerating their declines on Performance scale subtests. The modest true aging effects (TAEs) indicate that IQ actually remains relatively stable, on average, across a large segment of the lifespan.

Correspondence: *Kristina A. Agbayani, BA, University of Houston, 7009 Almeda Rd., Apt. S35, Houston, TX 77054. E-mail: kaagbayani@gmail.com*

F.S. AHMED & L. MILLER. Proverb Interpretation Relationship to Functional Independence in a Community-Dwelling Older Adult Population.

Objective: Executive functioning (EF) is our current best cognitive predictor of functional decline. In this study, we examined proverb interpretation. This refers to the ability to deduce abstract meanings from common sayings and has been conceptualized as EF. We examined whether ToM and proverbs would account for additional and meaningful variance in functional ability above and beyond traditional domains of cognitive flexibility and inhibition.

Participants and Methods: 43 older adults were recruited. They were administered the D-KEFS Proverb test, Trails and Color-Word Interference Test, and the Independent Living Scales (ILS).

Results: Hierarchical regression revealed that after controlling for age, proverb interpretation accounted for significant variance in functional ability ($\beta = 1.47, p < .01$). Cognitive flexibility was also significant ($\beta = 1.26, p < .01$) but inhibition was not.

Conclusions: Results suggest that proverb interpretation and cognitive flexibility both accounted for variance in functional ability as measured by the ILS. Inhibition's lack of significance may have been as a result of the structure of the ILS, which may not have relied as heavily on

inhibition than on the ability to think abstractly and flexibly. Our results suggest that it may be beneficial to include a measure of proverb interpretation as part of a neurocognitive assessment of older adults. Future group analyses with clinical populations should be the next step in evaluating the usefulness of proverb interpretation tests.

Correspondence: *Fayeza S. Ahmed, Ph.D., Weill Cornell Medical College, 425 E. 72nd St, Suite 500, New York, NY 10021. E-mail: ahmedfs@gmail.com*

F.S. AHMED & L. MILLER. The Relationship between Theory of Mind and Functional Independence.

Objective: Theory of Mind (ToM) is the ability to comprehend another person's viewpoint. Commonly evaluated in children, ToM is beginning to be examined among older adults, with mixed results. Executive Functioning (EF) is strongly related to decline in functional independence. Since previous research from our lab (Ahmed & Miller, 2010) suggests a relationship between ToM and EF, we examined whether ToM also accounted for significant variance in functional independence and if this was more than traditional EFs.

Participants and Methods: 43 older adults were recruited. They were administered two tests of ToM, a test of cognitive flexibility (D-KEFS Trails), inhibition (D-KEFS Color-word Interference), proverb interpretation (D-KEFS Proverbs), and functional independence (ILS). Proverb interpretation was included because previous research from our lab found it accounted for variance in functional independence (Ahmed & Miller, unpublished).

Results: Hierarchical multiple regression revealed that one ToM test accounted for variance in functional ability ($\beta = 2.07, p < .01$) while the other did not. Additionally, proverb interpretation explained significant variance in this ToM test ($\beta = .23, p < .05$). A multiple mediation model revealed that combined and individual indirect effects of the EFs mediated the relationship.

Conclusions: The only ToM test that did account for significant variance in functional independence shared variance with proverb interpretation. Thus, the abstract verbal reasoning likely drove the significant result. Furthermore, the mediation modeled revealed that EF mediated the ToM-functional independence relationship. Therefore, assessment of ToM does not appear to add unique additional variance in this functional independence measure.

Correspondence: *Fayeza S. Ahmed, Ph.D., Weill Cornell Medical College, 425 E. 72nd St, Suite 500, New York, NY 10021. E-mail: ahmedfs@gmail.com*

C. ANDERSON-HANLEY, A.M. BRICKMAN, B.T. WASSERMAN, F.A. PROVENZANO, S.G. ROMERO & E.D. HARMON. Neuroimaging Effects of Exercise for Older Adults: Pilot Results from the Cybicycle Study.

Objective: Interventions for our aging population are sought to ensure brain health and curb cognitive decline. Exercise yields neuropsychological benefits, but little is understood about the mechanisms linking exercise to cognitive outcomes. Structural magnetic resonance imaging (MRI) was collected from a pilot sample ($n=10$) of older adults participating in a larger clinical trial, the Cybicycle Study, which randomized 79 older adults to three months of exercise using a cybicycle (virtual reality-enhanced bike) or traditional stationary bike. We examined evidence of neuroplasticity to corroborate recent research indicating changes in brain structure coincident with exercise (Colcombe et al., 2006; Erickson et al., 2011). We expected improvement in memory and executive functioning would covary with increased volume in cerebral white matter (CWM), anterior cingulate cortex (ACC), left superior temporal gyrus (LSTG), right inferior frontal gyrus (RIFG) and hippocampus.

Participants and Methods: Ten participants from the Cybicycle Study enrolled in this neuroimaging pilot study. A neuropsychological battery was administered before and after exercise; results were compared with structural MRI images.

Results: MRI data from six participants (ages 60-87) were analyzable. Increased volume of the CWM was associated with improved perform-

ance on Stroop C ($r_s = -.83$; $p = .04$); ACC change was associated with Digits Backwards ($r_s = .88$; $p = .02$); left inferior temporal gyrus (LITG) change was associated with RAVLT delayed recall ($r_s = .90$; $p = .02$); and left hippocampus change was associated with RAVLT immediate recall ($r_s = .88$; $p = .02$).

Conclusions: Neuroimaging pilot results partially replicate prior research reporting structural changes in the brain commensurate with exercise. Four of five a priori hypotheses were supported; executive function improvement correlated with increased CWM and the ACC, and verbal memory improvement correlated with the LITG and left hippocampus.

Correspondence: *Cay Anderson-Hanley, PhD, Psychology, Union College, 807 Union Street, Schenectady, NY 12308. E-mail: andersoc@union.edu*

J. ANSADO, O. MONCHI, N. ENNABIL, S. FAURE & Y. JOANETTE. Neural implementation of cognitive reserve depends of the task demand in normal aging.

Objective: Cognitive Reserve (CR) model suggests that the brain attempts to cope with aging using the neural reserve mechanism (i.e., pre-existing neural network) or the neural compensation mechanism (i.e., by enlisting alternative neural network). The purpose of the current study, is to determine, how these neural mechanisms are deployed in the context of visual selective attention in aging.

Participants and Methods: Sixteen young adults and Sixteen older adults performed a letter-matching while undergoing functional Magnetic Resonance Imaging (fMRI). The letter-matching task had four levels of complexity: Perceptual matching (i.e., A-A) with three letters (3-Pm); Perceptual matching with Five letters (5-Pm); Semantic matching (i.e., a-A) with three letters (3-Sm); Semantic matching with five letters (5-Sm).

Results: First, for the 3_Pm condition, the older group used more frontal superior gyri (BA8, BA9) than the younger one. Second, the intergroup comparison between the high and the low load level for the contrast 5Pm-3Pm revealed more activation in the superior parietal gyrus in both groups. Finally, the intergroup comparison between the high and the low load level for the semantic judgment (5Sem-3Sem) show that the older group needs to recruit more bilateral frontal regions (BA 6, 9, 10) to successfully perform the task, while the younger one recruit more bilateral occipital regions (BA19).

Conclusions: Results show the presence of a Posterior-Anterior Shift in Aging (PASA) phenomena (Davis et al., 2007), suggesting that older individuals use neural compensation mechanism starting at the lowest level of complexity. The second result, showing more activation in the superior parietal gyrus in both groups for the higher attentional load condition (5-Pm), suggests that the neural reserve mechanism can aid the compensation mechanism to cope with increasing attentional load. The latter findings indicating a load-dependant PASA, indicates the deployment of a compensatory mechanisms for the most complex task level (5-Sem).

Correspondence: *Jennyfer Ansado, PhD, Faculty of medicine - University of Montreal, 4565, Chemin Queen-Mary, Montreal, QC H4B2C7, Canada. E-mail: jennyfer.ansado@videotron.ca*

T. ATCHISON & S. O'BRYANT. Self-report of Previous TBI Relationship to Current Cognitive Function in an Older Rural Population.

Objective: Project FRONTIER (Facing Rural Obstacles to healthcare Now Through Intervention Education, and Research) is attempting to understand and overcome barriers rural populations face in receiving healthcare. The rural populations are on average older and have poorer health outcomes than urban dwellers. Evidence exists that TBI is more common in the rural population than in urban dwellers (Gabella, et al. 1997) and some studies found a significantly higher rate of TBI in AD patients than in the matched controls (Fleminger, et al. 2003).

The accuracy of self-reports of has been questioned. Reitz et al. (2009) compared the self-report of stroke with results from brain imaging and concluded that accuracy is low. Schofield, et al. (2011) looked at hospitalization records of prisoners and found thirty percent of self-report TBI was not validated. It is important to understand the relationship of self-report TBI to current cognitive function.

Participants and Methods: Subjects evaluated by project FRONTIER were the basis of this study. The group included 273 females (68%) and 127 males (32%) predominantly Caucasian Anglo and Hispanic. The average age of the group was 62.6 years (sd. = 12.9). Chi-Square indicated that self-report of TBI was significantly higher in males (Males 33.9%, Females 17.2%). Due to this difference in rate of self-report of TBI and better cognitive function in the females, gender groups were analyzed separately. Cognitive measures were grouped by domain and analyzed with MANCOVA. Domains Included memory, attention, language, and visual spatial.

Results: No significant differences in cognitive function were observed between males with and without self-reported TBI. No significant differences were observed for females with and without self-report TBI.

Conclusions: Great care should be exercised in the use of self-report of previous TBI in clinical work. In future research on the connection between MCI/AD and TBI the brain injury should be verified through collateral report or records.

Correspondence: *Timothy Atchison, Ph.D., West Texas A&M Univ., WTAMU Box 60876, Canyon, TX 79016. E-mail: tatchison@wtamu.edu*

M.L. BENJAMIN, K.M. MCGREGOR, A. SUDHYADHOM, J.P. TRINASTIC, L. SEEDS, I. LEVY, A.M. GARCIA, J.F. SELBST, R.M. BAUER, J. ROSENBEK & B. CROSSON. Cortical-Subcortical Functions in Verb and Noun Generation in Healthy Aging.

Objective: Behavioral studies of action (verb) generation suggest that action fluency may strongly engage frontal-striatal neuroanatomical systems, although action generation has not been studied to the same extent as phonemic fluency and object category-member generation. The current healthy aging study compared the cortical-subcortical substrates for noun and verb generation using functional magnetic resonance imaging (fMRI).

Participants and Methods: Fifteen old (over age 70) and 15 young healthy adults were presented with blocks of nouns or verbs and asked to covertly generate within grammatical class semantically-related items.

Results: For whole-brain between-group analyses, significant group differences were found in the right precentral gyrus during noun generation, right inferior frontal sulcus during verb generation, and left angular gyrus for both conditions, with old subjects demonstrating greater activity for these regions. Anatomy-based ROIs showed significant between-group differences for bilateral subthalamic nucleus (STN) and left caudate nucleus during noun generation, with greater STN activity in old adults and greater left caudate activity in young adults. Within-group whole-brain analyses indicated bilateral lateral frontal, medial frontal, and subcortical activity for both age groups during both types of word generation, implicating a similar bilateral frontal-subcortical network for the current noun and verb generation conditions within each age cohort.

Conclusions: These findings suggest that aging hemispheric asymmetry reductions (HAROLD) and non-dominant hemispheric recruitment differences may pertain primarily to anterior cortices during language production, with greater posterior perisylvian language-dominant hemisphere recruitment for older adults during word generation. Furthermore, this paradigm appears to elicit an extensive cortical-subcortical network for evaluating differences in language production in healthy aging.

Correspondence: *Michelle L. Benjamin, MS, UAB, 1702 Penthouse Drive, Birmingham, FL 35205. E-mail: mbenjami@uab.edu*

J. BERENQUER, R.F. KAPLAN, N. MOSCUFO, C. GUTTMANN & L. WOLFSON. Letter and Category Fluency in Relation to Hippocampal Volume and White Matter Hyperintensities.

Objective: Research continues to show an advantage of letter fluency over category fluency in Alzheimer's disease (AD). This differential performance on verbal fluency tasks is likely a result of the breakdown

of semantic memory together with relatively preserved frontal lobe functioning in early AD (Salmon, Heindel, & Lange, 1999). In contrast, patients with vascular cognitive impairment (VCI) have difficulty on tasks requiring executive control like phonemic fluency tasks. We examined the relationship between hippocampal volume, white matter hyperintensities (WMH), and performance on semantic and phonemic fluency tasks in non demented elderly.

Participants and Methods: 72 volunteers, aged 75-90, completed the RBANS semantic fluency subtest and the Controlled Oral Word Association Test (COWAT). Quantitative MRI was used to measure WMH and volumetric MRI was used to measure hippocampal volume. Associations between WMH, hippocampal volume, and verbal fluency performance were evaluated.

Results: Hierarchical regression analyses showed WMH volume was the primary predictor of low COWAT performance accounting for 15.7% ($p < .05$) of the variance, whereas hippocampal volume did not significantly add to the model. Hippocampal volume was the primary predictor of category fluency accounting for 4.0% of the total variance.

Conclusions: Differences in WMH and hippocampal volume in the normal elderly parallel the discrepancies between phonemic and semantic fluency commonly associated with VCI and AD.

Correspondence: *Richard F. Kaplan, PhD, Psychiatry, UConn Health Center, 263 Farmington Ar, Farmington, CT 06030. E-mail: rkaplan@uchc.edu*

N. CASTONGUAY, M. LUSSIER, A. BUGAJSKA, C. LORD & L. BHERER. Sex Differences and the Effects of Hormone Replacement Therapy on Cognitive Performances.

Objective: Men generally outperform women in spatial tasks while women outperform men in tasks recruiting verbal abilities. However, sex differences in executive functions remain unclear. In women, menopause occurs around 52 years of age and results ultimately by a drastic drop of estrogen levels. It is hypothesized that the changes in estrogen concentration could influence cognitive sex differences in middle-aged individuals. On the other hand, some studies have evaluated the potential beneficial effects of hormone therapy (HT) on cognition. Confounding variables such as women age, timing of initiation of HT and limited assessment of executive functions might have led to inconsistent results in the literature.

Participants and Methods: The present study was designed to evaluate the effects of sex and HT on executive functions using a complete battery of cognitive tasks. Seventy-one adults aged between 55 and 65 years participated in the study and were divided in three groups: women who had never used HT (HT-never), women taking HT who initiated the treatment at menopause (HT-user) and men.

Results: In accordance with previous studies, women outperformed men in the episodic memory task while men outperformed women in the mental rotation task. Moreover, HT-user outperformed HT-never in the episodic memory task. Group differences were also observed for some specific executive functions. In fact, men and HT-user performed better than HT-never in the switching task, while no group differences were observed in inhibition and dual-task performances.

Conclusions: These results are consistent with previous findings on sex differences in cognition and suggest that sex and HT have specific effects on executive functions. These results also expand the literature on the positive effects of estrogens on prefrontal and hippocampal-dependent cognition in aging.

Correspondence: *Nathalie Castonguay, Psychology, Université du Québec à Montréal, 305 Christin, Montreal, QC H3C 3P8, Canada. E-mail: nath.castonguay@gmail.com*

L. DESJARDINS, F. LANGLOIS, T. VU, J. VILLALPANDO, M. RE-NAUD & L. BHERER. Predicting Cognitive Performances Based On a Geriatric Examination in Community-Dwelling Older Adults.

Objective: Many studies have explored the relationship between cardiovascular risk factors and cognitive functioning in older adults. How-

ever, the influence of other medical conditions on cognition, such as pulmonary diseases, gastrointestinal symptoms or musculoskeletal disorders, has received little attention. This study assessed the relationship between medical conditions and cognitive performances in community-dwelling older adults.

Participants and Methods: A total of 139 participants aged 60 years and older ($M = 72.51$, $SD = 6.51$) completed an exhaustive geriatric assessment and a neuropsychological examination that targeted global cognition, verbal reasoning, episodic memory, short term memory, psychomotor speed and executive functions. A stepwise multiple linear regression was performed on each cognitive measure, using education, age, cardiovascular risk factors, pulmonary diseases, gastrointestinal symptoms, and musculoskeletal problems as independent factors.

Results: Education and age are the best predictors of the majority of cognitive measures. Cardiovascular risk factors are also an important predictor of global cognitive functioning and verbal reasoning. Surprisingly, musculoskeletal symptoms, but not cardiovascular risk factors, were associated with performances in processing speed and episodic memory.

Conclusions: In line with previous studies, results suggest that cardiovascular risk factors are associated with global cognitive functioning. Musculoskeletal disorders, such as arthritis, osteoporosis, fractures, and gait difficulties, were better predictors of processing speed and episodic memory performances. These results open new perspectives on the impact of medical status on cognitive functioning in the elderly.

Correspondence: *Laurence Desjardins, Psychology, Université du Québec à Montréal, C. P. 8888, Succursale Centre-Ville, Montréal, QC H3C 3P8, Canada. E-mail: desjardins.laurence@gmail.com*

U. DIAZ-ORUETA, M. GONZALEZ, B. MORALES, L.S. FRID, D. FACAL & A. ORBEGOZO. Early Years of Formal Education Versus Word Accentuation Test: Implications for the Study of Cognitive Reserve in Elderly People.

Objective: Years of formal education, though described as a valid proxy for cognitive reserve, do not reflect the impact on late-life cognitive performance, and Word Accentuation Test (WAT) measure has been claimed as a more accurate tool for this purpose. The objective of this study was to test whether using the WAT provides an added value to study cognitive reserve than years of education alone.

Participants and Methods: 87 Spanish community-dwelling elderly (72% women), mean age of 70.10 years ($sd=6.63$, range 55-87), mean years of formal education: 8.44 ($sd=3.08$, range 3-21), were administered the Spanish versions for WAT, FAS-Animals Verbal Fluency Test, Rey Auditory Verbal Learning Test (RAVLT), Forward-and-Backward-Digit-Span, and Digit-Symbol-Substitution-Test (DSST).

Results: Both years of formal education and WAT correlated significantly with most of the cognitive tests. Partial correlations were held controlling effects for age and sex and, in order to see the contribution of each target variable, years of formal education or WAT were also alternatively controlled. In these analyses, on the one hand, WAT still correlated with Forward and Backward Digit Span (both in number-of-trials and maximum span), RAVLT trial 1, DSST correct symbols and all phonological and semantic verbal fluency measures from FAS-Animals test (all $p < 0.05$). On the other hand, Years of formal education showed correlations with Forward Digit Span, AVLIT trials 1 to 4, and DSST correct symbols, but not with Backward Digit Span (working memory) neither most Verbal Fluency Measures (F, S and semantic).

Conclusions: In our study, while both measures related similarly to attentional and short-term memory measures, WAT related more than years of formal education to working memory and semantic verbal fluency. Both measures complement each other in the study of cognitive reserve.

Correspondence: *Unai Diaz-Orueta, Fundacion Instituto Gerontologico Matia INGEMA, Paseo de Mikeletegi, 1-3, San Sebastian 20009, Spain. E-mail: unai.diaz@ingema.es*

U. DIAZ-ORUETA, M. GONZALEZ, D. FACAL, B. MORALES, L.S. FRID & E. URDANETA. Predictors for Cognitive Performance From Mid to Late Life: a Cross-sectional Study About Cognitive Reserve Proxies.

Objective: Elderly people may show decline in cognitive functions, being the age itself one of the main predictors of this decline. However, other variables such as years of formal education, physical performance or occupational complexity also play a role when explaining late-life cognitive status. This study tries to clarify the influence of these variables in mid to late-life cognitive function.

Participants and Methods: 87 community-dwelling older people (72.4% women), with a mean age of 70.10 years ($sd=6.63$, range 55-87), and healthy cognitive aging, were administered Spanish versions for Word-Accentuation-Test (WAT); Rey Auditory Verbal Learning Test (RAVLT); PAL (visual memory and new learning), IED (shifting and flexibility of attention), RTI (Five-choice speed of response) and MOT (simple speed of response) from the CANTAB computerized battery; a brief Occupational Complexity Scale (OCS); 2 Minute Step Test, and Foot-Up-and-Go Test (FUGT).

Results: Several stepwise regressions, where cognitive function was the dependent variable, were carried out taking as independent variables: age, WAT, years of formal education, OCS, 2 Minute Step Test and FUGT. The following variables entered in the model: for IED total errors (adjusted), WAT ($p<.005$; $R=.313$; $R^2=.098$); for MOT Mean Latency, WAT ($p<.001$; $R=.413$; $R^2=.171$); for RTI Five Choice Reaction Time, FUGT ($p<.005$; $R=.271$; $R^2=.074$); for PAL Total Errors Adjusted, WAT ($p<.005$; $R=.316$; $R^2=.100$); for RAVLT series 1, years of formal education ($p<.001$; $R=.414$; $R^2=.171$), WAT ($p<.001$; $R=.507$; $R^2=.257$), and OCS ($p<.001$; $R=.549$; $R^2=.302$); for RAVLT series 5, education years ($p<.005$; $R=.315$; $R^2=.099$); and OCS ($p<.005$; $R=.398$; $R^2=.158$). **Conclusions:** WAT seems to play a predicting role in those tests which assess simple reaction time, cognitive flexibility and visual memory, while complex reaction time is better explained by physical capacity, and verbal memory by years of formal education.

Correspondence: *Unai Diaz-Orueta, Fundacion Instituto Gerontologico Matia INGEMA, Paseo de Mikeletegi, 1-3, San Sebastian 20009, Spain. E-mail: unai.diaz@ingema.es*

U. DIAZ-ORUETA, M. GONZALEZ, I. LASKIBAR, M. ITURBURU, E. ARRIOLA & E. URDANETA. Do Traditional Physical Performance and Gait Speed Tests Tell Us Anything About Cognitive Performance in Mid to Late Life Age?

Objective: Gait involves integration of different motor, perceptual and cognitive processes, and scientific evidence indicates that limitation in gait speed seems to mediate the association between cognitive function and disability. In this study, we tried to investigate how measures of gait speed were related to cognitive performance in a sample of individuals from mid- to late age.

Participants and Methods: 87 community-dwelling older people (72.4% women), with a mean age of 70.10 years ($sd=6.63$, range 55-87), and healthy cognitive aging, were administered Spanish versions for RAVLT; Direct-and-Inverse-Digit-Span; FAS-Animals Verbal Fluency Test; Digit Symbol Substitution Test (DSST); PAL (visual memory and new learning), IED (shifting and flexibility of attention), RTI (Five-choice speed of response) and MOT (simple speed of response) from the CANTAB computerized battery; 2 Minute Step Test, and Foot-Up-and-Go Test (FUGT) from the Senior Fitness Test (SFT).

Results: 2 Minutes Step Test significantly correlated with AVLT trials 1 ($r=0.251$, $p=0.032$) and 2 ($r=0.22$, $p=0.025$), and these correlations maintained when controlling for age and gender. For FUGT test, significant inverse correlations were found between FUGT and FAS-Animals semantic fluency ($r=-0.285$, $p=0.009$), as well as direct correlations with some CANTAB tests: IED total trials ($r=0.258$, $p=0.018$), IED total errors ($r=0.351$, $p=0.018$) and RTI five-choice reaction time ($r=0.274$, $p=0.012$), all of which maintained after controlling for age and gender. Other significant correlations found with the rest of cognitive tests disappeared after controlling for age and gender.

Conclusions: In our study, measures of physical performance contained in the SFT showed relation to processing speed, short-term memory, and cognitive flexibility measures. Brief physical activity tools should be a standardized complement of cognitive assessment protocols in the study of cognitive performance in old age.

Correspondence: *Unai Diaz-Orueta, Fundacion Instituto Gerontologico Matia INGEMA, Paseo de Mikeletegi, 1-3, San Sebastian 20009, Spain. E-mail: unai.diaz@ingema.es*

C.J. DYKSTRA-AIELLO & K.A. CARLBERG. Gender and Age Effects on Aerobic Exercise-Induced Reductions in Pain Sensitivity in Sprague-Dawley Rats.

Objective: Pain perception appears to be reduced by bouts of exercise, either aerobic or anaerobic. The purpose of our study was to examine gender and age effects on aerobic exercise-induced reductions in pain sensitivity in exercise trained Sprague-Dawley rats.

Participants and Methods: Gender effects were examined with 10 male and 10 female rats that were exercised 11 wk in motorized running wheels for up to 30 min every other day. Ten male and 10 female sedentary rats were handled every other day. At 5 – 6 hr post-exercise, the tail flick latency (TFL) test measured pain perception. TFL is the number of seconds for the rat to flick its tail from under a hot light. A longer latency indicates reduced pain sensitivity. Endogenous opioid involvement was examined 2 wk later with naloxone (2 mg/kg, subcutaneous), an opioid antagonist. Data were analyzed using the Mann-Whitney U-test for non-parametric data, with $p=0.05$.

Results: In exercised female rats, TFL was significantly increased ($p=0.034$) compared with female sedentary rats. Naloxone eliminated the difference, suggesting opioid mediation of this exercise-induced effect. No significantly different TFL response was found between exercised and sedentary male rats. Age effects were examined by continuing to exercise 8 female rats for 30 min every other day to middle-age (38 wk). The 10 sedentary female rats continued to be handled every other day. A significantly increased TFL response ($p=0.0078$) in middle-age exercised rats was eliminated by naloxone.

Conclusions: These results showed that pain sensitivity is reduced by aerobic exercise in female rats but not males, is not diminished in middle age, and is opioid-mediated.

Correspondence: *Cheryl J. Dykstra-Aiello, Eastern Washington University; PO Box 201, Marshall, WA 99020. E-mail: cjda@eagles.uwu.edu*

J.A. FALKOWSKI, M. WEINER, D. LEONARD & L. DEFINA. Relationship between Exercise and Cognition: Cooper Clinic Longitudinal Study.

Objective: Age-related declines in cognitive efficiency have become a prominent public health concern. Particular interest has been placed on the relationship between fitness and cognitive functioning, as increasing cardio-respiratory fitness may be a practical means to mitigate cognitive decline. Although many studies have reported findings in support of this relationship, evidence has been conflicting. This study set out to clarify the association between cognitive functioning and cardiovascular fitness among a relatively healthy and well educated elderly cohort.

Participants and Methods: 1875 participants, 485 women and 1390 men, from the Cooper Clinic Longitudinal Study (CCLS) between the ages of 55-80 were included in the analysis. Cardiovascular fitness was quantified by computing a metabolic equivalent score (METs) derived from a maximal treadmill test. Global cognitive functioning was assessed with the Montreal Cognitive Assessment (MoCA).

Results: Data were plotted then entered into a multiple regression model of MoCA scores on METs and age by sex. Scatter plots revealed a slight, increasing relationship between MoCA scores and METs for men and women. The linear relationship between MoCA scores and METs was significant in men ($\beta=0.11$ per MET, $p<0.001$) but not in women ($\beta=-0.03$ per MET, $p=0.56$). Age was significantly associated with lower MoCA scores in both men and women ($p<0.001$).

Conclusions: In this elderly, healthy, well educated cohort, cardiovascular fitness was related to global cognition among men but not women suggesting that protective effects of fitness on cognition may be gender specific.

Correspondence: *Jed A. Falkowski, M.A., Psychiatry, Division of Psychology, UT Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390. E-mail: jed.falkowski@utsouthwestern.edu*

M. FANNING, T. GIOVANNETTI, A.C. LYON, S. HEVERLY-FITT & T. FLOYD. Insights into the Evaluation of Instrumental Activities of Daily Living.

Objective: Studies have shown a link between executive control and awareness of everyday functioning abilities among older adults. Few studies have examined this link in older adults with vascular disease, a population with known executive dysfunction. We predict that discordant self and caregiver IADL evaluations reflect poor insight and deficient behavioral monitoring and will be associated with executive dysfunction.

Participants and Methods: 113 older adults (age ≥ 65) diagnosed with aortic stenosis and/or coronary artery were recruited for a larger study of stroke and cognitive outcomes. Self and caregiver IADL ratings and neuropsychological test data were obtained.

Results: Most participants' IADL scores were consistent with their caregivers' scores ($n = 77, 68\%$, CONSISTENT group). Participants with discordant IADL scores formed 2 groups: a small group overestimated their abilities ($n = 24, 21\%$; OVERESTIMATION group) and an even smaller group underestimated their abilities ($n = 12, 11\%$; UNDERESTIMATION group). The 3 groups did not differ in age or education, but there was a significantly higher proportion of women in the OVERESTIMATION group (58% women) than the other groups (CONSISTENT 26%; UNDERESTIMATION 16%; $\chi^2 = 18.37, p < .01$). The discordant groups had significantly lower MMSE scores ($F = 4.23, p = .01$) and more vascular risk factors ($F = 5.17, p < .01$) than the CONSISTENT group. The UNDERESTIMATION group had significantly lower Boston Naming Test scores ($F = 4.67, p = .01$) than the CONSISTENT group. The groups did not differ on tests of executive control ($p = .17$), episodic memory ($p = .17$) or white matter lesion volume ($p = .70$).

Conclusions: Incongruent evaluations of IADL were rare and unrelated to executive control but related to overall cognitive deficit and vascular risk. Language difficulties may impose personally salient deficits in everyday life that may go unnoticed by caregivers. Gender biases in IADL also may influence insight into functional capabilities.

Correspondence: *Tania Giovannetti, Psychology, Temple University, Weiss Hall, 1701 N 13th St., Philadelphia, PA 19122. E-mail: tgio@temple.edu*

M. FEIGON, M. FONG, E. LEE & B. LEAHY. RBANS Neuropsychological Profiles in Older Adults with Memory Decline.

Objective: Previous profiling studies using the Repeatable Battery for Assessment of Neuropsychological Status (RBANS; Randolph, 1998) have identified cognitively distinct profiles of specific diseases (Beatty, 2003; Randolph, Tierney, Mohr & Chase, 1998; Schmitt et al., 2010). These subgroups have been shown to be valuable in differentiating among diagnoses. Cognitive profiles may assist in decision-making with regard to treatment and follow-up (Randolph Tierney, Mohr & Chase, 1998; Schmitt et al., 2010). However, there have been limited studies to develop cognitive prototypes among older adults with suspected cognitive decline and memory loss. The objective of this study is to determine distinct cognitive profiles on the RBANS.

Participants and Methods: Cluster analysis and subsequent posthoc analyses were used to determine cognitive profiles. Participants ($n = 335$) were older, community dwelling adults who underwent a brief neuropsychological assessment for suspected cognitive decline and memory loss.

Results: The results showed five distinct cognitive profile types, which were subsequently labeled as: (1) language impaired (10.15% of the

subjects); (2) visuospatially impaired (32.24%); (3) severely impaired (23.58%); (4) above average visuospatial and attentional skills (10.45%); and (5) minimally impaired (23.58% of participants). The five cluster groups exhibited different patterns of results on demographic variables and independent living skills.

Conclusions: Participants had significantly different profiles on the RBANS. In particular, attentional, language, and visuospatial skills uniquely distinguished the groups. The specific profile characteristics of the identified cognitive profiles are presented and their implications for the assessment of health and safety decision-making capacity are discussed.

Correspondence: *Maia Feigon, M.A., Illinois Institute of Technology, 651 W. Sheridan Rd. #3B, Chicago, IL 60613. E-mail: mfeigon@iit.edu*

A.L. FISCHER, W.L. THORNTON & D.M. BERNSTEIN. Beyond Traditional Models of Theory of Mind in Normal Aging: The Modifying Influence of Blood Pressure.

Objective: Age changes in theory of mind (ToM) persist after accounting for differences in neuropsychological performance; however, the extent to which health factors related to the aging process (e.g., blood pressure) may further explain ToM variability remains unknown. The present study builds upon extant literature by addressing potential modifying roles of blood pressure on age changes in ToM.

Participants and Methods: We used a short-story paradigm to assess ToM performance in 66 community-dwelling older adults (65–92 years; $M = 73.49$). For all participants, we obtained blood pressure measurements, and derived a composite indicator representing neuropsychological performance across several domains (working memory, speed, inhibition, cognitive flexibility, memory). We used regression analyses to examine associations among blood pressure, neuropsychological performance and ToM.

Results: Systolic blood pressure (SBP; $\Delta R^2 = .057, \Delta F = 4.66, p < .05$) accounted for variance in ToM beyond age and neuropsychological performance, such that a 10-mmHg increase in SBP accounted for a .24-point decrease in ToM performance ($M \pm SD = 5.64 \pm 1.66$). Further, an interaction between pulse pressure (surrogate marker of arterial stiffness; SBP-DBP) and neuropsychological performance ($\Delta R^2 = .062, \Delta F = 5.23, p < .05$) revealed that links between poor ToM and lower neuropsychological performance were more pronounced among participants with higher pulse pressure.

Conclusions: We demonstrated the importance of blood pressure in determining the strength of associations between ToM and supporting neuropsychological resources, wherein associations were more robust among older adults with high blood pressure. Thus, assessing contributions of age-related neuropsychological change alone may not be sufficient to explain late-life variability in ToM.

Correspondence: *Ashley L. Fischer, M.A., Psychology, Simon Fraser University, 8888 University Drive, Simon Fraser University, Department of Psychology, Burnaby, BC V5A 1S6, Canada. E-mail: alf3@sfu.ca*

B.L. FISCHER, L. MAUCIERI, W.T. HOYT, C.M. CARLSSON, A. KIND, S. ASTHANA, M. YVISAKER, J. UPTEGRAW, G.G. HUNT, T. SWADER, J.E. MAHONEY & C.E. GLEASON. Timed Up and Go (TUG) Tasks Predict Cognitive Performance and Discriminate Between Groups of Elderly Fallers.

Objective: Falling represents a serious hazard for older adults. Current American Geriatric Society (AGS) guidelines suggest referring individuals for falls evaluation or intervention based on a self-reported history of falls. However, contributing factors to falls include decrements in cognitive functioning, which both increase falls risk and impede individuals' ability to accurately report their falls. Needed are measures that identify potential fallers among patients with cognitive deficits. The current study examined the ability of Timed Up and Go (TUG) tasks to predict cognitive performance and to discriminate between groups of fallers.

Participants and Methods: Participants were 120 consecutive new patients to the Memory Assessment Clinic of the Geriatric Research Edu-

cation and Clinical Center (GRECC) at the Wm. S. Middleton Memorial Veteran's Hospital. In addition to the standard dementia screening battery, all participants were administered three variations of the TUG test. Pearson product-moment correlation and hierarchical multiple regression were utilized to examine relationships between TUG performance, performance on cognitive measures, and falls.

Results: The TUG tasks correlated well with multiple tasks of attention and executive functioning. In addition, the TUG tasks significantly predicted cognitive performance over and above the AGS criteria for falls risk. The TUG tasks successfully discriminated between multiple fallers, and never and single fallers.

Conclusions: The TUG tasks significantly predicted performance on executive functioning tasks, and significantly discriminated between groups of fallers. The TUG tasks show promise in identifying potential fallers and fallers with cognitive impairment.

Correspondence: *Barbara L. Fischer, M.Ed., Psychology, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, 10701 East Boulevard, Cleveland, OH 44106. E-mail: barbaralfischer@gmail.com*

A. FORTIN & N. CAZA. Validation of a Medial Temporal and a Frontal Lobe Function Index in French-speaking Healthy Older Adults.

Objective: Aging negatively affects episodic memory and executive functions (Craik & Salthouse, 2008) associated with medial temporal lobe (MTL) and frontal lobe (FL) functions, respectively. Glisky and colleagues (1995; 2008) have proposed the use of composite z-scores from targeted neuropsychological tests to index MTL and FL functions. Importantly, a factorial analysis confirmed the presence of these two factors in young and older English-speaking adults. The goal of this study was to validate the MTL and FL indexes in French-speaking older adults, using a similar methodology as Glisky and colleagues.

Participants and Methods: Sixty healthy older adults were tested with 3 neuropsychological tests associated with episodic memory performance and 5 tests associated with executive functions.

Results: Results showed that the 3 scores thought to index MTL function grouped to form the first factor and the 5 scores thought to index FL function formed the second factor.

Conclusions: This study validates, for the first time, the use of composite z-scores in French-speaking healthy older adults to index MTL and FL functions. Given the age-related changes in episodic memory and executive functions, these composite z-scores may be used as a sensitive method to investigate cognitive changes in French-speaking populations.

Correspondence: *Alexandra Fortin, Centre de recherche, Institut universitaire de gériatrie de Montréal, 4565 Queen Mary, Montréal, QC H3W 1W5, Canada. E-mail: alexandra.fortin-girard@umontreal.ca*

A.M. GARCIA, M.L. BENJAMIN, K.D. WHITE & B. CROSSON. Strategic Output of Semantic Fluency in Healthy Aging.

Objective: The prototypical output measure for semantic fluency is total words generated. However, quantification of strategic approach may add information about performance, especially in a healthy aging context.

Participants and Methods: Participants generated the names of as many animals as they could in one minute. Strategy during animal generation (i.e. word clustering and category switching strategies as defined by Troyer et al. (1997) and Abwender et al. (2001)) was examined for three adult age groups: young ($n = 41$, $M_{age} = 24.63$, age range = 18-34 years), young-old ($n = 37$, $M_{age} = 68.89$, age range = 65-73 years), and old-old ($n = 41$, $M_{age} = 78.56$, age range = 74-89 years). A new model delineating switching behavior into three kinds (as opposed to two kinds) of switches was proposed.

Results: Switching frequencies and total output demonstrated an age-related decline, with young adults showing more total words and more switches than the combined group of old adults. Results also indicate

the decline in total words and switches was incremental, with young-old showing more total words and more switches than old-old adults. Clustering was stable across age. Moreover, regression models indicated that each of the three switch types in the proposed model contributed unique variance in predicting total output.

Conclusions: Strategy maintenance does not change across age group, while strategy initiation and non-strategic output decrease with age. Classifying strategy as maintenance, initiation, or non-strategic output creates a more precise model, providing better information about the underlying cognitive mechanisms.

Correspondence: *Amanda M. Garcia, Bachelor of Science, Clinical and Health Psychology, University of Florida, 2360 SW Archer Rd. #1005, Gainesville, FL 32608. E-mail: amgar@phhp.ufl.edu*

K. GIFFORD, A. DER, B. MARTIN, N. CANTWELL, N. KOWALL & A. JEFFERSON. Subjective Cognitive Complaints Among Older Adults.

Objective: Cognitive complaints are necessary for the diagnosis of mild cognitive impairment (MCI) but there is no consensus for how to assess such complaints. We compared older adults with normal cognition (NC) and MCI on different methods for assessing complaints.

Participants and Methods: Participants included 110 NC (76 ± 7 years, 63% female) and 42 MCI individuals (77 ± 7 years, 45% female) recruited from the Boston University Alzheimer's Disease Center, who completed a cognitive complaint survey that included commonly administered cognitive complaint questions.

Results: Chi-square analyses revealed that responses to seven survey questions differed between NC and MCI participants, including: 1) Do you have problems with your memory? ($\chi^2=10.5$, $p=0.005$); 2) Is your memory worse than two years ago? ($\chi^2=7.2$, $p=0.007$); 3) Do you have more memory problems than most? ($\chi^2=9.6$, $p=0.008$); 4) Do you remember things as well as you used to? ($\chi^2=6.8$, $p=0.009$); 5) Is your memory worse than others of the same age? ($\chi^2=9.6$, $p=0.008$); 6) Do you have difficulty remembering two-three shopping items? ($\chi^2=11.0$, $p=0.004$); and 7) Do you have difficulty recalling names of family? ($\chi^2=12.3$, $p=0.002$). The two groups did not differ on the remaining 36 questions (all p -values > 0.02).

Conclusions: Findings suggest that the selection of questions one uses to assess cognitive complaints may be important in differentiating underlying neurodegenerative disease from normal aging in non-demented older adults.

Acknowledgements: AG013846, AG030962, HRC-08-88733, AG034962, AG036697

Correspondence: *Katherine Gifford, PsyD, Boston University, 72 E Concord St, Robinson 7800, Boston, MA 02118. E-mail: kgifford@bu.edu*

K. GIFFORD, H. CARMONA, Y. TRIPODIS, B. MARTIN, N. CANTWELL, N. KOWALL & A. JEFFERSON. Subjective Cognitive Complaint Predicts Cognitive and Functional Trajectory in Individuals with Mild Cognitive Impairment.

Objective: There is limited consensus regarding the relationship between subjective cognitive complaints and cognitive and functional trajectory among individuals with mild cognitive impairment (MCI). The current study examined whether baseline subjective complaints predict functional and cognitive change in individuals with MCI over a follow-up period.

Participants and Methods: Participants with a baseline MCI diagnosis were drawn from National Alzheimer's Coordinating Center extant data ($n=1743$, 77 ± 8 years, 60% female). Baseline cognitive complaint status was categorized as 1) no complaint, 2) self-complaint only, 3) informant-complaint only, or 4) both self- and informant-complaint. Generalized linear mixed models related complaint status to cognitive and functional trajectory, adjusting for age, sex, education, and time-to-follow-up.

Results: At follow-up (3 ± 1 years), 21% participants converted to dementia. Compared to individuals with no complaint, informant-complaint only and both complaints predicted a decline in Functional

Activities Questionnaire ($B=2.4$, $p<0.001$; $B=3.0$, $p<0.001$, respectively); Mini-Mental State Examination ($B=-0.5$, $p<0.003$; $B=-1.0$, $p<0.001$, respectively); Logical Memory Delayed ($B=-2.6$, $p<0.001$; $B=-3.4$, $p<0.001$, respectively); Trail Making Test-Part B ($B=2.4$, $p<0.001$; $B=3.0$, $p<0.001$, respectively); and Vegetable Naming ($B=-1.0$, $p<0.001$; $B=-1.3$, $p<0.001$, respectively). Informant-complaint only predicted decline in Digit Span-Forward ($B=-0.3$, $p=0.009$). Both complaints predicted a decline in Animal Naming ($B=-0.9$, $p<0.001$) and Digit-Symbol Coding ($B=-1.8$, $p<0.001$).

Conclusions: Our findings highlight that subjective cognitive complaints are associated with functional and cognitive decline in individuals with MCI. A combination of self- and informant-complaint or informant-complaint alone, as compared to self-complaint alone may be more sensitive in predicting cognitive change.

Supported by: NACC Project #2011-JI-08, P30-AG013846, AG030962, IIRC-08-88733, AG034962, AG036697, AG016976

Correspondence: *Katherine Gifford, PsyD, Boston University, 72 E Concord St, Robinson 7500, Boston, MA 02118. E-mail: kgifford@bu.edu*

F. CONSTANTINIDOU, E. GIOGKARAKI, M. MICHAELIDES, J. PROKOPIOU & M. CHRISTODOULOU. The Role of Cognitive Reserve in Episodic Memory and Executive Functioning in the Elderly.

Objective: To examine the cognitive reserve (CR) hypothesis in association with age, verbal episodic memory (VEP), and executive functioning (EF) in neurologically healthy older adults. A latent variable model for CR was implemented to test the hypotheses stating that CR plays a moderating role on the relationship between age and cognitive functions in healthy aging.

Participants and Methods: A neuropsychological battery was administered to a community-based sample of healthy 253 Greek-Cypriot older adults (Mean age= 75.12, $SD=6.19$; Mean years of education=6.96, $SD=4.11$). Through confirmatory factor analyses we validated latent constructs representing two neuropsychological domains (VEP and EF) and a measure of CR. The CR latent construct had three reflective indicators: education, passive vocabulary, and reading performance. Two structural equation models (SEM) were evaluated.

Results: The first SEM tested the direct relationships between age and two latent variables reflecting VEP and EF. Results showed adequate model fit and yielded negative associations among age and both cognitive domains. The second SEM which included CR as a moderator also had acceptable fit. Results demonstrated that CR strongly moderated the relationship between age and cognitive functions as following: (i) the strength of the (negative) relationship between age and episodic memory was reduced; (ii) the direct path from age to executive functions was no longer statistically significant and (iii) all indirect paths were statistically significant.

Conclusions: Our findings support the cognitive reserve hypothesis and its moderator effect on the relationships of age on VEP and EF. Implications for the theoretical understanding of cognitive reserve on healthy aging are discussed.

Correspondence: *Erasmia Giogkaraki, PhD, Psychology, University of Cyprus, 75, Kallipoleos Avenue, Nicosia 1678, Cyprus. E-mail: erasmia.yogarakis@gmail.com*

J. GRAND, S. MACDONALD & H. TUOKKO. Intra-individual Variability and Behavioral Plasticity Predicts Cognitive Change in Older Adults.

Objective: The evolution of cognitive abilities is no longer considered to reflect a universal, cumulative process of decline. Rather, significant inter- and intra- individual differences exist in cognitive trajectories, with the maintenance of functions ultimately determined by multi-dimensional processes (e.g., biological, environmental, psychological). The current study examined the relationship between intra-individual variability, cognitive plasticity, and long-term cognitive function in older adults.

Participants and Methods: Data were analyzed from Project Mental MIND, a 6-year longitudinal burst design study, integrating micro-weekly assessments (reaction time (RT) tasks), with macro-annual evaluations ($n = 304$, mean age = 74.02, $SD = 5.95$). Hierarchical multiple regression models were used to examine long-term cognitive function, along with multilevel modeling (HLM) techniques for the analysis of predictors of longitudinal rates of cognitive change.

Results: Baseline intra-individual variability emerged as a robust and highly sensitive predictor, with increased variability associated with decreased long-term cognitive function. Complex baseline cognitive plasticity (1-Back 4-Choice RT) uniquely predicted subsequent function for measures of processing speed, fluid reasoning, episodic memory, and crystallized verbal ability. Multilevel models revealed chronological age to be a significant predictor across cognitive domains, while intra-individual variability selectively moderated rates of cognitive change for episodic memory and verbal ability.

Conclusions: These findings underscore the potential utility of intra-individual variability and behavioral plasticity as dynamic predictors of cognitive change in older adults. Continued efforts will help to identify individual differences in acquired functioning (e.g., expertise, personality), cognitive flexibility (e.g., cognitive load hypothesis), and potential moderators of cognitive function (e.g., cardiovascular health, neuropathological disease).

Correspondence: *Jacob Grand, M.Sc., Psychology, University of Victoria, PO Box 3050 STN CSC, University of Victoria, Victoria, BC V8W 3P5, Canada. E-mail: jgrand@uvic.ca*

L. BOLLWERK, M. RAY, A. GINLEY, J. INKELES, K. ONDERKO, R. HAMMAN, J. BAXTER & J. GRIGSBY. Post-Menopausal Hormone Replacement Therapy Associated with Better Executive Cognitive Functioning in the San Luis Valley Health and Aging Study (SLVHAS).

Objective: Hormone replacement therapy (HRT) has been widely used in treating symptoms and conditions associated with menopause. Previous research has examined the relationship between hormone supplementation after menopause—both estrogen alone and opposed by progesterone, and changes in certain aspects of cognition. We examined the effects on executive functioning (EF) of HRT among female participants in the San Luis Valley Health and Aging Study (SLVHAS), a longitudinal study of chronic illness and disability in older (age > 59) Hispanic and non-Hispanic White (NHW) persons in rural southern Colorado.

Participants and Methods: History of HRT was obtained from a sample of 558 post-menopausal women (Mean age=72.8; Hispanic=301; NHW=257) who were enrolled in the SLVHAS. Of the subjects, 157 had used estrogen alone, and 20 had used opposed estrogen. EF was measured using the Behavioral Dyscontrol Scale (BDS), a reliable and valid measure of the capacity for behavioral self-regulation. Data were analyzed using unadjusted and adjusted linear regression models, the latter controlling for age, education, ethnicity, and mood (using the Center for Epidemiologic Studies Depression Scale, or CES-D). Separate models were created for women who reported taking estrogen alone, and for those who were prescribed opposed estrogen.

Results: In unadjusted linear regression models, both estrogen ($p<0.0001$) and opposed estrogen ($p=0.026$) were associated with better EF. In adjusted models, estrogen ($p<0.0001$) was significantly associated with better EF, but opposed estrogen was not.

Conclusions: History of HRT is positively associated with ECF. Stronger neuroprotective effects were observed in estrogen supplementation alone than in opposed estrogen (estrogen and progesterone together). Previous research in this area has yielded mixed findings. Moreover, there are concerns about the risk of stroke and gynecologic cancer with HRT. Nevertheless, these data support the beneficial effects of HRT among menopausal women.

Correspondence: *Jim Grigsby, PhD, Psychology, University of Colorado Denver, 1200 Larimer Street, Campus Box 173, Denver, CO 80217-3364. E-mail: jim.grigsby@ucdenver.edu*

S.D. HAN, J.M. ALLMAN, K. ARFANAKIS, D.A. FLEISCHMAN, M.M. HOOGS, R.A. GAVETT, P.D. LEO, P.A. BOYLE & D.A. BENNETT. *Von Economo Neurons, Conscientiousness, and Purpose in Life in Older Adults.*

Objective: Von Economo Neurons (VENs) are large bipolar cells, which are a distinctive feature of fronto-insular cortex in large mammalian brains and may serve as a rapid relay of information from this area to other brain regions. We investigated the functional connectivity of the right frontal-insular cortex (FI), where the VENs are 30% more numerous than on the left, and its relation to conscientiousness and purpose in life, measures of social perception and planning, in older adults. **Participants and Methods:** One hundred and sixty-six nondemented older adults (mean age=81.54, male/female=43/123, mean MMSE=28.81) from the Rush Memory and Aging Project were scanned using a resting-state functional MRI sequence. A 4 mm radius spherical seed region of interest was prescribed in the right FI (MNI coordinates: x=38, y=26, z=-10) to quantify functional connectivity after removal of nuisance variables. Between-group contrasts of those designated “high” and “low” in conscientiousness and “high” and “low” in purpose in life were conducted after controlling for total gray matter volume effects.

Results: Voxel-wise differences ($p < 0.001$) in functional connectivity were observed such that the right FI showed greater functional connectivity to the supramarginal gyrus ($t=4.4535$) and frontal pole ($t=4.5422$) in those high in conscientiousness, and greater functional connectivity to the left dorsolateral prefrontal cortex ($t=4.4789$) for those high in purpose in life.

Conclusions: In older adults with high levels of conscientiousness and purpose in life, the right FI was more functionally associated with regions important in social perception and planning.

Correspondence: *S. D. Han, PhD, Behavioral Sciences, Rush University Medical Center, 1653 W. Congress Parkway, Chicago, IL 60612. E-mail: Duke_Han@rush.edu*

A.K. HOLLAND. *Age-Related Changes in Systolic Blood Pressure and Motor Performance as a Function of Exposure to a Left-Lateralized Stressor.*

Objective: Behavioral and physiological measures of executive decline are two indicators that mark the progression of normal aging. Left hemispheric functional cerebral systems may be compromised with increasing age. Using dual task procedures, the current experiment examines age-related changes in task performance concurrently with regulation of left hemisphere stress.

Participants and Methods: Thirty-three younger (ages 18-26) and 24 older (ages 55-85) adults completed the Finger Tap Task (FTT) at the conclusion of a 5-hour fast, and 35 minutes after consuming a sandwich, which is conceptualized as a left-hemisphere stressor. Systolic Blood Pressure (SBP) measures were taken before and after each experimental manipulation.

Results: A main effect for Age was found ($F(4, 212)=30.48, p < .0001$), indicating that older adults had higher SBP across experimental conditions. An Age x Condition interaction was found ($F(4, 212)=2.9, p < .05$), indicating a relative increase in SBP for older but not younger adults in the absorption phase. A main effect for Condition was found ($F(1, 54)=21.64, p < .0001$), indicating an increase in FTT scores in the post stress condition for older and younger adults. A Condition x Hand was found ($F(1, 54)=4.28, p < .05$), indicating an increase in FTT scores in the post stress condition for older and younger adults at the right hand.

Conclusions: The current results indicate that functional cerebral systems may be especially compromised in older adults. The Age x Condition interaction indicates that older adults may be less able to carry out tasks that are governed by the left cerebral hemisphere as observed by a relative increase in SBP in the absorption and pre-digestion conditions in older adults.

Correspondence: *Alissa K. Holland, Ph.D., Psychology, University of South Carolina Lancaster, 476 Hubbard Drive, Lancaster, SC 29721. E-mail: akhollan@mailbox.sc.edu*

S.M. HORNING & H.P. DAVIS. *Sensitivity to Facial Expressions across the Lifespan: The Impact of Age and Cognition.*

Objective: A large number of studies report impairment in older adults' ability to recognize emotions. This finding is extended by examining change across the lifespan in sensitivity to facial emotions. Specifically, different age-groups require different levels of information in order to recognize expressions. The current study reports recognition thresholds for different facial expressions across the lifespan.

Participants and Methods: The sensitivity measure requires participants to identify at which point along an expression continuum, from neutral to a full-blown expression, when they are first able to identify an emotion. A sample of children, adolescents, young, middle-age, and older adults ($N = 726$) were compared on this measure. Additionally, the influence of fluid intelligence, memory, and processing speed to expression sensitivity was explored, along with sex differences.

Results: Six 5 x 2 Between-Groups ANOVAs were completed to compare the age and sex groups on sensitivity to expressions of the basic emotions. The results demonstrated that the young adults outperformed the older adults across all emotions ($p < .01$), as well as the children ($p < .01$) with the exception of sadness. No sex differences were found. To investigate the contribution of cognition to expression sensitivity, a series of hierarchical regression analyses were conducted. For participants under age 25, no cognitive variable significantly predicted sensitivity. However, for adults ages 25 to 89, fluid intelligence and memory mediated the relationship between age and expression sensitivity across all emotions ($p < .01$).

Conclusions: Thus, age-related changes in expression sensitivity among adults appear to be impacted by age-related changes in cognitive functioning.

Correspondence: *Sheena M. Horning, MA, Psychology, University of Colorado at Colorado Springs, 1420 Austin Bluffs Pkwy., Colorado Springs, CO 80918. E-mail: Shorning@uccs.edu*

A.M. HUBLEY & M. CHINNI. *Are Memory and Wellbeing Linked? An Exploratory Study with Adults Over Age 80.*

Objective: Despite the expectation that memory performance and measures of wellbeing ought to be related, very little research has examined this. The available research has focused mostly on autobiographical memory rather than measures of explicit memory. The purpose of this study was to examine the relationships of verbal and visuospatial learning and memory performance to age, education, mental status, and measures of wellbeing (i.e., depression, life satisfaction, self-esteem, and satisfaction with age) in a sample of older adults ages 80-99 years.

Participants and Methods: The sample consisted of 83 predominantly Caucasian adults (24 men, 59 women) ages 80-99 years ($M = 87.2, SD = 4.84$) with 3-21 years of education ($M = 13.1, SD = 3.83$). The sample included individuals from both rural and urban settings residing in assisted care facilities, nursing homes, and independently in private residences. They completed the Mini-Mental State Exam, Geriatric Depression Scale, Word List and Figure from the Memory Test for Older Adults Short Version (MTOA:S), Diener Satisfaction with Life Scale, Rosenberg Self-Esteem Scale, and an age satisfaction item.

Results: An examination of descriptive statistics showed good variability for each of the measures. Overall, the Word List and Figure showed moderate positive correlations ($r = .35$ to $.66$) with mental status scores, low negative correlations ($r = -.22$ to $-.34$) with age, and nonsignificant correlations with each of years of education and scores on the depression, life satisfaction, self-esteem, and age satisfaction measures.

Conclusions: As expected, lower mental status scores and older ages were associated with lower verbal and visuospatial learning and memory performance. No significant relationships were found, however, between any of the measures of wellbeing and verbal and visuospatial learning and memory scores. Thus, it does not appear to be the case that wellbeing variables impact learning and memory performance or vice versa in this age group.

Correspondence: *Anita M. Hubley, Ph.D., Dept. of ECPS, University of British Columbia, 2125 Main Mall, Vancouver, BC V6T 1Z4, Canada. E-mail: anita.hubley@ubc.ca*

A. IWAHARA, N. KATAYAMA, T. HATTA, E. ITO, N. NAGAHARA & C. HOTTA. Olfactory Dysfunction and Cognitive Decline in Middle Aged and Older Adults: Evidence from Yakumo Study in Japan.

Objective: Olfactory identification requires sensory, perceptual as well as cognitive functions. Aging is accompanied by impairment in various sensory and cognitive aspects of olfactory functioning. Several studies have demonstrated that difficulty in identifying odors predicts subsequent development of MCI among older persons without manifest cognitive impairment. However, the relationship between olfactory identification and cognitive function has not been investigated systematically in Japan. The aim of this study was to investigate this relationship and to consider robustness of this hypothesis cross-culturally.

Participants and Methods: Subjects were 276 community-dwelling middle aged and older persons without dementia. They were assessed cognitive functions and olfactory identification. The cognitive functions were measured by means of logical memory test, Money road test, stroop test, D-CAT (digit cancellation test) and verbal fluency test. Odor identification was assessed using 12 item smell identification test (Odor Stick Identification Test for Japanese).

Results: Participants were divided into three age groups (middle aged, younger old and older old) and two olfactory groups (normal or dysfunction) based on the smell identification test in each age groups. ANCOVA, using sex and education as covariate, age group and olfactory group as independent variables, and scores on the cognitive tasks as dependent variables, was conducted to investigate the effect of olfactory dysfunction on the age-related decline of cognitive functions. A significant interaction was shown for the score on logical memory test and stroop test.

Conclusions: The results suggest that olfactory dysfunction in the older old related more rapid cognitive decline. Our data collected in Japan replicated the fact that the smell identification test may be useful as predictor of cognitive impairment.

Correspondence: *Akihiko Iwahara, PhD, School of Health and Nursing Science, Wakayama Medical University, 580, Mikazura, Wakayama 6410011, Japan. E-mail: iwahara@wakayama-med.ac.jp*

S. KAUR, M.M. GONZALES, D. EAGAN, K.K. GOUDARZI & A.P. HALEY. Nutrition habits and fMRI – effects on fMRI BOLD response in middle age.

Objective: Cardiovascular health in middle age is associated with later cognitive performance. Nutrition habits are associated with better cardiovascular health. However, it is unclear if these habits are also associated with better cognitive function. The mechanisms for these associations are also unclear. We hypothesize that the ingestion of >3 servings of fruit + vegetables/week would be associated with better performance + higher fMRI BOLD response during a cognitively demanding task (the 2 back task). We also hypothesized that the ingestion of >3 servings of fruit and vegetables/week is associated with better performance on neuropsychological assessment.

Participants and Methods: Data from 22 participants were analyzed through one-way ANOVAs and multiple regressions. Participants were >40 years at time of assessment and had no record of psychiatric/neurological illness. Participants filled out a health questionnaire prior to assessment. Endorsement of individual items was examined against functional activation levels in a priori regions of interest, traditionally associated with the 2 back task and scores on neuropsychological tests. Age and cardiovascular risk factors were entered in the regression model as control variables.

Results: Participants who endorsed consuming >3 servings of fruit + vegetables/ week had significantly more activation in the right superior frontal gyrus ($F_{1,22} = 8.96, p = 0.007$), left middle frontal gyrus ($F_{1,22} = 6.18, p = 0.021$), left precentral gyrus ($F_{1,22} = 6.01, p = 0.023$) and right superior frontal gyrus ($F_{1,22} = 8.37, p = 0.009$). These associations remained significant after controlling for age and cardiovascular disease.

Conclusions: Consuming >3 servings of fruit + vegetables in a week is associated with increased activation in several frontal regions during a working memory task. Reduced cerebral hemodynamic response is associated with increased risk for dementia, modification of dietary habits could impact cognition in aging. Further research is needed to confirm this.

Correspondence: *Sonya Kaur, BA (Hons), University of Texas Austin, 1 University Station A8000, Austin, TX 78712. E-mail: sonya_kaur@mail.utexas.edu*

H. KIM, J. CHEY & M. SHIN. Increased Prefrontal Activity is Associated with Inefficient Cognitive Control in Aging Subjects.

Objective: Cognitive control is involved in various cognitive processes, and its inefficiency in elderly people has been suggested as playing a key role in various cognitive decline associated aging. The prefrontal cortex, the neural substrate of cognitive control, is the area that shows the most atrophy in an aging brain. We investigated the efficiency of cognitive control in old adults compared to young adults during the Multisource Interference Tasks, while measuring the neural activity of the prefrontal cortex, especially the posterior medial prefrontal cortex (MPFC) and the lateral prefrontal cortex (LPFC).

Participants and Methods: Using functional magnetic resonance imaging we compared neural activity during tasks that demanded high level of cognitive control to tasks that required minimum cognitive control. In young (ages: 20–34 years old) and old participants (ages: 64–77 years old).

Results: We found age-related decline in cognitive performance that was associated with increased activity in the MPFC and the LPFC: i.e., the older subjects activated the cognitive control areas even in tasks that required minimum cognitive control.

Conclusions: This implies that the neural circuitry between the cognitive control center and information processing centers are losing connections with aging. Further study is necessary to investigate age-related changes in the functional connectivity between the control centers and basic information processing centers.

Correspondence: *Hoyoung Kim, MA, Psychology, Seoul National University, Gwanakro 599, Gwanak-gu, Seoul 151-742, Republic of Korea. E-mail: bread76@snu.ac.kr*

L. KORTHAUER, R. CHARLTON, A. KUMAR & M. LAMAR. The Impact of White Matter Hyperintensities on Cognitive Function in Aging and Late-Life Depression.

Objective: Vascular damage, detectable on T2-weighted MRI as white matter hyperintensities (WMH), becomes increasingly common with advancing age and negatively impacts mood and cognition. Late-life depression (LLD) has been associated with increased vascular risk and subsequent vascular damage, but associations with mood and cognition are less clear. We hypothesized that WMH volume will be greater in LLD compared to age-matched healthy controls (HC) and more associated with mood and executive functioning than with other cognitive abilities.

Participants and Methods: WMH volume was measured for 24 participants (12 LLD & 12 HC) using a semi-automated software program (Jim) applied to FLAIR MR images. Composite z-scores of cognitive abilities were calculated for the following domains: executive function, episodic memory, processing speed and language.

Results: Despite statistically equivalent WMH volumes ($p = .13$), vascular damage was greater in LLD than in HC (LLD mean = 4278 mm³, HC mean = 1467 mm³). There were no group differences on cognitive measures, but correlations between composite z-scores and WMH volumes differed by group. In LLD, WMH volume correlated with executive function ($r = -.55, p = .03$); in HC, processing speed trended toward a significant association with WMH ($r = .49, p = .06$). No significant correlations were observed between WMH volume and episodic memory, language or depressive symptomatology in either group.

Conclusions: Results suggest WMH, seemingly more common in LLD compared to HC, negatively impact higher-level executive functions in LLD only. This may be related to higher vascular risk or medical comorbidity but not to subjective reports of depressive symptomatology; associations to be explored further in a larger sample.

Correspondence: *Laura Korthauer, M.A., Department of Psychiatry, University of Illinois at Chicago, 1601 W. Taylor St, Chicago, IL 60612. E-mail: lkorthauer@psych.uic.edu*

A. LANGLOIS & S. BELLEVILLE. Cognitive Complaint in Healthy Older Adults: Its Nature and Association with Objective Measures of Cognition.

Objective: The presence of memory complaint(s) has been identified as one of the defining symptoms for mild cognitive impairment, a pre-clinical stage for Alzheimer's disease. However, cognitive complaint is present in older adults and it is critical to better understand its nature. This study undertakes a fine-grained analysis of cognitive complaint in older adults by investigating the main domains of complaint and the relationship between complaint and objective cognitive performance.

Participants and Methods: A total of 115 community-dwelling healthy older adults completed a 62-item questionnaire measuring subjective perception of memory problems happening under various every-day life conditions (Self-Evaluation Questionnaire; QAM) and were tested with a comprehensive neuropsychological battery.

Results: A principal components analysis performed on the items of the QAM identified seven domains of subjective perception. Older adults expressed a high level of complaints for situations where external (ex: noise) or internal (ex: fatigue) factors interfered with cognition. Domains of mild/moderate complaint were related to Semantic knowledge, Slips of attention and Significant personal events. Correlational analyses indicated that level of complaint is associated with objective measures of episodic and working memory. Reporting difficulties in remembering significant personal events was associated with reduced functional autonomy.

Conclusions: This study provides a precise description of the subjective perception that older adults have about their memory. Complaint is well circumscribed showing only a few domains as the objects of complaint. Because subjective appraisal is correlated with objective performance, this study indicates that complaint can be used as a valid indicator of memory functioning in older adults.

Correspondence: *Anne-Sophie Langlois, doctorate, Psychology, Université de Montréal, Institut universitaire de gériatrie de Montréal, 4565 Queen-Mary, Montreal, QC H3W 1W5, Canada. E-mail: anne-sophie.langlois@umontreal.ca*

J. LOVE, P. BREWSTER & S. MACDONALD. Function and cognition: The structure of gait and its relation to cognitive status.

Objective: Examining the relationship between gait and cognition may further inform our understanding of those at risk for non-normative aging (e.g., dementia), health concerns (e.g., falls), or early mortality. Previous research has shown that both spatial and temporal indicators of gait function may be characterized according to multiple domains including pace, rhythm, phases, bases of support and variability. Here, we attempt to replicate previously reported factor structures for various gait indicators, as well as use these indicators and corresponding factor scores to predict cognitive group status.

Participants and Methods: 54 community dwelling older adults (76% female) between the ages of 65 and 87 years ($M=74.09$) underwent a series of tasks that included measures of neuropsychological integrity and physical mobility. Physical mobility was measured using a 16 foot GaitRite electronic walkway. Principal components analysis (PCA) was used to assess the factor structure of 23 spatiotemporal gait parameters (e.g., cadence, velocity, stance time). Logistic regression was then used to examine the unique predictive associations of individual indicators, as well as factors, for differentiating cognitive status subgroups classified as Not Cognitively Impaired (NCI), Cognitive Impairment No Dementia-simple (CINDs), or Cognitive Impairment No Dementia-multiple (CINDm).

Results: PCA revealed four primary components accounting for 93.23% of the variance in the 23 gait measures (i.e., factor 1, 51.77%; factor 2, 24.17%; factor 3, 11.52%; factor 4, 5.78%). Results from the logistic regression models indicated that gait speed best differentiated those classified as NCI versus CINDs or CINDm.

Conclusions: We were able to identify four factors related to gait, with gait speed sharing the strongest association with cognitive status. Future research needs to further examine potential mechanisms underlying the association between gait and cognitive function, as well as the prognostic utility of gait markers for identifying those at risk.

Correspondence: *Janet Love, Psychology, University of Victoria, P. O. Box 3050, Victoria, BC V8W 3P5, Canada. E-mail: janets@uvic.ca*

D.A. LOWE & S.A. ROGERS. Extroversion Impacts Older Adults' Intellectual and Frontal-Executive Functioning.

Objective: Research suggests that personality traits are associated with risk for cognitive decline later in life. However, little research has considered the relationship between personality and specific cognitive domains. This study examines the relationship between extroversion and intellectual and frontal-executive functioning among older adults.

Participants and Methods: One hundred twenty older adults completed a comprehensive neuropsychological battery. WAIS-III Verbal IQ (VIQ), Performance IQ (PIQ), and Full-Scale IQ (FSIQ) were calculated for participants. Frontal-executive measures included Trail Making A and B, COWAT FAS, DKEFS Color-Word Interference, and WAIS-III Digit Span, Digit Symbol, Similarities, and Letter-Number Sequencing subtests. The NEO-FFI was administered to assess five personality factors, including extroversion. Based on their Extroversion T-score, participants were divided into three groups: extroverts, introverts, and ambiverts.

Results: Extroversion was positively correlated with PIQ, FSIQ, Trail Making B, DKEFS Color-Word Interference, Digit Symbol, and Similarities, $ps < .05$. ANOVAs revealed significant differences between the three extroversion groups for PIQ, FSIQ, Trail Making B, Digit Span, Digit Symbol, and DKEFS Word Reading and Color-Word Interference, $ps < .05$. There was a trend toward significant differences between extroversion groups for WAIS-III Similarities and DKEFS Color Naming, $ps < .07$. Post-hoc analyses indicated introverts performed lower than extroverts and ambiverts on these measures, $ps < .05$.

Conclusions: Extroversion seems to be associated with higher nonverbal and overall intelligence, as well as stronger frontal-executive skills among older adults. Compared to extroverts and ambiverts, introverts may struggle on measures of basic and divided attention, graphomotor speed, verbal abstraction, response inhibition, and language processing speed. More research is needed, but these results have important implications for assessing and working with older adults.

Correspondence: *Deborah A. Lowe, Department of Psychology, Texas A&M University, 4235 TAMU, College Station, TX 77843. E-mail: dalowe@tamu.edu*

W. LU, J.R. MAHONEY & R. HOLTZER. Selective Interference of Working Memory in Aging.

Objective: The current study assessed the sensitivity of encoding, retention, and probe phases of working memory to dual-task interference in young and old individuals. To accomplish this aim, we developed a novel computerized dual-task paradigm consisting of a primary delayed item recognition task (DIR) and a secondary tone discrimination task (TDT) that selectively interfered with the encoding, retention, and probe phases of the DIR task.

Participants and Methods: 15 community dwelling older adults ages 59-91 years ($M = 66.87$), and 18 younger adults ages 17-28 years ($M = 19.17$) participated in the current study. All participants were determined to be non-demented and without any medical or psychiatric conditions that would affect their performance. A 2x4 repeated measures ANOVA was used to assess the effect of age (two-level between subject factor) task (alone, interference with encoding, retention, and probe) and their interactions on the primary and secondary tasks. Accuracy and RT served as the dependent measures. Analyses controlled for gender and education.

Results: As expected, older adults exhibited significantly greater RT and reduced accuracy across all conditions compared to younger adults

on both the DIR and TDT tasks. Specifically, disproportionate age-related dual-task costs in accuracy were observed in the probe dual-task interference condition in both the DIR [$F(1,29) = 12.048, p < .01$] and TDT [$F(1,29) = 18.016, p < .001$] tasks. Interference with encoding resulted in age-related reduced accuracy on the TDT task [$F(1,29) = 6.217, p < .05$].

Conclusions: We suggest that interference during the probe phase of working memory disproportionately taxes the central executive system in older adults.

Correspondence: *William Lu, MA, Psychology, Yeshiva University: Ferkauf Graduate School of Psychology, 1165 Morris Park Avenue, Bronx, NY 10461. E-mail: lu.william@hotmail.com*

N. LUC, S.F. SORG, D.M. SCHIEHSER, A. JAK, E. LANNI, M.W. BONDI, D.C. DELIS, L.R. FRANK & L. DELANO-WOOD. The Relationship Between Fornix White Matter Integrity and Memory Performance in Mild Cognitive Impairment Subtypes: A Diffusion Tensor Tractography Study.

Objective: The fornix is a white matter (WM) structure within the Papez circuit connecting the hippocampus to the frontal lobe. Since studies have suggested that hippocampal atrophy may precipitate cognitive decline in the context of mild cognitive impairment (MCI); we investigated the association between fornix integrity, hippocampal volume, and cognition in MCI subtypes.

Participants and Methods: Forty-seven older adults were divided into two demographically-comparable groups on the basis of their cognitive status (MCI: $n=27$; Normal Control [NC]: $n=20$). Comprehensive neuropsychological evaluations were administered as well as a 61-direction 3T-DTI scan. DTI values were extracted from fornix tracking, seeded from an ROI drawn on a T1 image and using an FA color-map as a reference. Hippocampal and intracranial volume were estimated using FreeSurfer.

Results: Despite no differences in hippocampal volume, MCI participants demonstrated lower fornix FA after adjusting for age and intracranial volume ($p=.001$). Additionally, the Amnesic MCI subgroup showed poorer WM fornix FA when compared to the Nonamnesic MCI subgroup, and fornix DTI values were positively related to performance on tasks of verbal memory (recall, retention, and recognition).

Conclusions: Our results demonstrated that, when compared to normally aging participants, those with MCI showed poorer fornix WM integrity. Additionally, the Amnesic MCI subgroup demonstrated poorer fornix integrity than the Nonamnesic MCI subgroup, and fornix FA was positively related to performance on verbal memory tasks. Findings suggest that fornix integrity may be more sensitive than hippocampal volumes to early MCI-related cognitive decline, and lend further support to the notion that WM integrity plays a role in MCI-related changes.

Correspondence: *Norman Luc, BA Psychology, UCSD, 3350 La Jolla Village Dr., San Diego, CA 92161. E-mail: nluc@rapop.ucsd.edu*

F. WOON, P.S. PANDIT, C.C. PERSAD, L. MICHALSKI, A.H. DOONG, C. CLINE & B.J. GIORDANI. Effects of an Alert Maintenance Task on Driving Performance in Older Adults: A Driving Simulated Study.

Objective: Monotonous road conditions may lead to fatigue and increased crash risk. Implementing a secondary (dual) task such as a trivia game during monotonous simulated driving (MSD) has been found to increase driving performance in tired young adult drivers, but such interventions have not been examined in tired older adults, a group already found to demonstrate performance declines in dual-task situations. This study examined whether an auditorily-presented interactive trivia game during MSD results in similarly improved driving performance in both younger and older adults.

Participants and Methods: We recruited 34 young adults (mean age 21.5 ± 3.9) and 35 older adults (mean age 63.4 ± 7.2). All subjects completed measures of executive function prior to the simulated driving. Fatigue was induced through a 50-min monotonous drive, followed by a

10-min baseline monotonous drive. Next, participants engaged in 10-min dual-task driving during which they were asked to answer questions from an automated trivia game. Driving performance was measured by how consistently the driver stayed in the center of the lane during both 10-min driving segments, using a 2x2 repeated measure ANOVA. **Results:** Results indicated no significant differences between age groups or between the monotonous and dual-task driving conditions. However, there was a significant correlation between the dual task cost in the trivia condition and the Wisconsin Card Sorting Test-Failure to Maintain Set, $r(69) = .263, p < .05$.

Conclusions: We did not find evidence to support the finding that certain dual task interventions can improve driving performance, though poor executive function was significantly associated with poor driving during a trivia game for both groups.

Correspondence: *Fu Lye Woon, Psychology, Brigham Young University, 3474 Cummings Dr, Ann Arbor, MI 48105. E-mail: lisztS@gmail.com*

C. MESSIER, D. MILLER, V. TALBOT & M. GAGNON. Press “0” for the operator: Cognitive abilities required in older people for successful interaction with interactive voice response systems.

Objective: In the recent years, there has been a proliferation of Interactive Voice Response Systems (IVR) to provide a number of services from business to health care. In the context of health care, IVR systems have the potential to improve efficiency to maximize the use of health care resources. However, surveys examining people's attitudes towards these systems have consistently found that people in general and older people in particular do not like to interact with IVR systems. Also, older people have significantly more difficulties using them (Katz, Aspden, & Reich, 1997). Many of the difficulties that seniors experience when interacting with IVR systems are suggested to be due to cognitive changes associated with aging (Dulude, 2002).

Participants and Methods: To date, there is no research on the cognitive abilities necessary for successful IVR interaction. In this study, we compared the performance of 185 older adults (age 65 and older) on the WAIS-IV and the WMS-IV with their performance on four IVR real-life systems (2 governmental information systems and two airline reservation systems) that varied in difficulty.

Results: Results showed that only 3% of participants were able to complete all four IVR tasks and a significant number of them (20.5%) could not complete any of the tasks. Of all cognitive abilities measures by the WAIS and WMS, auditory and working memory were the most significant predictors of how many tasks participants completed and how well they navigated within the IVR systems. Age did not predict participants' success of IVR tasks but it was, together with immediate and auditory memory, a significant predictor of how many errors participants made during their interaction.

Conclusions: We suggest that IVR systems can be improved and be friendlier toward older people by adapting them to lower abilities in working memory and auditory memory.

Correspondence: *Claude Messier, PhD, School of Psychology, Université of Ottawa, 136 Jean-Jacques Lussier Room 2076A, Ottawa, ON K1N 6N5, Canada. E-mail: cmessier@uottawa.ca*

I. METHQAL, Y. MARSOLAIS, M. WILSON, J. PROVOST, G. ALBOUY, F. GIERSKY & Y. JOANETTE. Clustering and Switching During Lexical Fluency: an fMRI Study in Young and Older Participants.

Objective: The complex underlying cognitive processes involved in lexical fluency (LF) tasks are suspected to be different across ages. A qualitative analysis approach has proven to be effective to study underlying strategic processes in LF.

To describe the neurofunctional patterns of activation underlying clustering (i.e., producing words from the same semantic or phonological group) and switching (i.e., changing the cluster) processes in semantic and orthographic LF during normal aging.

Participants and Methods: We used a mixed experimental design in fMRI allowing to explore the neural substrates supporting the processes

of clustering and switching. 24 French-speaking participants were divided into two groups of age: 12 younger individuals (20-35 years) and 12 older individuals (60-75 years). The LF task included 4 semantic categories (animals, vegetables, clothing, sports) and 4 orthographic categories (L, M, V, P), alternated with a control condition (months of the year).

Results: No significant differences were observed between younger and older individuals in terms of number of clusters and switches. However, imaging analysis shows a difference in the pattern of brain activation between the age groups and the strategy used. During clustering, younger participants showed greater activation of the posterior and anterior areas of the brain, including posterior parietal regions, left superior temporal, and bilateral posterior prefrontal regions. Additionally, we found no significant difference in activation for switching vs clustering in the group of elderly, unlike what was observed in younger participants.

Conclusions: These results are coherent with the literature suggesting that the pattern of brain activation sustaining similar performing young and older adults can be distinct. However, the nature of the difference in the present study does not appear to express compensation mechanisms but could be compatible with increased individual differences in the elderly linked to distinct life and communication experiences.

Correspondence: *Ikram Methqal, centre de recherche de l'institut universitaire de g riatrie de montr al, 4565, chemin queen mary, Montr al, QC H3W1W5, Canada. E-mail: ikrammethqal@live.fr*

K.M. MIRRA & E.J. MOES. Executive Functioning and Instrumental Activities of Daily Living in Healthy Older Adults.

Objective: The current study explored the relationship between tasks of executive functioning (EF) and instrumental activities of daily living (IADLs). Previous findings have been mixed when trying to parse out the aspects of EF most associated with daily functioning. Gaining a better understanding of what areas of cognition are most associated with IADLs in older adults has clear clinical implications.

Participants and Methods: Forty-five community-dwelling older adults with a mean age of 75.34 (6.73) years completed the study. There were 35 women and 10 men, with a mean education of 14.98 (2.84) years. The following EF measures were administered: WAIS-IV Digit Span (DS), D-KEFS Color-Word Interference Test (CWIT), and D-KEFS Trail Making Test (TMT). IADLs were measured using performance-based (Independent Living Scales, ILS) and self-report (Assessment of Living Skills and Resources; ALSAR) measures.

Results: A statistically significant relationship was found between the ILS and TMT4 ($\rho = .45$, $p = .001$), but not with DSB or CWIT3. The ALSAR was not significantly related to TMT4, DSB, or CWIT3. Further, when ILS was broken down into subscales to explore aspects of IADLs, TMT4 and CWIT4 were observed to be related to different aspects of daily function with moderate to large effect sizes.

Conclusions: The current study highlights the need to continue to explore the relationship between neuropsychological variables and everyday functioning in an aging population. Certain aspects of EF involving inhibition and cognitive flexibility may be more closely related to different aspects of everyday functioning.

Correspondence: *Kathryn M. Mirra, Ph.D., Psychology, Suffolk University, 41 Temple Street, Boston, MA 02114. E-mail: kathryn.lombardi@gmail.com*

K.M. MIRRA & E.J. MOES. Association or Discrepancy: Self-report and Performance-based Measures of Daily Functioning in Healthy Older Adults.

Objective: This study examined the relationship of self-report to performance-based assessment of IADLs in healthy older adults. The accuracy of assessing functional ability is important for determining safety to live independently, as well as for diagnostic accuracy, such as when considering the possible presence of dementia.

Participants and Methods: Forty-five community-dwelling older adults with a mean age of 75.34 (6.73) years completed the study. There were

35 women and 10 men, with a mean education of 14.98 (2.84) years. IADLs were assessed using a self-report inventory (Assessment of Living Skills and Resources, ALSAR) and a performance-based measure (Independent Living Scales, ILS). A discrepancy score between ALSAR and ILS was calculated as the difference between the z-scores based on the sample characteristics. The relationship of this score to demographic and other variables was then examined.

Results: ALSAR and ILS were not significantly related ($\rho = -.19$, $p = .11$). No statistically significant relationships were found between the discrepancy score and demographic variables (age, gender, education, IQ) and depression. There was a trend with age ($r = -0.23$, $p = 0.07$) suggesting that as people get older they get better at appraising their actual ability.

Conclusions: The lack of association between self-report and performance IADL measures is concerning, considering the ease, low cost, and widespread use of self-report measures. The accuracy of self-reported functioning is questionable, even in this highly educated and healthy sample, highlighting the dangers of using self-report for clinical and research purposes. Correspondence: *Kathryn M. Mirra, Ph.D., Psychology, Suffolk University, 41 Temple Street, Boston, MA 02114. E-mail: kathryn.lombardi@gmail.com*

M. MONTEBEAULT, S. JOUBERT, J. DOYON, J. CARRIER, J. GAGNON, O. MONCHI, O. LUNGU, S. BELLEVILLE & S. BRAMBATI. The Impact of Aging on Gray Matter Structural Covariance Networks.

Objective: Previous anatomic volumetric studies have shown that healthy aging is associated with gray matter (GM) tissue loss. However, it is quite possible that these studies have missed critical elements of age-related brain changes, which may exist largely in terms of interrelationship among brain regions. The present magnetic resonance imaging study aims at assessing the effect of aging on the organization of the GM structural covariance networks (SCNs).

Participants and Methods: Here, we used Voxel-Based Morphometry on high-definition brain scans to compare the patterns of GM structural covariance networks (SCN) that sustain different sensorimotor and high-order cognitive functions between 97 young (mean age=24.2±3.7 years, F/M=55/42) and 91 older (mean age=67.0±5.9 years, F/M=58/33) participants. This approach relies on the assumption that functionally correlated brain regions show correlated GM volume as a result of mutually trophic influences or common experience-related plasticity.

Results: We found a reduction in the strength of covariance patterns in the older adults compared with those who were younger, especially in the high-order cognitive networks. Major differences were observed in the SCNs subserving a) language skills that involve semantic knowledge, b) the ability to identify novel or relevant stimuli in order to guide behavior (salience network), c) executive functions and working memory (executive control network). These cognitive functions are typically altered in the older population.

Conclusions: Our results indicate that healthy aging alters the structural organization of cognitive networks, shifting from a more distributed (in young adulthood) to a more localized topological organization in older individuals. These age-related brain changes, however, do not indiscriminately affect all sensorimotor and cognitive networks but rather depend on the function sustained by the network itself.

Correspondence: *Simona Maria Brambati, Centre de Recherche - IUGM, 4565, Chemin Queen-Mary, Montreal, QC H3W1W5, Canada. E-mail: simonabrambati@gmail.com*

C.S. MOORE, M.D. GRANT, M.J. LYONS, W.S. KREMEN, C.E. FRANZ, M.S. PANIZZON, H. XIAN, R. TOOMEY & S.A. EISEN. The Relationship Between Erectile Dysfunction and Cognitive Performance in Late Middle Age.

Objective: Erectile dysfunction (ED) is a medical condition affecting ~50% of men between 40-70 years old in the United States. ED usually reflects a vascular disorder, with cardiovascular disease (CVD) accounting for up to 80% of all cases. Because it typically onsets 2-3

years before CVD diagnosis, ED has been accepted as a harbinger of systemic vascular disease in otherwise asymptomatic men. A vast literature exists on the negative impact CVD has on cognitive function. Given the association between vascular health and ED, this study investigated whether ED presence and severity was associated with a cognitive domain impacted early in CVD development.

Participants and Methods: As part of an ongoing longitudinal study, 1237 male twins aged 51-60 completed an extensive neuropsychological battery. ED was assessed by the International Index of Erectile Function.

Results: After controlling for age, education, and traditional CVD risk factors, there was a significant relationship between ED severity and processing speed (partial $r=0.16$, $p<.001$), such that increasing ED severity was associated with psychomotor slowing. ED was more predictive of cognitive performance than conventional vascular variables such as dyslipidemia, hypertension, angina, and diabetes.

Conclusions: ED is significantly associated with processing speed in late middle-aged men. Although there is typically a 2-3 year delay from ED onset to CVD diagnosis, our results suggest that underlying vascular dysfunction is already influencing cognitive performance. Intriguingly, ED was more predictive of cognitive function than other traditional indicators of vascular health. Our results underscore the importance of early diagnosis of ED and, to our knowledge, provide the first evidence relating it to cognitive function.

Correspondence: *Caitlin S. Moore, MA, Caitlin Moore, Boston University, 513 Putnam Ave, 210 N. Gilbert, Cambridge, MA 02139. E-mail: csmoore@bu.edu*

L. MORRA, D. ZADE, R. MCGLINCHEY & W. MILBERG. "Normal" Aging and Cognition: The Unacknowledged Contribution of Cerebrovascular Risk Factors.

Objective: Despite the widespread assumption that cognitive decline is an inherent part of normal aging (e.g., frontal hypothesis of aging) [1-4], research suggests that some of the variance in age-related cognitive decline can be attributed to modifiable factors common in geriatric populations such as cerebrovascular risk factors (CVRFs). Therefore, conventional wisdom about normal aging and cognition may, in part, reflect the impact of CVRFs (e.g., hypertension, elevated cholesterol, glucose intolerance). We evaluated the current literature to determine the extent to which CVRFs are accounted for.

Participants and Methods: A literature search using Science Citation Index was conducted to find the most cited articles published in the last ten years evaluating normal aging and cognition. Articles were categorized according to the degree and nature of CVRF evaluation: empirical, self-report, non-specific evaluation, no evaluation, and unclear CVRF consideration.

Results: Of the eight-seven articles selected only thirty-five articles evaluated CVRFs. More specifically, 20 articles measured CVRFs empirically, 13 used self-report measures, and 2 measured CVRFs in a non-specific manner. The remaining 52 (59.8%) articles didn't collect relevant CVRF data ($N=49$) or were unclear in their methods and couldn't be accurately placed into another group ($N=3$).

Conclusions: We found that the majority of the most frequently cited literature doesn't adequately account for the contribution of CVRFs and therefore, it is likely that many conclusions about normal aging and cognition are flawed or incomplete. Further investigation of the role of CVRFs in age-related cognitive decline is imperative to more accurately understand the effect of aging on cognition.

Correspondence: *Lindsay Morra, B.A., Boston VA Medical Center, 150 S. Huntington Ave, JP1S2, Boston, MA 02109. E-mail: lindsay.morra@gmail.com*

C.A. MUNRO & S.K. WEST. Sex Differences in the Cognitive Effects of Anticholinergic Medication.

Objective: The increased risk of cognitive morbidity among patients taking anticholinergic (AC) medications is a concern for clinicians. Al-

though robust sex differences in the non-cognitive effects of AC medications have been reported, we know of no studies that analyzed the cognitive effects of AC medications in men and women separately. In this study, we examined the relation between AC drug use and cognitive test performance in a community sample of older, high-functioning men and women.

Participants and Methods: Subjects were part of the Salisbury Eye Evaluation Driving Study, a study of cognitive and visual predictors of driving ability. They included 1425 adults, mean age 76.1 (range 67-88; 712 men; mean MMSE = 28.3). Information regarding medication use was gathered from in-home interviews with participants. Medications were classified as AC or not AC by a pharmacist. Cognitive test scores were compared between subjects taking AC medications ($n=294$) to those not taking AC medications, and analyzed separately in men and women.

Results: Subjects taking AC and not taking AC medications did not differ in age or education. In women, no differences in cognitive test performance between those taking and those not taking AC medications were found [p values ranged from .133 (word list learning) to .949 (letter fluency)]. In contrast, men taking AC medications performed lower on the MMSE ($p = .032$), the Brief Test of Attention ($p = .044$), and the Beery VMI ($p = .016$) compared to men not taking AC medications. Of note, none of the memory test performances differed between those taking AC medications and those not taking them, in either sex.

Conclusions: In healthy older adults, men may be more vulnerable than women to the cognitive effects of AC medications. The finding that memory does not appear to be affected by AC medication use in either sex suggests that AC medications may interact with disease to produce the memory dysfunction found in prior studies.

Correspondence: *Cynthia A. Munro, Ph.D., Psychiatry, Johns Hopkins School of Medicine, 600 N. Wolfe St., Meyer 218, Baltimore, MD 21287. E-mail: cmunro@jhmi.edu*

R.N. NEWSOME & M.D. BARENSE. Preclinical cognitive impairment in "healthy" volunteers, as assessed by MoCA.

Objective: The Montreal Cognitive Assessment (MoCA) is a neuropsychological test designed to screen for Mild Cognitive Impairment (MCI, Nasreddine et al., 2005). A suggestive cut-off score of <26 (out of 30) on the MoCA is indicative of probable MCI or a related dementia. However, Nasreddine and colleagues found that normal controls scored as low as 25 on the MoCA. Therefore, we compared those who scored <24 on the MoCA with MCI patients and healthy controls (MoCA >26).

Participants and Methods: We recruited older adults through the University of Toronto Adult Volunteer Panel. These older adults responded to fliers about aging studies in the community, and contacted the panel about participation. Of the 74 older adult volunteers (ages 60-80) tested on the MoCA in our laboratory in the past year, 19 scored <24 on the MoCA. We then tested 8 of these 19 so called "healthy" participants (mean age = 73) on a series of experimental tests we had performed previously in cases with MCI (Newsome, Duarte, & Barense, 2011, patient $n = 8$), and compared their performance to a group of controls ($n = 13$) who had passed the MoCA.

Results: Some, but not all, of those who fail the MoCA fall below 2 standard deviations of the mean on some of our experimental paradigms. We used a Repeated Measures ANOVA to compare MCI patients, MoCA <24 participants, and controls to examine behavioral effects. These analyses indicated that the MoCA <24 participants have behavioral data similar to MCI patients.

Conclusions: Our findings indicate that a significant number of so-called "healthy" controls participating through older adult volunteer panels may actually have cognitive deficits. Moreover, the data suggest that some of these individuals who perform poorly on the MoCA are not neurologically healthy, but may have undiagnosed MCI. In general, our findings indicate that the MoCA is a useful clinical concept, and may be helpful in identifying individuals at risk for developing dementia.

Correspondence: *Rachel N. Newsome, B.S., Psychology, University of Toronto, 100 St. George Street, Toronto, ON M5S 3G3, Canada. E-mail: rachel.newsome@utoronto.ca*

X. ORTIZ. Influence of Age and Schooling on Inhibition and Flexibility in Elderly People.

Objective: Inhibition and flexibility are two components of executive functions that depend on the frontal lobe. It has been suggested that executive functions decline with age due to frontal lobe dysfunction. The objective of this study was to analyze the influence of age and schooling on inhibition and flexibility in elderly people.

Participants and Methods: The total sample of participants was 171 elderly persons (60-87 years of age), 70 men and 101 women, with no history of neurological, psychiatric or sensory disorders. All participants signed an informed consent and then performed a modified Stroop task: 48 words printed in incongruent colors, half of the words have a dot in the left side. First, participants read the 48 words, then named the color of the ink of the same words. Time required to name the color of the ink was taken as indicator of inhibition. After that, participants had to read the words marked with a dot and to name the color of the unmarked words; finally, they had to name the color of the marked words and to read the unmarked words. Time in these sections was taken as indicator of flexibility.

Results: Inhibition decreases with age ($R^2=13$, $\beta=0.37$, $F=26.69$, $p<0.01$) and flexibility increases with schooling ($R^2=10$, $\beta=-0.32$, $F=19.39$, $p<0.01$).

Conclusions: These results suggest that some components of executive functions such as inhibition are influenced by age, while others, such as flexibility are influenced by schooling.

Correspondence: *Xochitl Ortiz, Ph.D., Laboratorio de Psicofisiología, Facultad de Psicología, Mutualismo 110, Monterrey 64460, Mexico. E-mail: xortizj@gmail.com*

J. PAYETTE, M. LAGUË-BEAUVAIS, L. DESJARDINS, N. CASTONGUAY, S. FRASER, F. LESAGE & L. BHERER. Neuropsychological performances associated with brain activation induced by dual-tasking in older and younger adults: a fNIRS study.

Objective: Age-related differences in dual-task performances have often been reported, but the underlying brain mechanisms supporting these performances are still debated. This study assesses the relation between performances in neuropsychological tests and brain activation induced by dual-task execution in both older and younger adults using functional near-infrared spectroscopy (fNIRS).

Participants and Methods: Younger ($M=23.6$; $SD=2$) and older adults ($M=63.9$; $SD=3.3$) underwent a battery of neuropsychological tests followed by a dual-task, during which changes in oxyhemoglobin (HbO) concentration was recorded in the prefrontal cortex using fNIRS.

Results: In younger adults, dual-task performances were associated with activation in the right dorsolateral prefrontal cortex (DLPFC) ($p=.003$) and in the bilateral ventrolateral prefrontal cortex (VLPFC) ($p=.042$). HbO levels in the right DLPFC correlated with performances in the Trail Making Test A (TMTA) ($p=.01$), while activation in the bilateral VLPFC correlated with the WAIS-III Matrix subtest ($p=.03$). In older adults, Trail Making Test B (TMTB) correlated with dual-task performance ($p=0.033$) and HbO concentration in the left DLPFC ($p=.04$).

Conclusions: Correlations between young adults' dual-task performance and the TMTA are coherent with previous findings, while this test's correlation with DLPFC could be related to the attention/executive demand of the task. Although unexpected, correlations with the WAIS-III Matrix subtest in young adults are coherent with findings linking visuospatial judgements to a frontoparietal network that includes VLPFC. In older adults, the association between dual-task performances and the TMTB is coherent with results showing increased sensitivity to interference with age. These results suggest that with age, dual-task performances can involve different brain regions or a different use of the proper regions, which could explain older adults' deficit in dual-task performance.

Correspondence: *Jean-François Payette, University of Quebec in Montreal, 2576 rue Beaucourt, Varennes, QC J3X 1K1, Canada. E-mail: jfpayette@gmail.com*

F. PETERS, S.M. BRAMBATI, D. GANDINI, O. COLLIGNON & S. BELLEVILLE. Auditory-visual integration during object localization and identification in normal aging.

Objective: Although much effort has been devoted to understanding how sensory systems in humans interact with each other, the effect of aging on these multisensory processes remains largely unknown. This study examined auditory-visual integration in healthy aged and young individuals under two experimental conditions.

Participants and Methods: In the localization condition, participants were asked to localize auditory (i.e. pure tone), visual (i.e. white-filled circle) or combined auditory-visual stimuli (simultaneous presentation of unimodal stimuli) presented on the left or right hemispace. In the identification condition, participants were instructed to discriminate between two different types of centrally presented stimuli (i.e. uttered words "red" or "blue" for auditory stimuli, red- or blue-filled circles for visual stimuli, and simultaneous presentation of congruent unimodal stimuli for bimodal stimuli).

Results: In the localization condition, the presentation of multisensory stimuli speeded response times in both groups as compared to unimodal stimuli, and the performance gain for aged individuals was similar to the one observed in young adults. In contrast, in the identification condition, the magnitude of multisensory enhancement in older adults was significantly greater than in young adults. Importantly, the analysis of unisensory response times revealed that age-related differences in multisensory processing are not solely attributable to general slowing.

Conclusions: Overall, these results indicate that older adults derive greater benefit from the combination of auditory and visual stimulations than do younger adults when discriminating object identity, but not object location. More generally, these findings support the idea that the use of multisensory environments may improve object recognition in normal aging.

Correspondence: *Frederic Peters, PhD, Institut Universitaire de Gériatrie de Montréal, 4565, Chemin Queen-Mary, Montreal, QC H3W 1W5, Canada. E-mail: fred.peters@gmail.com*

A. POLSINELLI & E. GLISKY. The Use of Perspective in Older Adults' Emotional Autobiographical Memories.

Objective: Older adults, compared to younger adults, process more positively-valenced information, a phenomenon known as the positivity bias (PB). However, the mechanisms through which the PB occurs, especially as it relates to autobiographical memory (AM), are unclear. This study attempted to identify potential factors, notably the use of perspective, that contribute to the PB and determine its relation to executive functioning (EF) which has been previously found important. Perspective was chosen as a potential factor in the PB as past research has shown that perspective can be used as an emotional regulatory tool.

Participants and Methods: 68 participants (31 younger adults, age 18-25, and 37 older adults, age 60-95) performed an emotional AM task as well as measures of affect and inhibition. Participants recalled 3 positive, 3 negative and 3 neutral AMs and indicated the perspective that was used at recall: Field perspective (Fp) or observer perspective (Op).

Results: Results indicated a trend in the interaction between age and the valence of memories recalled in Fp such that older adults used Fp more often for positive memories than younger adults. No effect of EF was found. Correlational analysis identified a significant positive relationship between age and the number of positive AMs recalled in Fp. Additionally, age was positively correlated with positive mood and negatively correlated with negative mood.

Conclusions: Preliminary findings suggest that older adults, regardless of EF, may use more Fp to recall positive AM which suggests that perspective may be one factor in the maintenance of the PB. Also, consistent with previous research, results suggest that older adults experience more positive and less negative affect than younger adults. As a previous power analysis indicated that more participants would be required to detect an interaction effect, recruitment of additional participants is underway.

Correspondence: *Angelina Polsinelli, B.Sc., Psychology, University of Arizona, 1503 E University Blvd, Psychology Bldg, Tucson, AZ 85716. E-mail: apolsine@email.arizona.edu*

E.E. RICHARDSON, J.L. WOODARD, W.R. MARKESBERY, R.C. GREEN, M. GEARING, L. MILLER, P. MARTIN, A. DAVEY & L. POON. Neuropathological Diagnosis of Alzheimer's Disease and Cognitive Status in Centenarians.

Objective: Several sets of neuropathological criteria have been used for definitive post-mortem AD diagnosis including: Khachaturian (KC), Consortium to Establish a Registry of Alzheimer's Disease (CERAD), Braak and Braak (BB), and National Institute on Aging- Reagan (NIA-R) criteria. The extent to which neuropathological burden or severity measured by these criteria correlates with cognitive functioning has not been investigated in the "oldest old." Using a large sample of centenarians, we investigated the consistency of neuropathological ratings between each set of criteria, and we subsequently examined the relationships between neuropathological burden and several clinical outcome measures for each set of criteria.

Participants and Methods: The Georgia Centenarian Study is a population-based sample of 244 centenarians or near-centenarians. Post-mortem AD diagnoses were obtained from 50 of the 244 participants. Participants were administered the Mini-Mental State Examination (MMSE), the Fuld Object Memory (FOME), the Behavioral Dyscontrol Scale, and the Direct Assessment of Functional Status (DAFS) as part of a larger evaluation.

Results: NIA-R criteria severity ratings differed significantly from CERAD, BB, and KC, although these latter three sets of criteria yielded comparable severity ratings among themselves. After controlling for demographic variables, NIA-R and CERAD criteria predicted performance on the MMSE and FOME Recall, Retention, and Repeated Retrieval Indices, while BB and KC predicted performance on the MMSE and FOME Retention Estimate.

Conclusions: Neuropathological AD rating criteria that focus on either plaques or tangles, but not both, yield similar ratings of neuropathological burden. Increased neuropathological burden is significantly related to general cognitive function and delayed retention in centenarians.

Correspondence: *Emily E. Richardson, Wayne State University, 2454 Semihole Street, Detroit, MI 48214. E-mail: emilyerichardson@gmail.com*

A.M. SEELYE, A. SMITH, M. SCHMITTER-EDGEcombe & D. COOK. A Graded Hierarchy of Prompts to Assist Healthy Older Adults in Completion of Instrumental Activities of Daily Living in a Smart Environment.

Objective: This study examined whether healthy older adults would benefit from receiving prompts in a smart environment when errors occurred during completion of instrumental activities of daily living (IADLs).

Participants and Methods: Participants were 26 middle-aged (45-59 years), 57 young-old (60-74 years), and 30 old-old (75+ years) cognitively intact community dwelling individuals. Participants completed 8 IADLs within a smart environment. A graded hierarchy of prompts (i.e., verbal indirect, verbal direct, and multimodal) was generated for each step needed to complete the IADLs. Prompts were delivered from a laptop when an error in activity completion occurred.

Results: A significant Kruskal-Wallis test, $p < .05$, followed by Mann-Whitney tests revealed that the old-old group ($Mdn = 2.5$) received more prompts to support task completion than the middle age group ($Mdn = 1.0$), $p < .001$. The old-old group ($Mdn = 1.5$) required that significantly more activity steps be prompted than the middle age group ($Mdn = 1$), $p < .001$, and received poorer experimenter quality ratings ($Mdn = 1.87$) than the middle age group, ($Mdn = 1.68$), $p < .001$. All three groups responded well to the verbal indirect prompts and the experimenter accuracy rating in response to prompting did not differ between groups.

Conclusions: Old-old participants required more prompts be given to support IADL completion than middle aged participants. All three groups responded well to the first level of prompting (i.e., verbal indirect), which helped orient participants back to task. Smart environment prompting technology might keep older adults functioning independently in their homes for longer periods of time.

Correspondence: *Adriana M. Seelye, M.S., Psychology, Washington State University, 14217 Brittany Terrace, Oregon City, OR 97045. E-mail: aseelye@wsu.edu*

T. SEIDER, B. BETTCHER, D. MUNGAS, B.R. REED, W. MACK, C. DECARLI, H. CHUI & J.H. KRAMER. Carotid Intima Media Thickness is Associated with Executive Function Decline in Non-Demented Elderly.

Objective: Atherosclerosis is a risk factor for cerebrovascular disease, and thus may be associated with age-related decline in executive functioning (EF). The primary goal of this study is to investigate the relationship between carotid artery intima media thickness (CIMT), a marker of atherosclerosis, and longitudinal change in EF in community-dwelling elderly. A secondary goal is to determine whether this relationship is mediated by MRI markers of white matter disease.

Participants and Methods: 49 non-demented subjects (mean age=79.6, mean MMSE=28.84) underwent neuropsychological assessment and B-mode carotid artery ultrasound. Cognitive testing occurred at baseline and one year after. EF was quantified using a well established IRT-based composite score built from several EF donor scales. Baseline MRI data were available in a subset ($n=34$) of subjects. White matter hypointensities (WMH) on T1 images were volumed using Freesurfer.

Results: The relationship between CIMT and change in executive functioning was modeled using partial correlations adjusted for age. Thicker mean CIMT at baseline was associated with greater decline in executive functioning ($r=-.44$, $p=.002$). After controlling for WMH, the association between CIMT and EF decline remained ($r=-.47$, $p=.007$).

Conclusions: Results indicate that thicker CIMT is associated with greater decline in EF abilities. This finding persists after controlling for WMH, suggesting that an MRI marker of white matter disease is not sufficient to explain this relationship. We conclude that carotid atherosclerosis, a vascular risk factor, is associated with adverse cognitive outcomes in non-demented elderly. The mechanisms underlying this relationship deserve further investigation.

Correspondence: *Talia Seider, University of California, San Francisco, 350 Parnassus Ave, Ste 905, San Francisco, CA 94117. E-mail: tseider@memory.ucsf.edu*

C. SETER, T. GIOVANNETTI, D.J. LIBON, J.M. MINGER & C. NIEVES. Everyday Action Through the Years: Aging is Associated with Reduced Accuracy but not Slowed Speed on Complex Tasks.

Objective: Cognitive aging has been attributed to slowed processing speed, increased interference, and/or reduction in general cognitive resources. The effect of aging on everyday tasks is not well understood; performance-based assessment allows for characterization of performance to elucidate potential mechanisms of decline.

Participants and Methods: Forty-five healthy participants ($M_{age} = 59.00 \pm 21.47$, range 20-82 years; $M_{education} = 14.24 \pm 3.45$, range 8-25 years) were administered the MMSE and Naturalistic Action Test (NAT), a performance-based measure of everyday action. Task 1 is the simplest, with all of the materials provided on the tabletop. Task 2 includes semantically related distractor items, enabling measurement of interference effects. Task 3 is the most complex, requiring completion of multiple goals with distractor items and task relevant items in a tabletop drawer. Videotaped performances were coded for % Accomplishment of central task steps, Total Errors, and Completion Time.

Results: Age explained 14% of the variance in Total Errors and 16% of the variance in Accomplishment [$F(1, 44) > 7.15$, $p < .05$ for both]. Age explained a non-significant percent of variance (<1%) in Completion Time. Task analysis showed that aging effects were observed only

for the most complex Task 3, where age explained 21% of variance in Total Errors. There was no effect of age on Tasks 1 or 2. There was no effect of gender, and education effects were non-significant after accounting for age. Cognitive status (as measured by the MMSE) continued to explain a significant portion of the variance in Total Errors even after accounting for age.

Conclusions: Neither slowed speed nor greater interference from distractors increased with age. Aging negatively influenced everyday action accuracy, likely due to reduced cognitive resources.

Correspondence: *Colette Seter, M.A., Psychology, Temple University, 1701 North 13th Street, Weiss Hall- Room 857, Philadelphia, PA 19122. E-mail: tua93506@temple.edu*

A. SIMMONS, L. QUITANIA PARK, D. HARVEY & S. TOMASZEWSKI FARIAS. Neuropsychiatric Symptoms are not Strongly Associated With Degree of Cognitive Impairment in Older Adults.

Objective: Neuropsychiatric symptoms are common in dementia, MCI, and older adult populations. The risk factors which make older adults more susceptible to neuropsychiatric symptoms is not well known. We hypothesized that greater executive impairment would increase the prevalence of neuropsychiatric symptoms within a mixed older adult sample, when compared with other cognitive domains.

Participants and Methods: A cross-sectional cohort of 1007 participants (cognitively normal, 30%; MCI, 23%; and dementia, 47%), was examined (age, $M = 76$). Cognitive domains including, executive functioning, semantic and episodic memory, and spatial ability were taken from the SENAS battery; and absence or presence of neuropsychiatric symptoms (NPS) was assessed using the Neuropsychiatric Inventory (NPI-Q).

Results: In models that included only one cognitive variable (and age and education), episodic memory ($p < 0.0001$), executive functioning ($p = 0.004$), and spatial ability ($p = 0.044$) had statistically significant associations with NPS. However, the total variance accounted for by these three cognitive variables was rather small ($R^2 =$ ranged from .02 to .05). In a multivariate model that include all four cognitive variables and age and education, only episodic memory contributed unique variance to predicting the presence of NPS.

Conclusions: Contrary to our prediction, executive function was not particularly important in predicting the presence of NPS. Of the cognitive domains, episodic memory was the primary determinant of NPS. However, overall the relationships between cognitive function and NPS was small, suggesting that the presence of NPS are largely independent of the degree or nature of the cognitive impairment.

Correspondence: *Amanda Simmons, Neurology, UC Davis Medical Center, 4560 Y Street, Suite 3900, Sacramento, CA 95817. E-mail: amanda.simmons@ucdmc.ucdavis.edu*

C. SIMON, D. MUNGAS & S. TOMASZEWSKI FARIAS. Cognitive Correlates of Performance-Based Measures of Everyday Function in Older Adults.

Objective: Loss of functional abilities accompanies dementia, and to a lesser degree Mild Cognitive Impairment (MCI) and normal aging. The cognitive determinates of everyday function are still not well understood, and likely vary by task. The current study examined the relationship between cognitive tests assessing a wide range of neuropsychological abilities, and performance-based functional tasks.

Participants and Methods: A total of 62 older adults with normal cognition, MCI or dementia were studied. Average age was 75.9 (6.78), education was 14.97 (3.08), approximately half were female and 82% Caucasian. The performance-based functional tasks included the Memory for People video, the Check Writing and Planning Recreational Activities subscales from the UPSA, and a Map Reading from the NAB. Neuropsychological composites measured episodic memory, semantic memory, spatial abilities and executive functions using the SENAS.

Results: Bivariate and multivariate analyses were conducted to examine the relationship between the performance-based functional tasks and the cognitive domains. In bivariate analysis all performance-based measures were significantly associated with all cognitive domains (ranging $r^2 = .11 - .48$). Multivariate models used each of the four performance-based tasks as outcomes with all of cognitive measures plus age and education as predictors. Recall for people, check writing, and planning were all significantly predicted only by episodic memory performance. In contrast, Map Reading was independently related only to spatial abilities.

Conclusions: Results suggest that a variety of performance-based functional abilities are highly dependent on episodic memory. However, there is also evidence that some functional tasks depend on more specific cognitive abilities.

Correspondence: *Christa Simon, B.S, Neurology, UC Davis, 202 Cousteau Place, Center for Mind and Brain, Davis, CA 95618. E-mail: christamsimon@gmail.com*

E. BOLINGER, J. SUHR & K. HEFFNER. The Relationship of Pre-morbid Memory Ability to Cortisol Reactivity in Aging-Related Stereotype Threat.

Objective: Some studies have shown increased cortisol reactivity to stress is associated with impaired memory performance, while other studies have shown the opposite. These mixed findings may be explained by lack of control for premorbid memory ability (PMA).

Participants and Methods: In the present study, we examined the relationship of PMA ability to stereotype threat effects on memory performance and cortisol reactivity in older adults carefully screened for pre-existing medical and neurological conditions.

Results: Low PMA was related to worse verbal memory, $p < .001$. There was no main effect of stereotype threat, $p = .96$, and no interaction of PMA and stereotype threat, $p = .63$. Low PMA was also related to worse working memory, $p < .001$; there was a trend towards a main effect of stereotype threat, $p = .11$, but no interaction, $p = .50$. Baseline cortisol levels were not associated with stereotype threat, $p = .29$, PMA, $p = .16$, or their interaction, $p = .22$. However, the interaction between PMA and stereotype threat was significant immediately post-task, $p < .001$, and at 20 minutes post-task, $p < .001$. Follow-ups showed that, in the neutral condition, those with worse PMA were more stressed following the tasks than those with better PMA. However, in the stereotype threat condition, those with worse PMA were LESS stressed following the tasks than those with better PMA.

Conclusions: Findings point to the importance of controlling for pre-morbid cognitive functioning when understanding the effects of stereotype threat on behavioral performance and stress reactivity in older adults.

Correspondence: *Julie Suhr, Psychology, Ohio University, 200 Porter Hall, Athens, OH 45701. E-mail: suhr@ohio.edu*

S. VANDERMORRIS, K.J. MURPHY & A.K. TROYER. Older Age is Associated with Elevated Intraindividual Variability on Associative Memory Tasks.

Objective: Elevations in intraindividual variability (IIV) in cognitive function associated with older age have been linked to reduced executive control associated with decline in frontal lobe function. Emerging evidence suggests that IIV may also reflect changes to more distributed neural network activity, including frontal, parietal, and medial temporal regions. As such, we hypothesized that age-related elevations in IIV would be evident on tasks of cognitive processes sensitive to aging, but not primarily reliant on frontal systems, such as associative memory.

Participants and Methods: Participants were 20 older (aged 63-86 years) and 20 younger (aged 18 to 25) healthy adult volunteers who completed two computer-based associative memory tasks (word-word, face-name). In addition to traditional accuracy and speed measures, indices of IIV were derived from individual reaction times, statistically purified for systematic between-group and trial effects.

Results: For both tasks, older adults showed elevated IIV relative to the younger adults (Word-Word $\eta_p^2=.20$; Face-Name $\eta_p^2=.16$). Elevated IIV was robustly correlated with slowed response speed across both groups and tasks (r 's ranging from .64 to .78). IIV-accuracy correlations were mixed (r 's ranging from -.44 to .49).

Conclusions: The present study expands the evidence base on IIV as an indicator of age-related neurocognitive compromise, showing that elevations in IIV associated with older age are evident on a broader range of cognitive tasks than have been studied to date. Observed elevations in IIV on associative memory tasks are congruent with the notion that IIV may reflect, in addition to frontal systems dysfunction, age-related decline in more distributed neural networks, including medial temporal regions.

Correspondence: *Susan Vandermorris, PhD, Rotman Research Institute, Baycrest, 3560 Bathurst St, Toronto, ON M6A 2E1, Canada. E-mail: svandermorris@rotman-baycrest.on.ca*

B.P. VASQUEZ & N.D. ANDERSON. Reaction Time Variability is Greater in Older Adults on an Ecologically Valid Measure of Selective Attention.

Objective: Intraindividual variability (IIV) or inconsistency across trials is now thought to be an informative measure of performance for many cognitive tasks. Previous research has shown that increased IIV exists in both healthy aging and various brain pathologies. The study of IIV in sustained attention may be particularly useful as research suggests increased variability to be an index of impaired cognitive/attentional control.

Participants and Methods: IIV in reaction time (RT) was examined in 24 healthy older (ages 65 – 85) and 24 healthy younger adults (ages 18 – 32) on a selective attention task designed to be more ecologically valid than those used in the past. Participants observed playing cards scrolling continuously across a touch screen, with the task being to use a stylus to tap a specific target as quickly as possible.

Results: Younger and older adults' mean RT, intraindividual standard deviation (ISD) of RT, and target misses were compared using t -tests. The results revealed that older adults were more variable in their response latencies, had greater mean RTs, and missed more targets than did the group of younger adults.

Conclusions: Our findings provide further support for the association between aging and increased RT inconsistency. Importantly, we have shown for the first time that this increased variability in aging exists in the context of a real world type of task, comparable to production lines, quality control positions, and luggage scanning at airport security. In the future, we plan to investigate the effects of cognitive training that will target the attention mechanisms involved, leading to decreased trial-to-trial inconsistency, improved attention, and the generalization of these beneficial effects to other tasks. This research was supported by the Heart & Stroke Foundation of Ontario Centre for Stroke Recovery.

Correspondence: *Brandon Vasquez, Rotman Research Institute, Baycrest, University of Toronto, 3560 Bathurst Street, Toronto, ON M6A 2E1, Canada. E-mail: brandon.vasquez@utoronto.ca*

E. VUOKSIMAA, M.S. PANIZZON, C. FENNEMA-NOTESTINE, L. EYLER, A. JAK, C. FRANZ, M. LYONS, T. JERNIGAN, A. DALE & W.S. KREMEN. Association Between Cognitive Functions and Brain Pathology in Late Middle Age: What is the Role of Cognitive Reserve?

Objective: Increased brain pathology is related to cognitive functions in people with aging-related dementias, but it is unclear how the association between brain pathology and cognitive functioning is manifested among non-demented individuals in late middle age. Moreover, it is of interest whether cognitive reserve plays a role in brain-cognition relationships in non-demented, relatively younger adults.

Participants and Methods: We studied the association between brain pathology and various cognitive domains and the role of cognitive reserve in a sample of 467 middle-aged men (51 – 60 y) from the Viet-

nam Era Twin Study of Aging with two measures of cognitive reserve: educational level and premorbid general cognitive ability measured at age 20. We used MRI measures of white matter abnormalities and ventricular volumes, adjusted for intracranial volume, as measures of brain pathology.

Results: Increased brain pathology was a significant ($p<0.05$) predictor of poorer performance in the domains of processing speed, executive function, visuo-spatial ability, and abstract reasoning. Age 20 general cognitive ability was also a significant ($p<0.05$) predictor of performance in these cognitive domains. The effect of reserve was investigated by including an interaction term between measures of reserve and brain pathology index. Evidence of cognitive reserve was detected only in the processing speed domain. The education-x-brain pathology interaction was a significant ($p<0.05$) predictor of processing speed, indicating that the increased brain pathology was associated with impaired processing speed only among lower educated individuals.

Conclusions: Interestingly, there was support for the cognitive reserve hypothesis based on education as an index of reserve, but not based on actual young adult cognitive ability.

Correspondence: *Eero Vuoksimaa, PhD, University of Helsinki, P.O. Box 41 (Mannerheimintie 172), Helsingin yliopisto 00014, Finland. E-mail: eero.vuoksimaa@helsinki.fi*

J. WOHLTMANN & E. GLISKY. A Comparison of Many-to-One Mapping and One-to-One Mapping of Source and Associative Memory in Older Adults.

Objective: The difference between source and associative memory is unclear. Few studies have directly compared source and associative memory in order to clarify hypothesized differences. One hypothesis is that source and associative memory are distinguishable by the different mapping schemes typically used for each task. Source memory typically links many items to one of two different sources (many-to-one mapping), while associative memory typically links each item with another unique item (one-to-one mapping). In addition, associative memory has usually been linked with medial temporal lobe (MTL) function and source memory has been associated with frontal lobe (FL) function. The present study tested this mapping hypothesis by comparing groups of neuropsychologically diverse older adults on a many-to-one and a one-to-one mapped memory task.

Participants and Methods: 32 healthy older adults were categorized as above or below average on composite measures of FL and MTL function. They then studied headlines that appeared in one of two newspapers (many-to-one condition) or in different newspapers (one-to-one condition). After a short delay, participants were given a two-alternative forced choice recognition memory test for which headline appeared in which newspaper.

Results: Findings indicated there were no differences in memory as a function of the mapping condition, and older adults with high-MTL scores performed significantly better on both memory tasks.

Conclusions: The results suggest that a) differences in mapping do not distinguish associative and source memory and b) both tests are dependent on processes associated with the MTLs. Reasons for the failure to find an effect of FL function on source memory will be discussed.

Correspondence: *Janelle Wohltmann, M.A., University of Arizona, 1503 E. University Blvd., PO Box 210068, Tucson, AZ 85721. E-mail: jjw@email.arizona.edu*

K. WOLFF. Influence of Personality on Diagnosis of Cognitive Impairment in Older Adults.

Objective: The current study explored differences in personality among older adults whose cognitive diagnosis improved, declined, or remained stable over time.

Participants and Methods: Longitudinal data were collected for 73 older adults who completed a neuropsychological battery and the NEO-Five Factor Inventory to assess personality. Participants were classified into four aging-related diagnostic groups.

Results: The results suggest that those with lower levels of Openness to Experience and Agreeableness appear to be more likely to experience a change in diagnosis than those with higher levels of Openness and Agreeableness.

Conclusions: When considering the specific type of diagnostic change, those with lower levels of Openness at first assessment seem to be more likely to experience a decline in their diagnosis over time. These results suggest that older adults with lower levels of Openness and Agreeableness are at greater risk of experiencing cognitive decline over time than older adults with higher levels of these personality factors.

Correspondence: *Kelsey Wolff, Westmont College, 955 La Paz Road, Santa Barbara, CA 93108. E-mail: kwolff@westmont.edu*

H.H. WRIGHT, M. STOLTZFUS, G. FERGADIOTIS & G. CAPILOUTO. Cohesion and local coherence in narratives across the lifespan.

Objective: As operationalized, cohesion and local coherence (LC) share similar linguistic properties. Cohesion is when interpretation of one element in discourse is dependent on another element and LC refers to how well the content from one discourse unit relates to the content of the preceding unit. Use of cohesive devices, then, may influence discourse coherence. However, age-related changes have been found for LC but not use of cohesive devices. The purposes of this study were to examine the relationship between local coherence and cohesion and to evaluate age related differences.

Participants and Methods: Study participants included 60 healthy adults between 20 and 89 years comprising three age groups – younger (20-29), middle-aged (40-59), and older (70-89). Discourse samples included three narrative recounts – participants recounted their (1) recent vacation, (2) recent holiday, and (3) weekend plans. The samples were orthographically transcribed and segmented into C-units. Hand measures included cohesive density (complete cohesive ties/c-units) and LC mean rating (max score = 4).

Results: Preliminary results indicated a difference across age groups for LC, $F(2,57) = 5.59$, $p = .0061$; but not for cohesive density, $F(2,57) = 2.39$, $p = .10$. Planned comparisons indicated that the older group had significantly better LC scores compared to the middle-aged group. A significant correlation between cohesive density and LC meaning ratings was found for the younger and middle-aged groups, $r = .47$, $p = .037$ and $r = .70$, $p = .0003$, respectively.

Conclusions: Clinical and theoretical implications of the results will be discussed.

Correspondence: *Heather H. Wright, PhD, Speech & Hearing Science, Arizona State University, P.O. Box 870102, Tempe, AZ 85287-0102. E-mail: Heather.Wright.1@asu.edu*

S.E. YEUNG, T.S. PATERSON & W.L. THORNTON. Depressive Symptoms Predict Everyday Problem Solving Ability in Older, but not Young, Adults.

Objective: Increased symptom endorsement on the Centre for Epidemiologic Studies Depression (CES-D) Scale has been associated with reduced everyday problem solving (EPS) ability in older age (Yen et al., 2011). However, it remains unclear which aspects of depressive symptomatology may account for this relationship. Furthermore, these associations remain unexplored in younger adults, who generally endorse higher depressive symptoms and superior EPS performance as compared to older adults. To address these issues, we examined CES-D scores as predictors of EPS in different age cohorts.

Participants and Methods: Young undergraduates ($n=111$; age: 13-30) and older adults ($n=103$; age: 51-91) were administered the CES-D to measure depressive symptomatology. EPS ability was determined by the number of safe/effective solutions generated for real-world scenarios.

Results: Young adults endorsed higher CES-D symptoms than older adults ($t(210)=5.74$, $p<.001$). Regression analyses revealed that increased CES-D scores predicted worse EPS ability in older adults ($\beta=-$

$.17$, $p<.05$) beyond age, sex, and education. Four regression analyses examining each CES-D factor score revealed that Positive Affect ($\beta=-.21$, $p<.01$) remained the only significant predictor of EPS ability beyond demographic variables. Neither demographic variables nor CES-D scores predicted EPS ability in young adults.

Conclusions: The current results extend previous findings that increased depressive symptomatology predicts decreased EPS ability in older age, by demonstrating that this relationship may be driven by lower positive affect (loss of hope/enjoyment in life). Furthermore, this association is not observed in younger age. While young adults may endorse higher depressive symptoms, these symptoms do not necessarily predict everyday problem solving ability in this cohort.

Correspondence: *Sophie E. Yeung, M.A., Simon Fraser University, #1401-2135 Madison Avenue, Burnaby, BC V5C 6T6, Canada. E-mail: sey1@sfu.ca*

D. ZAMORA, S. CHRISTOPHER & A. BELK. Is Aging a Privilege or a Burden?

Objective: Aging stereotypes influence older adults' performance on cognitive, physical, physiological, psychological variables. The goal of this study was to examine beliefs about getting old, of individuals 18 and older. We measured positive and negative stereotypes of psychological, psychosocial and physical aspects of aging, and then examined the relationship between several demographic variables and aging stereotypes. **Participants and Methods:** Participants were recruited on-line via social networks. They completed questionnaires which consisted of a Demographics Questionnaire, the Perspectives on Aging Scale, and the Attitudes of Aging Questionnaire. The sample was 84% Caucasian, 68% female, and the mean age and education was 35 years and two-years of college respectively.

Results: Through higher order analysis, the data indicated that race, gender, education, marital and employment status, and household income were not related to either positive or negative stereotypes of aging. As people got older, their positive beliefs about aging become stronger and their negative beliefs about aging became weaker. The correlation between a person's age and beliefs about getting old was stronger for physical aspects of aging compared to both psychological and psychosocial aspects of getting old.

Conclusions: Age was the strongest predictor of aging beliefs. The older the person was, the more positive views of aging they had. This suggests that getting old may not be perceived as negative stage by those who are in it. Teaching the reality about aging can help reduce the negative beliefs and attitudes towards the elderly, which may indirectly influence their performance across many cognitive and psychological domains.

Correspondence: *Diana Zamora, Binghamton University, 426 Clubhouse Road, # 3, Vestal, NY 13850. E-mail: dzamora1@binghamton.edu*

R.F. ZEC, S. KOHLRUS, S. FRITZ, R. ROBBS & T. ALA. Effects of Age, Education, Gender on "FAS" Phonemic Word Fluency.

Objective: The objective was to study the effects of age, education, and gender on "FAS" word fluency in a large sample of "non-demented" older adults.

Participants and Methods: "FAS" fluency was administered to 1045 "normal" older adults (age 50-89) as part of a comprehensive cognitive battery in a study of cognitive aging. For the total sample, mean age = 68.2, female/male=705/340, mean MMSE=28.9, & mean education=14.37. There were 176, 409, 353, and 107 participants in their 50s, 60s, 70s, and 80s, respectively. Mean MMSE scores for the 4 age groups were 29.1, 29.1, 28.8, and 28.3.

Results: The mean+/- SD "FAS" fluency score for the entire sample was 38.42+/-11.8. Somewhat poorer mean "FAS" fluency scores were found with successively older age decades (50s, 60s, 70s, 80s): 40.73+/-13.1, 39.06+/-11.7, 37.03+/-11.2, & 36.81+/-11.5. Significantly poorer mean "FAS" fluency scores were found with successively decreasing educational levels (<12, =12, >12 years), i.e., 29.36+/-11.2, 36.84+/-11.4, & 40.14+/-11.6 words. Mean "FAS" fluency was 39.45+/-11.9 for women

and 36.29+/-11.5 for men. The magnitude of the "FAS" fluency decline was relatively modest across the four age decades, i.e. -1.67, -2.03, & -0.22 words decline, respectively. The magnitude of the difference between mean "FAS" fluency scores was sizable between the three educational levels but clearly larger between the <12 and =12 educational groups (-7.84 words) than between the =12 and >12 groups (-3.30 words). Gender difference on "FAS" fluency was also sizable (-3.16 words).

Conclusions: Significantly poorer mean "FAS" fluency scores were found with decreasing educational levels and in the male group vs. female group. Successively older age decades had relatively modest effects on "FAS" fluency with a negligible difference between the 70-79 vs. 80-89 age groups. The significant effects of education and gender, and to a lesser degree age, on "FAS" fluency demonstrate the importance of using normative data to determine an individual's impairment level.

Correspondence: *Ronald F. Zec, Ph.D., Neurology, SIUSOM, 751 N. Rutledge St, Springfield, IL 62794. E-mail: rzec@stumed.edu*

A.L. WANTZ, W.S. RAMRATAN, R.B. LIPTON & M.E. ZIMMERMAN. Neuropsychological Performance, Actigraphy, and Self-Report of Sleep among Healthy Older Adults.

Objective: Although both cognitive decline and sleep disturbance have been reported among older adults, investigations of the relationship between these two critical clinical entities have produced mixed findings. The goal of this study was to comprehensively examine relationships between neuropsychological and sleep functions among healthy older adults using both objective (actigraphy) and subjective (questionnaire) sleep assessments.

Participants and Methods: Twenty-seven nondemented older adults (mean age=80+4.6 years, 44% women, 63% Caucasian) completed neuropsychological assessment, actigraphy, and a sleep questionnaire (Medical Outcomes Study Sleep Scale (MOS-SS)). Neuropsychological variables of interest included tests of processing speed, attention, executive function, and memory. Actigraphy measures included Onset Latency, Wake After Sleep Onset, Efficiency, and Total Sleep Time. Analogous measures were selected from the MOS-SS.

Results: Lower actigraphy-measured sleep Efficiency was associated with poorer performance across tests of processing speed, attention, and executive function ($r=-0.42$ to -0.60). Similarly, longer actigraphy-measured Onset Latency was associated with poorer performance on tests of processing speed, attention, and executive function ($r=0.40$ to 0.41). Self-report measures of sleep were not associated with neurocognitive tests, except sleep adequacy and processing speed ($r=-0.48$). Memory was not associated with either actigraphy or MOS-SS. Actigraphy and MOS-SS measures also were not associated.

Conclusions: Our primary finding from this pilot study is that among healthy older adults, processing speed, attention, and executive function were strongly related to several sleep disturbance indices measured objectively by actigraphy, but not by a self-report questionnaire. Actigraphy may provide a more sensitive measure of sleep disturbance that is not captured by self-report measures completed by older adults.

Correspondence: *Molly E. Zimmerman, Ph.D., Department of Neurology, Albert Einstein College of Medicine, 1165 Morris Park Ave., Rousso Bldg, Room 310, Bronx, NY 10463. E-mail: molly.zimmerman@einstein.yu.edu*

HIV/AIDS/Infectious Disease

A. ARENTOFT, J.G. MONZONES, C.C. KELLY, A. FUENTES, A. ROSARIO, C. MIRANDA & M. RIVERA MINDT. Socioeconomic Status Predicts Neuropsychological Test Performance Among Racially/Ethnically Diverse HIV+ Adults.

Objective: Research indicates that individuals of lower SES and racial/ethnic minority status are at greater risk for HIV infection (CDC 2008, U.S. Census Bureau, 2006) and that HIV is associated with neuropsychological (NP) impairment (Heaton et al., 2010).

The relationship between socioeconomic (SES) and NP performance may be particularly relevant for the HIV+ population, but has yet to be explored. This study investigated the impact of SES on NP test performance among a racially/ethnically diverse group of HIV+ adults.

Participants and Methods: 128 HIV+ adults (33% female; 76% Hispanic/Latino and 24% non-Hispanic white; age=47.67±8.04, education=12.48±2.84) completed a standardized SES measure (Hollingshead Index of Social Prestige [ISP]) and a comprehensive NP battery (attention/working memory, processing speed, learning, memory, verbal, executive, & motor functioning).

Results: Hollingshead ISP was significantly positively correlated with average Learning and Memory T-scores (all p 's<.05). Regression analyses revealed that Hollingshead ISP accounted for 8% and 9% (respectively) of the variance in Learning (B=.30) and Memory T-scores (B=.34, all p 's<.01). Hollingshead ISP score also completely mediated the relationship between race/ethnicity and Learning and Memory, such that race/ethnicity (all p 's>.10) no longer predicted Learning or Memory performance.

Conclusions: Results revealed that lower SES estimates were significantly related to worse NP performance, particularly in learning and memory. Furthermore, SES completely mediated the relationship between race/ethnicity and NP functioning. These results suggest that SES should be considered when interpreting NP test performance, particularly within racially/ethnically diverse populations. Further research is needed to examine these relationships among other racial/ethnic and medical populations.

Correspondence: *Alyssa Arentoft, MA, Psychology, Fordham University, 441 East Fordham Road, Dealy Hall 226, Bronx, NY 10458. E-mail: alyssa.arentoft@gmail.com*

K. BLACKSTONE. Deficit Scores versus Clinical Ratings: Defining Neurocognitive Impairment in HIV.

Objective: Due to mild and variable HIV-related neurocognitive profiles, clinical ratings (CR) and global deficit scores (GDS) are recommended for detecting impairment as opposed to mean group differences. The CR-approach requires impairment in at least two ability domains, whereas the GDS considers impairment across all measures. The current study examines the appropriateness and correlates of each method.

Participants and Methods: Neurocognitive functioning of 1574 HIV-infected participants was assessed via a comprehensive seven-domain neuropsychological battery. Global neurocognitive impairment was defined for each participant independently by CR and GDS. Participants were classified into four categories based on the two impairment classification approaches (Dually-normal, CR-only impaired, GDS-only impaired, or Dually-impaired). Discrepant classifications were examined across HIV-disease, daily functioning, and demographic measures.

Results: There was 86% concordance between CR and GDS neurocognitive classifications. Less than 1% were classified as GDS-only impaired; 14% were classified as only CR-only impaired. As compared to Dually-normal, CR-only impaired participants were more likely to be unemployed, have AIDS, and reported more everyday cognitive complaints (p 's < 0.05). However, the CR-only impaired participants reported fewer everyday cognitive complaints than participants classified as Dually-impaired (p 's < 0.05).

Conclusions: Cognitive impairment classifications were in high agreement. In discrepant classifications, assuring impairment in at least two neurocognitive domains resulted in more detection of intermediate-level functional problems (e.g., advanced HIV disease, increased unemployment and functional complaints). Although there is high overlap between approaches, clinicians and researchers should recognize the strengths and weaknesses of each when evaluating neurocognitive complications in HIV.

Correspondence: *Kaitlin Blackstone, SDSU/UCSD Joint Doctoral Program, 4055 Falcon Street, #201, San Diego, CA 92103. E-mail: kaitlin.blackstone@gmail.com*

D. BRAGA, T. MARCOTTE & R. MEYER. HIV-Associated Neurocognitive Disorders are Associated with Driving Cessation.

Objective: HIV often results in neuropsychological (NP) impairments. These impairments have been shown to impact automobile driving ability, as assessed via driving simulators and on-road evaluations. The goal of this study was to determine whether HIV-associated neurocognitive disorders (HAND) were also associated with self-reported driving cessation, and to determine whether functioning in specific cognitive domains was predictive of those who stopped driving.

Participants and Methods: 158 HIV+ participants who had previously driven in their lifetime completed an NP test battery and questionnaire regarding driving history and habits. Participants with significant non-HIV-related contributing factors to impairment were excluded. The sample was 85% male, with a mean age = 39.8, mean years of education = 13.5, and median CD4 of 278; 63% had been diagnosed with AIDS.

Results: The NP impaired group was more likely than the NP Normal group to have stopped driving (46% vs. 15%, $p < .0001$). Participants with Mild Neurocognitive Disorder had the highest driving cessation rate (67%), followed by participants with Asymptomatic Neurocognitive Disorder (32%; all groups significantly different from each other at $p < .05$). Current medical status was not associated with driving cessation. Level of impairment in Attention/Working Memory and Motor Functioning predicted driving cessation in a multivariable model that controlled for demographic contributors and accounted for 20% of the variance ($p < .0001$).

Conclusions: Persons with HAND, including those who do not report that their impairments affect everyday functioning (“asymptomatic”), are at risk for driving cessation. Such impairments have the potential to significantly impact a patient’s mobility, independence, and quality of life.

Correspondence: Daniela Braga, HIV Neurobehavioral Research Program, University of California, San Diego, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: tmarcotte@ucsd.edu

J. CATTIE, D. FRANKLIN, M. CHERNER, S. WOODS, R.K. HEATON, W. PERRY, T. HASSANEIN, F. BARAKAT, S. LETENDRE & I. GRANT. Longitudinal Cognitive, Affective, and Neurobehavioral Effects of Interferon and Ribavirin Therapy for Hepatitis C Virus (HCV).

Objective: Although interferon (IFN)- α and ribavirin are effective in treating chronic Hepatitis C (HCV), a substantial proportion of patients subjectively experience adverse mood and cognitive effects. It has been hypothesized that HCV may induce neuroinflammation and brain dysfunction (Bokemeyer et al., 2010) and that IFN- α may exacerbate risk for impairment due to its pro-inflammatory properties. Findings are mixed as to whether significant changes in objective neuropsychological test performance occur during treatment (Fontana et al., 2007; Hilsabeck et al., 2005), and if so, whether cognitive functioning eventually returns to pre-treatment levels after interferon and ribavirin are discontinued.

Participants and Methods: We performed detailed neuropsychological, neuromedical, and neurobehavioral evaluations on 28 (8 HIV+) HCV+ individuals at baseline as well as 8-12 weeks, 6 months, and 12 months after initiating interferon- α therapy.

Results: Paired samples analyses revealed significant declines in global neuropsychological functioning, including domains of executive, learning, motor, and working memory performance after 8-12 weeks ($ps < .05$). Between baseline and the 8-12 week assessment, incidence of cognitive impairment nearly doubled (25% to 46%). Elevated rates of neurobehavioral disturbance and depressive symptoms were also observed after 8-12 weeks ($ps < .05$). After one year, participants did not significantly differ from baseline on GDS, depressive symptoms, or total neurobehavioral disturbance ($ps < .05$). However, their trajectories were variable, and 71% of individuals who experienced incident impairment during treatment remained impaired after one year.

Conclusions: These data suggest that initial worsening in cognitive functioning, depressive and neurobehavioral symptoms may occur with HCV treatment, but these may partially improve within 1 year.

Correspondence: Jordan Cattie, B.S., SDSU/UCSD Joint Doctoral Program in Clinical Psychology, 220 Dickinson St, Suite B, San Diego, CA 92103. E-mail: jcattie@ucsd.edu

K.L. DOYLE, E. WEBER, J. ATKINSON, I. GRANT & S. WOODS. Interrelationships of Age, Prospective Memory, and Health-Related Quality of Life in HIV Infection.

Objective: Both HIV infection and aging are independently associated with deficits in prospective memory (PM), which is a dissociable and ecologically relevant aspect of episodic memory involving the ability to execute future intentions. As the incidence and prevalence of HIV infection among older adults is increasing, the current study sought to investigate the possible differential effects of PM on health-related quality of life (QoL) in older and younger HIV-infected adults.

Participants and Methods: Seventy-two HIV+ older adults (i.e., ≥ 50 years) and forty-one HIV+ younger adults (i.e., ≤ 40 years) were administered the RAND 36-Item Short Form Health Survey (SF-36), the Memory for Intentions Screening Test (MIST), and the Prospective and Retrospective Memory Questionnaire (PRMQ).

Results: The PRMQ PM scales were predictive of QoL across both age groups, but results showed a significant interaction between time-based PM and age group on both mental and physical QoL, even after controlling for other demographic and medical risk factors. Follow-up analyses revealed that lower time-based PM was associated with lower QoL in younger, but not older HIV+ subjects. In the younger cohort, time-based PM, PRMQ PM scales, and current major depressive disorder were sole predictors of QoL, independent of disease severity, substance abuse, and global neurocognitive impairment.

Conclusions: These findings are commensurate with prior data showing that PM is an important predictor of everyday functioning in HIV infection. Whether the relatively stronger predictive value of PM impairment on QoL in the younger versus older HIV-infected cohorts is moderated by age-related differences in the deployment of compensatory strategies remains to be determined.

Correspondence: Katie L. Doyle, Psychiatry, UCSD, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: kldoyle@ucsd.edu

R.P. FELLOWS, D.A. BYRD & S. MORCELLO. Effects of HIV-Associated Distal Sensory Polyneuropathy on Neuropsychological Test Performance.

Objective: Distal sensory polyneuropathy (DSP) is the most common neurological condition associated with HIV, causing nerve damage in upper and lower extremities, yet its impact on neuropsychological test performance is unclear. As the prevalence of HIV-associated neurocognitive disorders remains high, it is essential to examine other potential mechanisms of dysfunction. This study examined the effects of DSP on neuropsychological test performance in HIV+ participants.

Participants and Methods: This cross-sectional study comprised 279 HIV+ participants enrolled in the Manhattan HIV Brain Bank. All participants underwent comprehensive neuropsychological and neurological assessments. Multivariate regression analyses, adjusting for age and reading level, were conducted to assess the independent contribution of DSP anatomic distribution (upper extremity vs. lower extremity) and DSP symptom status (symptomatic vs. asymptomatic) on standardized neuropsychological domain scores.

Results: Of the 279 participants, 150 (54%) met criteria for DSP. Overall, DSP was associated with significantly worse psychomotor performance with a lesser, yet significant, effect on information processing speed and executive function. The presence of neurologic signs of DSP in the upper extremities and symptomatic DSP were the strongest independent predictors of psychomotor performance ($p < .001$). However, DSP limited to the lower extremities also predicted differences in these domains ($p < .05$). DSP was not associated with encoding, retrieval, verbal fluency, or working memory.

Conclusions: These findings indicate that HIV-associated DSP significantly impacts performance in multiple domains which require psychomotor responses: psychomotor speed, information processing speed, and executive function. Thus, poor neuropsychological test performance among HIV+ persons with DSP may be partially attributed to peripheral abnormalities rather than pure cognitive dysfunction.

Correspondence: *Robert P. Fellows, Mount Sinai School of Medicine, One Gustave L. Levy Place, Box 1134, New York, NY 10029. E-mail: robert.fellows@mssm.edu*

C.J. GIESBRECHT, K. GICAS, H.A. BAITZ, F. VILA-RODRIGUEZ, G.W. MACEWAN, A.M. BARR, D.J. LANG, W.G. HONER & A.E. THORNTON. Memory Recall Processes of Poly-Substance Users: Associations with Viral Exposure.

Objective: Viral infections can impact neurocognition with greater deficits found in individuals with two infections. In polysubstance users (PSU), this study examines the extent to which total number of viral exposures differentially contributes to memory processes engaged by an encoding specificity task (EST; Tulving & Thomson, 1973).

Participants and Methods: PSU were recruited from single-room occupancy hotels (n=173; age 23-68; 135 M, 38 F). Assessments involved self-reported substance use via timeline follow-back methods, viral serology and testing (5 viruses: HIV, HBV, HCV, HSV, CMV) and a cognitive battery, including the EST. EST involves manipulation of study and cue conditions using word pairs of differing associational strengths. The dependent variable, memory bias, was calculated. Higher scores indicated relatively greater semantic based recall and lower scores represented relational memory processes. Regression analysis was used to evaluate potential associations between number of viral exposures and relational memory recall on the EST.

Results: Predictor variables screened prior to running a hierarchical regression included gender, head injury, psychosis, age, education, number of viral exposures, and substance use (cocaine, methamphetamine, cannabis, and heroin). Variables that met the $p < .05$ cutoff for association with memory bias were age, number of viruses, and methamphetamine and cannabis use. Significant variance in memory bias was explained by age (2.3%, $p < .05$). Subsequently, a block of variables capturing substance use explained additional variance (4.0%, $p < .05$). Finally, total viral exposures significantly increased the variance accounted for (3.9%, $p < .05$) in memory bias.

Conclusions: Increased age and number of viral exposures were associated with greater semantic recall, whereas more frequent methamphetamine and cannabis use was associated with relational based recall, suggesting that viruses and substances differentially impact memory processes by targeting dissociable neural pathways.

Correspondence: *Chantelle Giesbrecht, MSc, Simon Fraser University, SSSS University Drive, Department of Psychology, Burnaby, BC V5A1S6, Canada. E-mail: cjgiesbr@sfu.ca*

J.R. GRUBB, E.T. OVERTON, B.M. ANCES, N. PARKER, T. SPITZ, J. FRAIN, D. DEMARCO-SHAW & D. CLIFFORD. Brief Screening Tools for HIV-Associated Neurocognitive Disorders.

Objective: The diagnosis and management of HIV-associated neurocognitive disorders (HAND) can be time intensive and is often omitted in busy clinical settings. Brief screening tools are needed to identify persons at risk for HAND. The Montreal Cognitive Assessment (MOCA) and the AD-8, an 8 item interview, are simple neurocognitive batteries that have been previously validated in Alzheimer's Dementia but have not been used for identifying HAND.

Participants and Methods: We administered the MOCA and AD-8 to 200 HIV-infected persons. The neuropsychological z score for a standard battery of 8 tests (NPZ-8), was calculated to serve as the comparator. Correlation values using the Pearson Product Moment Correlation were compared for each of these brief screens to the (NPZ-8). For NPZ-8 testing, neurocognitive impairment was defined as a Z-score of < -1 in two separate domains, while impairment on the MoCA (< 26) and AD-8 (> 2) were based on previous criteria.

Results: 200 HIV+ subjects were enrolled (mean age=43 years old, 72% male, 67% black). All subjects were on antiretroviral therapy and were virologically suppressed with a median CD4 cell count of 538 c/mm³. Based on NPZ-8 testing, 127 subjects (63.5%) were diagnosed with neurocognitive impairment. By the AD-8 and MoCA screening, 113 (56.5%) and 101 (50.5%) subjects were impaired. The screening tools were significantly correlated to the calculated NPZ-8 scores ($r=0.58$ for MoCA, $p < 0.001$ and $r=-0.24$ for AD-8, $p=0.001$). The sensitivity and specificity of MoCA were 63% and 71%, respectively. The sensitivity and specificity of AD-8 were 61% and 51%, respectively.

Conclusions: Among a group of HIV-infected persons on stable antiretroviral therapy, HAND remains prevalent with 64% identified by formal testing. However, some of these subjects with mild cognitive impairment were not identified by the MoCA and AD-8. These data highlight that while these brief tools correlate well with formal neuropsychological screening, their sensitivities are lower than desired for a screening tool. Correspondence: *Jessica R. Grubb, MD, Internal Medicine, Washington University of Medicine, 660 S. Euclid, Box 8051, Saint Louis, MO 63110. E-mail: JGrubb@dom.wustl.edu*

S. GUPTA, S. GEORGES, T.R. HENDRIX, P. SUAREZ, R.K. HEATON & M. CHERNER. Sensitivity of a Performance-Based Assessment of Functional Impairment to HIV and Neuropsychological Status in Spanish-speakers.

Objective: HIV-associated neurocognitive diagnoses require assessment of neuropsychological impairment (NPI) and its functional impact in everyday life. However, development and validation of performance-based functional assessments lag, particularly for Spanish speakers.

Participants and Methods: We sought to validate the use of a performance-based battery of instrumental activities of daily living in 98 HIV+ [age: $m=40.8$ (10.3); education: $m=11.5$ (3.9)] and 104 HIV- [age: $m=39.8$ (13.6); education: $m=11.7$ (4.2)] Spanish-speakers. The battery included 8 tasks requiring daily living skills. Task deficit scores and impairment cut-points were developed based on the HIV- distribution of scores. The deficit scores were averaged to produce an overall functional deficit score (FDS). NPI was classified using a Spanish language neuropsychological battery with demographically-corrected norms. We compared functional performance among HIV-, HIV+ without NPI (HIV+NPI-) and HIV+ with NPI (HIV+NPI+). The three groups did not differ significantly on age or education. Although the HIV- group had significantly more women ($p < .001$), gender was unrelated to functional or NPI impairment.

Results: Chi square analyses revealed significantly higher prevalence of functional impairment among HIV+NPI+ (39%) compared to HIV+NPI- (10.7%) and HIV- (12.5%; $p < .01$). We then selected the four functional tasks that best discriminated between groups and generated an abbreviated FDS-2, which proved more sensitive (56.5%, 21.3% and 16.4% functionally impaired, respectively; $p < .001$).

Conclusions: Findings support the utility of our battery in assessing the functional impact of HIV-associated NPI. The FDS-2 requires considerably less administration time and pending cross validation, may prove to be a better indicator of functional decline in HIV.

Correspondence: *Saurabh Gupta, Ph.D., Psychiatry, University of California San Diego, 220 Dickinson St., Ste. B, San Diego, CA 92103. E-mail: sGupta@ucsd.edu*

S. GEORGES, S. GUPTA, P. SUAREZ, T. HENDRIX, R. HEATON & M. CHERNER. Relationship Between Self-reported Cognitive Complaints and Objectively-measured Functional Impairment in Spanish-speakers Living with HIV.

Objective: Diagnoses of HIV-associated neurocognitive disorders require assessment of functional status in daily life. However, there is little research on the development and validation of performance-based functional measures, particularly among Spanish-speakers. We sought to redress this through validation of a performance based-measure of functional status by investigating associations with self-reported cognitive complaints.

Participants and Methods: 98 HIV+ Spanish-speakers [age: $m=40.7$ (10.4); education: $m=11.4$ (3.9)] received a performance-based func-

tional battery assessing everyday living skills, such as medication management, cooking, shopping, and money management, through simulation tasks. Deficit scores for each task were developed based on distributions of scores in an HIV- sample. The mean of deficit scores produced a functional deficit score and a cutoff was established to define functional impairment. Functionally impaired HIV+ participants were compared to the unimpaired on endorsement of self-reported cognitive complaints using the Patient's Assessment of Own Functioning Inventory (PAOFI), which consists of five scales: Memory, Language, Sensorimotor, Sensory-Perceptual, and Higher Cognitive Functions.

Results: Functionally impaired participants (n=18) had significantly higher levels of complaints ($p < .05$) than functionally intact participants (n=80) on all scales, excepting the PAOFI Memory subscale ($p > .10$). The same was true of the PAOFI Total Score ($p < .05$).

Conclusions: The observed association between most categories of cognitive complaints and functional impairment status supports the validity of our battery in reflecting losses of independence in everyday functioning related to HIV infection. However, functionally impaired subjects did not demonstrate significantly greater report of memory difficulties than the functionally unimpaired.

Correspondence: *Shereen Georges, Psychiatry, University of California San Diego, 220 Dickinson St., San Diego, CA 92103. E-mail: shereengeorges16@gmail.com*

J.M. HEAPS, J. JOSKA, J. HOARE, S. SEEDAT, M. ORTEGA, B. ANCES, D. STEIN & R. PAUL. Neuroimaging markers of HIV-infection in South Africa.

Objective: The purpose of this study is to assess volumetric differences between a group of antiretroviral (ARV)-naive HIV+ patients and healthy (HIV-) controls from Cape Town, South Africa.

Participants and Methods: Seventeen HIV+ individuals and 13 HIV-controls were recruited as part of an ongoing study. Each participant completed a brief screening for dementia (IHDS), structural MRI, and provided blood samples to evaluate clinical markers of HIV. Six brain regions were selected to assess volumetric differences and were normalized for head size.

Results: Volumetric reductions were observed in the thalamus ($p=.046$), cortex ($p=.01$), and total gray matter (inclusive of cortical and subcortical regions; $p=.01$). There were no volumetric differences in the caudate, total white matter, or the corpus callosum. Additionally, the volumes did not correlate with the clinical markers (i.e. CD4 count), age, or gender. The HIV+ group did perform worse on the IHDS ($M=9.71$, $p=.004$) compared to the control group ($M=11.3$). The performance on the IHDS was not correlated with volumes in any of the selected regions.

Conclusions: This study is the first to provide evidence of structural volumetric changes in CNS of HIV+ individuals in South Africa, where HIV Clade C predominates. Previous research using brief cognitive screens or in vitro analysis has suggested that Clade C maybe less neurovirulent than Clade B. However, these results, even in this small sample, suggest that HIV Clade C is neurovirulent. Future, more comprehensive studies incorporating genetic analyses, individual factors, and the impact of treatment with ARVs are necessary to understand the development of HIV-related neurocognitive disorders in South Africa.

Correspondence: *Jodi M. Heaps, M.A., Psychology, University of Missouri-St. Louis, 442-A Stadler Hall, One University Blvd, Saint Louis, MO 63121. E-mail: jmhfx3@umsl.edu*

L.J. HINES, E. MILLER, C. HINKIN, J. ALGER, P. BARKER, K. GOODKIN, E. MARTIN, V. MARUCA, A. RAGIN, N. SACKTOR, J. SANDERS, O. SELNES & J.T. BECKER. Cortical Brain Atrophy and Intra-Individual Variability in Neuropsychological Test Performance in HIV Disease.

Objective: The purpose of this study was to characterize the relationship between intra-individual variability (IIV) in neuropsychological test performance and brain volume HIV seropositive and seronegative men and to determine the effects of cardiovascular risk, drug use and HIV infection on this relationship.

Participants and Methods: Magnetic Resonance Imaging (MRI) was used to acquire high resolution neuroanatomic data in 160 men aged 50 and over, including 84 HIV seropositive (HIV+) and 76 seronegative controls (HIV-). Voxel Based Morphometry was used to derive volumetric measurements at the level of the individual voxel. These brain structure maps were analyzed using Statistical Parametric Mapping (SPM2). This is a cross-sectional, cohort study.

Results: Total gray matter (GM) volume was inversely associated with IIV. Among all subjects, IIV-related GM atrophy was observed primarily in three distinct cortical regions, including the inferior frontal gyrus bilaterally, with atrophy of the left inferior frontal gyrus extending to the supramarginal gyrus, spanning the lateral sulcus; the superior parietal lobule and intraparietal sulcus of the right hemisphere; and dorsal/ventral regions of the posterior section of the transverse temporal gyrus. Contrary to our predictions, HIV status, biological, and CVD variables were not linked to IIV-related gray matter atrophy.

Conclusions: Intra-individual variability in neuropsychological test performance may be a sensitive marker of cortical integrity in older adults, regardless of the HIV infection status or CVD risk factors, and the degree of IIV links with volume loss in specific cortical regions; independent of mean-level performance on NP tests.

Correspondence: *Lindsay J. Hines, Ph.D., Neuropsychology, Sanford Health Neurosciences, 700 1st Ave S, Fargo, ND 58103. E-mail: lindsayhines@ucla.edu*

J. IUDICELLO, E.J. KELLOGG, E. WEBER, I. GRANT, D.L. DRANE & S. WOODS. Semantic Cueing Improves Verbal Fluency in Persons Living with HIV Infection.

Objective: HIV infection is associated with semantic fluency deficits, which are driven primarily by executive dyscontrol (e.g., switching between lexicosemantic clusters). The present experiment aimed to ameliorate HIV-associated fluency impairment by examining the potential benefits of semantic cueing.

Participants and Methods: Participants included 86 HIV-infected individuals and 87 demographically matched seronegative participants. Each participant was administered two 60-second semantic fluency trials: 1) a standard (i.e., uncued) category fluency task using either supermarket items or home items as superordinate categories; and 2) a cued fluency trial, in which participants were provided with a subordinate category retrieval cue at 15-second intervals (e.g., "fruits and vegetables" for supermarket items). Trial order and superordinate category cues (i.e., supermarket items or home items) were randomized for each participant.

Results: A repeated measures ANOVA revealed main effects of serostatus (HIV- > HIV+; $p = 0.012$) and fluency condition (Cued > Uncued; $p < 0.001$), but no significant interaction. Pairwise comparisons revealed significant improvements in performance for both the HIV- ($p = 0.002$; $d = 0.30$) and HIV+ ($p = 0.040$; $d = 0.22$) groups. Within the HIV+ group, lower education was uniquely associated with greater benefit from cueing ($p = 0.026$).

Conclusions: Consistent with research in other frontal systems populations, individuals with HIV benefitted from cueing on semantic fluency, possibly by minimizing the executive demands of the task (e.g., lexicosemantic search and retrieval). These findings may inform rehabilitation efforts aimed at improving cognition in HIV-infected individuals, particularly those with lower levels of education.

Correspondence: *Jennifer Iudicello, Ph.D., Psychiatry, HIV Neurobehavioral Research Center, SDSU/UCSD, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: jiudicello@ucsd.edu*

R. KAMAT, T. MARCOTTE, R. DEUTSCH, A. UMLAUF, S. WOODS, R. HEATON, H. ATKINSON, R. ELLIS & I. GRANT. Apathy is Associated with Antiretroviral Non-adherence in HIV+ Persons with Methamphetamine Use Disorders.

Objective: Cognitive impairment, substance use history, and psychiatric status are risk factors for poor adherence in HIV+ individuals. Clinically significant apathy (decreased goal directed behavior; motoric,

emotional and cognitive avolition) is a prominent sequela of HIV+ infection, but little is known about its functional ramifications. This study examined the potential role of apathy in non-adherence in a high-risk cohort of individuals with comorbid HIV infection and recent methamphetamine (MA) use disorder.

Participants and Methods: 44 HIV+ individuals, currently prescribed antiretroviral (ARV) therapy, and meeting DSM-IV criteria for MA dependence during their lifetime were administered a neuropsychological battery, a structured psychiatric interview, and the apathy subscale of the Frontal Systems Behavioral Scale. Self-reported non-adherence (i.e., any skipped ARV dose in the last four days) was established using the AIDS Clinical Trials Group Adherence Questionnaire.

Results: 36% of participants reported being non-adherent. A significant multivariable model was found when examining an a priori model of apathy (clinical elevation = T-score > 65), last use of MA, global NP impairment, and MDD diagnosis as predictors of self-reported adherence ($\chi^2=16.93, p<.01$). Clinically elevated apathy (LR $\chi^2=4.53, p=.033$) and more recent MA use (LR $\chi^2=8.15, p<.01$) contributed an additional significant effect beyond the other predictors' combined effect in predicting non-adherence.

Conclusions: Apathy appears to be significantly associated with HIV medication non-adherence in individuals with a history of MA dependence. These findings suggest that clinical detection of apathy may help identify patients who might be at greater risk for non-adherence and in need of additional support for medication compliance.

Correspondence: *Rujvi Kamat, MS, SDSU/UCSD Clinical Psychology JDP, 150 West Washington, 2nd Floor, San Diego, CA 92103. E-mail: rkamat@ucsd.edu*

T.D. MARCOTTE, M. GHATE, R. DEUTSCH, R. MEYER, S. LETENDRE, R.K. HEATON, R. KAMAT, I. GRANT & S. MEHENDALE. Early HIV Antiretroviral Treatment Improves Mild Neurocognitive Deficits.

Objective: Combination antiretroviral treatment (ART) has resulted in reduced severity of HIV-associated neurocognitive disorders. However, treatment is often initiated only after patients show immunocompromise (e.g., CD4 < 350), particularly in resource-limited settings. The goal of this study was to determine whether initiating ART at higher CD4 cell counts benefits neuropsychological (NP) functioning.

Participants and Methods: HIV+ participants in Pune, Maharashtra, India with a CD4 cell count > 350/mm³ and enrolled in a separate study (HPTN 052) were randomized to immediate (n = 35) or deferred treatment (n = 44). All participants completed a full NP battery (translated into Marathi) at baseline and a 1-year follow-up. NP performance was summarized using unadjusted mean scaled scores (mSS).

Results: Groups were similar with respect to age, education and gender, disease stage, and current CD4 cell count (~ 460/mm³). At baseline, the mSS for the deferred treatment group was 9.0 (1.8) vs. 9.7 (1.4) for the treated group (p = .09). In a multivariable model, compared to the deferred treatment group, the treated group experienced significantly greater improvement in mSS. Treated participants with the lowest baseline mSS and longest period of treatment demonstrated the most improvement.

Conclusions: ART at higher CD4 cell counts, even when NP dysfunction is less severe, appears to be beneficial to the central nervous system. Future analyses on larger numbers of patients, and control participants (to examine if early ART might delay NP decline), would generate more robust evidence regarding the possible benefit of early ART initiation.

Correspondence: *Thomas D. Marcotte, PhD, University of California, San Diego, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: tmarcotte@ucsd.edu*

E. MARTIN, R. GONZALEZ & J. VASSILEVA. Delay Discounting is Impaired with Hepatitis C but not HIV.

Objective: Substance dependent individuals tend to disproportionately discount the value of delayed rewards. This steeper "delay dis-

counting" is associated with ventral/limbic and neostriatum activation. A recent study by Huckans et al reported that HCV+ individuals discount rewards significantly more than HCV- individuals, but to our knowledge DD has not been investigated among groups of substance users seropositive for HIV, HCV, or both viruses, which often co-occur among substance users and are associated with neurocognitive impairment.

Participants and Methods: We administered a measure of delay discounting to a group of 252 well-matched toxicology-negative cocaine or heroin-dependent individuals, including 148 HIV-/HCV-, 52 HIV+/HCV-, 30 HIV-/HCV+ and 22 HCV+/HIV+ participants. Groups were also administered the Rotary Pursuit Task (RPT), a measure of motor skill learning with known sensitivity to HIV.

Results: HIV+ individuals performed the RPT significantly more poorly compared with HCV+ individuals; by contrast the HCV+ groups discounted delayed rewards significantly more than the HIV+ groups (p < .05 for both tests). The coinfecting group performed the RPT significantly more poorly than the noninfected group but DD performance did not vary systematically by number of risk factors.

Conclusions: We found a double dissociation among HIV+ and HCV+ SDIs on measures of motor skill learning and delay discounting. These results are consistent with separate reports of impaired motor skill learning among HIV+ and steeper delay discounting among HCV+ individuals with and without a history of substance dependence and raise the possibility that HIV and HCV have distinct profiles of CNS effects.

Correspondence: *Eileen Martin, University of Illinois, 1601 W. Taylor St., Chicago, IL 60612. E-mail: emmartin@uic.edu*

R.C. MCINTOSH, M. ROSSELLI, J. TARTAR & M. ALEJANDRA-SERRANO. Neuropsychological Correlates of Emotion Regulation in Women with HIV: An ERP Study.

Objective: To observe case-controlled outcomes (HIV+ vs. HIV-) and manipulate cue viewing of affective & non-affective IAPS images across randomized controlled trials.

Participants and Methods: Eighteen women (10 HIV-positive & 8 HIV-negative) were presented with neutral and unpleasant images while an electroencephalogram (EEG) recorded the magnitude of the Late Positive Potential (LPP) an electrophysiological measure of emotional processing. Instructions were presented for the participant to naturally view and respond to neutral images, negative images and increase/decrease their emotional response to negative pictures. Participants were trained to use situational or self-focused cognitive reappraisal strategies to reappraise (increase or decrease) the context of the depicted scene.

Results: A 2 (HIV) x 3(task) x 3(electrode) repeated measure ANOVA revealed a main effect for the increase task (F(2,12) = 4.25, partial eta = 0.25, p < .05). A near significant interaction was observed between HIV status and task (F(2,12) = 3.257, partial eta = 0.20, p = 0.55); the LPP was smaller for the increase condition for HIV+ women than HIV-controls. A correlation was found between language processing and the magnitude of LPP change between the view-negative and increase-negative conditions at the Fz location $r(14) = .71, p < .05$. A main effect for the task instructions was observed in for the decrease condition (F(2,19) = 9.58, partial eta = 0.324, p < .001). An interaction was found between HIV status and task (F(2,19) = 4.30, partial eta = 0.18, p = 0.20); the LPP was larger for the decrease condition in HIV negative women than HIV-positive women. A correlation was also found between a measure of response inhibition and the magnitude of LPP change between view-negative and decrease-negative conditions at the Pz location $r(24) = .441, p < .05$.

Conclusions: Results suggest that the neurotoxic effect of HIV on frontostriatal circuits may result in an impaired cognitive functioning in tasks requiring cognitive reappraisal.

Correspondence: *Roger C. McIntosh, M.A., M.S., Florida Atlantic University, 4569 NW 9th Ave, Pompano Beach, FL 33064. E-mail: rmcitno5@fau.edu*

E.E. MORGAN, S. WOODS, C. SMITH, E. WEBER, J. SCOTT & I. GRANT. Lower Cognitive Reserve Among Individuals with Syndromic HIV-associated Neurocognitive Disorders.

Objective: The cognitive reserve model states that the critical threshold at which brain pathology manifests as cognitive deficits differs on an individual basis as a function of the capacity for efficiently engaging brain networks. HIV-seropositive individuals with low cognitive reserve are more likely to be cognitively impaired than their counterparts with high reserve, and therefore it was hypothesized that cognitive reserve would also differentiate cognitively impaired HIV-seropositive individuals (i.e., those with HIV-associated neurocognitive disorders, or HAND) with and without everyday functioning decline (i.e., syndromic versus subsyndromic diagnoses).

Participants and Methods: Eighty-six individuals with HIV infection were evaluated; 53 individuals evidenced normal neurocognitive performance, 16 had subsyndromic HAND (SubHAND), and 17 were diagnosed with a syndromic HAND (SynHAND) based on a comprehensive neuropsychological battery that included both self-report and objective functional assessments. Cognitive reserve represented a combined score including years of education, estimated verbal IQ, and highest occupational attainment.

Results: The groups were comparable with regard to demographic, psychiatric, and medical factors, and the HAND groups had comparable levels of global neurocognitive impairment. An ANOVA revealed significant groups differences ($p = .003$, $\eta^2 = 0.109$), and the SynHAND group had lower reserve scores relative to subjects with either normal cognition ($p = .002$, Cohen's $d = 0.89$) or SubHAND ($p = .02$, Cohen's $d = 0.73$).

Conclusions: Extending the cognitive reserve model to everyday functioning, these data suggest that individuals with higher reserve more effectively compensate for cognitive impairment through better ability to use brain networks and strategies to maintain independence in daily living activities.

Correspondence: *Erin E. Morgan, PhD, Psychiatry, University of California, San Diego, 220 Dickinson St, HNRP/TMARC Suite B, San Diego, CA 92103. E-mail: eemorgan@ucsd.edu*

E.E. MORGAN, E. WEBER, A. ROONEY, I. GRANT & S. WOODS. Longer Ongoing Task Delay Intervals Exacerbate Prospective Memory Deficits in HIV-associated Neurocognitive Disorders (HAND).

Objective: The delay interval between encoding a future intention and detection of the retrieval cue is an essential feature of prospective memory (PM). McDaniel and Einstein's (2000) multi-process theory posits that greater demands are placed on strategic monitoring processes as the delay interval lengthens. This hypothesis was examined in HIV-associated neurocognitive disorders (HAND), which are associated with strategic dyscontrol of PM likely secondary to prefrontostriatal circuit pathology.

Participants and Methods: 78 seronegative adults and 49 individuals with HAND comprised the study groups, which were comparable with regard to demographic, psychiatric, and substance use factors. As part of a comprehensive neuropsychological evaluation, participants were administered a well-validated PM measure that included short (2-minute) and long- (15-min) task delay interval scales that utilized a standardized word search as the ongoing task.

Results: Results revealed a significant interaction of group and delay interval ($p = .007$), with significant effects of HAND on PM at long ($p = .01$), but not short delay ($p = .80$). The long delay PM effect in HAND was driven primarily by deficits in time-based PM and was most strongly associated with markers of executive dysfunction.

Conclusions: In concordance with the multi-process theory, individuals with HAND were disproportionately vulnerable to PM deficits at longer ongoing task delay intervals, which appear to be driven by strategic dyscontrol of PM that is consistent with preferential disruption of prefrontal systems in neuroAIDS. These findings have potential clinical implications for daily functioning, including medication adherence, and cognitive remediation may improve PM span in HIV infection.

Correspondence: *Erin E. Morgan, PhD, Psychiatry, University of California, San Diego, 220 Dickinson St, HNRP/TMARC Suite B, San Diego, CA 92103. E-mail: eemorgan@ucsd.edu*

S. PANOS, C. HINKIN, A. DEL RE, A. THAMES, S. PATEL, M. VALDES-SUEIRAS, G. MATHISEN, S. DONOVAN, E. SINGER & A. LEVINE. Longitudinal effects of APOE e4 on HIV-Associated Neurocognitive Dysfunction.

Objective: While it has been shown that the APOE e4 allele is associated with increased risk for Alzheimers disease and other age-linked neurodegenerative disorders, whether this confers increased risk for the development of HIV-Associated Neurocognitive Disorder (HAND) has yet to be definitively established. There is reason to believe that age may modulate the relationship between APOE e4 and HAND. The current study assesses the interplay between age and e4 on neurocognition both cross-sectionally and longitudinally.

Participants and Methods: Participants were 272 HIV+ adults who were recruited from the National NeuroAIDS Tissue Consortium. Individuals were administered comprehensive neuropsychological testing at study entry and every 6 months thereafter for up to 10 years. Apolipoprotein was genotyped. Longitudinal mixed-effect modeling (MLM) was employed, with age, e4 allele status, time, and the number of assessments as the independent variables and demographically corrected neuropsychological test performance as the outcome variable of interest.

Results: At baseline, there was no main effect of apoe4 on cognition. However, there was an e4 by age interaction, such that older e4 carriers had poor executive functioning and information processing speed. Longitudinally, there was an overall main effect of e4 on information processing speed and verbal fluency. There was also an e4 by age by time interaction in the domains of learning and memory.

Conclusions: Age appears to modulate the relationship between e4 and cognition in HIV. Although the effects of E4 do not become evident until older adulthood, e4 is associated with longitudinal changes over time among both older and younger adults.

Correspondence: *Stella Panos, PhD, UCLA, 760 Westwood Plaza, CS-746, Los Angeles, CA CA. E-mail: spanos@mednet.ucla.edu*

S.M. PATEL, A.D. THAMES, S. PANOS, J. FOLEY, S. LAWRENCE, S. CASTELLON & C.H. HINKIN. The Additive Effects of Neurological Risk Factors on Cognition Among HIV-Infected Individuals.

Objective: A host of factors have been demonstrated to place HIV+ individuals at greater risk for cognitive decline. However, it is unclear whether certain variables are associated with preferential cognitive deterioration, and whether these risk factors exert similar effects in younger versus older HIV+ adults.

Participants and Methods: 289 HIV+ adults were administered a battery of neuropsychological measures. Risk factors included low cognitive reserve (based on education and premorbid intelligence), current methamphetamine use, cerebrovascular co-morbidities (e.g., hypertension, diabetes), hepatitis C, and biomarkers reflective of HIV disease severity (e.g., nadir cd4+, recent cd4+). Using regression, risk factors were weighted based upon their relative impact on neuropsychological performance and then combined to create a composite 'risk severity score'.

Results: Results of multiple regression indicated that the risk factors that were most predictive of cognitive dysfunction were low cognitive reserve, methamphetamine use, and cerebrovascular risk. When the sample was stratified by age (using age 50 as a cut-point), while younger subjects scored higher on the risk severity index, the relationship between risk factors and cognition was significant among older adults ($p = .008$), but not among the younger adults ($p = .114$) suggesting that older adults may be more sensitive to the aggregate effects of risk factors on cognition. Furthermore, differential relationships were found between specific risk factors and specific cognitive functions.

Conclusions: These findings suggest that older adults may be more sensitive to the aggregate effects of multiple comorbid risk factors on cognition. Interestingly, HIV disease severity was not among the stronger predictors of cognitive dysfunction.

Correspondence: *Sapna M. Patel, Ph.D., UCLA, 760 Westwood Plaza, Los Angeles, CA 90095. E-mail: smpatel@mednet.ucla.edu*

A.J. POQUETTE, D.J. MOORE, B. GOUAUX, E.E. MORGAN, I. GRANT & S.P. WOODS. Antiretroviral Medication Non-Adherence is Associated with Deficits in Time-based Prospective Memory: Differential Effects of Longer Ongoing Task Delay Intervals.

Objective: Prospective memory (PM), or remembering to perform a prescribed intention, is an emerging predictor of medication non-adherence. Using McDaniel & Einstein's (2000) multiprocess framework, the current study examined the differential effects of shorter versus longer ongoing PM task delay intervals (i.e., the time between the encoding and the execution of the intention) as a predictor of antiretroviral (ARV) adherence in HIV infection.

Participants and Methods: Participants included 74 HIV-infected individuals who had a high prevalence of psychiatric comorbidities. We tracked ARV medication adherence using an electronic monitoring system, and classified participants as "adherent" ($n = 49$) or "non-adherent" ($n = 25$) based on openings of $\geq 90\%$ of prescribed doses. We evaluated short- (2-min) and long- (15-min) delay PM performance with the Memory for Intentions Screening Test (MIST).

Results: An adherence group by delay interval interaction was observed ($p = 0.03$) such that non-adherent participants had worse performance on the long ($d = -0.53$), but not short ($d = -0.19$) delay PM scales. The observed long-delay effects were significantly more pronounced on time- ($p < .05$) versus event- ($p > .05$) cued PM trials. In a follow-up regression analysis, long-delay time-based PM was an independent predictor of non-adherence, even after considering the influence of demographic, mood state, and general cognitive functioning variables.

Conclusions: These findings suggest that ARV non-adherence may be associated with deficits in strategic cue monitoring over longer PM delays. Interventions to improve ARV medication adherence among persons with HIV-associated PM impairment may be bolstered by increasing the frequency and salience of reminders during the longer delays between prescribed doses.

Correspondence: *Amelia J. Poquette, B.S., Psychiatry, UC San Diego, 220 Dickinson St., Suite B, San Diego, CA 92103. E-mail: apoquette@ucsd.edu*

C. POSADA, D.J. MOORE, B. GOUAUX, S.L. LETENDRE, H. ATKINSON & I. GRANT. Memory Deficits for Affective Words Among HIV+ Persons with Bipolar Disorder.

Objective: Mood congruent memory bias has been found among individuals with bipolar disorder; that is, words that are emotionally congruent with an individual's mood state are better recalled than non-congruent emotional words. The present study examined the performance of HIV-infected individuals with co-morbid bipolar disorder (HIV+/BD+) on the Affective Reading Span Task (ARST) as compared to HIV-infected individuals without co-morbid bipolar disorder (HIV+/BD-).

Participants and Methods: HIV+/BD+ ($n=28$) and HIV+/BD- ($n=23$) participants were administered the ARST. Participants were instructed to read aloud an affectively-laden (positive, negative) sentence presented on a computer screen, and then recall an affectively congruent word given at the end of each sentence. Groups were comparable on demographic, HIV disease, and current substance use factors.

Results: Both groups recalled, on average, more negative than positive words. HIV+/BD+ individuals recalled significantly fewer total words ($p=0.04$) and fewer positive words ($p=0.02$) than HIV+/BD- individuals. Across both groups, no significant correlations were found between ARST scores and levels of current mood symptoms (i.e., Beck Depression Inventory-II, Young Mania Rating Scale). Within the HIV+/BD+ group, no significant correlations were found between ARST variables and neuropsychological domains.

Conclusions: HIV+/BD+ individuals have particular difficulty recalling words that have a positive emotional valence. Performance was not related to general or domain-specific neurocognitive functioning or current mood symptoms, suggesting that this recalling emotionally-valenced content is more a trait characteristic of bipolar disorder than a result of mood state. Results suggest that emotional cognition may be a separate entity above and beyond the simple combination of emotion and cognition.

Correspondence: *Carolina Posada, SDSU/UCSD Joint Doctoral Program in Clinical Psychology, 220 Dickinson Street, San Diego, CA 92103. E-mail: cposada@ucsd.edu*

S.B. ROURKE, A. CARVALHAL, A.R. ZIPURSKY, T. BEKELE, J. MCCOMBE, A. RACHLIS, E. COLLINS, M. GILL, J. RABOUD & A. BURCHELL. The Canadian "CHARTER" Report: Prevalence and Determinants of HIV-Associated Neuropsychological Impairment in the OHTN Cohort Study.

Objective: With the introduction of combination antiretroviral treatment (CART), the prevalence of HIV-associated dementia has decreased but the prevalence of minor forms of neuropsychological (NP) impairment persist. The purpose of this study is to determine the frequency of NP impairment and the determinants that are associated with NP impairment in a large longitudinal cohort of people with HIV in Ontario during the CART era.

Participants and Methods: 834 adults were recruited from two hospital-based clinics in Toronto, Ontario (Mean age and education = 46.8 and 13.7 years; 80% male). Clinical, social-behavioural, NP testing and laboratory measures were obtained. Based on socio-economic status, time since HIV diagnosis, CD4 nadir, history of an AIDS defining condition, and history of HCV diagnosis, we categorized participants into 3 risk groups for NP impairment (low, medium, and high). We established NP impairment using the Global Impairment Rating criteria (2 or more impaired abilities).

Results: Overall 46% percent of sample had NP impairment and these rates were higher in groups with greater risk for NP impairment (33%, 44%, 50%). Participants' NP functioning in all 3 groups differed significantly ($p < 0.01$) within the motor efficiency domain while in the memory domain, the low and medium risk groups differed significantly ($p < 0.01$) from the high risk group. There were, however, no significant differences within the working memory domain. After controlling for age, education, income, depression, drug and alcohol use, and HCV diagnosis, the major predictors for NP impairment were gender (male), unemployment, and CD4 nadir < 200 .

Conclusions: This is the first large population-based study in Canada to evaluate the rates of NP impairment associated with HIV-infection. NP impairment remains common during the CART era, particularly in individuals at greater risk for impairment and for those with increased morbidity. Further work is underway to examine how CART can ameliorate NP impairment associated with HIV over time.

Correspondence: *Sean B. Rourke, PhD, Psychiatry, University of Toronto, 30 Bond Street, Room 2-044, Toronto, ON M5B 1W5, Canada. E-mail: sean.rourke@utoronto.ca*

M. SAKAMOTO, T.D. MARCOTTE, A. UMLAUF, D. FRANKLIN, R.K. HEATON, R.J. ELLIS, T. ALEXANDER, E.E. MORGAN, S.P. WOODS, A.C. COLLIER, D.B. CLIFFORD, B.B. GELMAN, A. MCCUTCHAN, J.C. MCARTHUR, S. MORGELLO & I. GRANT. Norms and Alternative Cutpoints Improve Sensitivity/Specificity Tradeoff for the HIV Dementia Scale: The CHARTER Study.

Objective: The HIV Dementia Scale (HDS) is a brief screen designed to detect HIV-related neuropsychological (NP) impairment. Utilizing a large, diverse cohort, the aims of this study were to 1) examine the classification accuracy of the HDS for NP impairment using raw and norm-based cutpoints and 2) evaluate the contribution of the HDS subtests to predicting NP impairment.

Participants and Methods: 1,580 HIV-infected participants from 6 U.S. clinics completed the HDS and a comprehensive NP battery. Based on a gold standard of clinical ratings, 51% (n= 810) of the sample was NP impaired.

Results: Sensitivity and specificity of the standard raw cutpoint (≤ 10) was 27% and 92%. Using published age- and education-adjusted normative standards ($T < 40$), sensitivity significantly improved to 69% ($p < .001$), but specificity declined to 57% ($p < .001$). Within a randomly selected subgroup, a raw score cutpoint of 14 improved sensitivity (66%) and specificity (61%), which was confirmed in the validation subgroup. Individuals incorrectly classified as impaired by the raw score tended to be older, less educated, and African American. Among the subtests, attention, 4-word recall, and speed significantly ($p < .001$) contributed to detection of NP impairment, while construction ($p = .55$) did not.

Conclusions: HDS sensitivity to NP impairment is significantly improved by using norms. Raising the raw cutpoint for impairment to 14 also improves sensitivity, which may be more appropriate for the milder impairments in the era of effective treatments, but the use of norms, when available, is recommended to avoid demographic biases in impairment classification.

Correspondence: *Maiko Sakamoto, Ph.D., Psychiatry; UCSD, 220 Dickinson Street, Suite B, San Diego, CA 92103. E-mail: masakamoto@ucsd.edu*

C. SALAMA, M. MORRIS & L. ARMISTEAD. Impact of Parenting Quality and Executive Functioning on HIV Risk in South African Youth.

Objective: The primary mode of transmission of HIV in South Africa is through heterosexual sex, particularly among adolescents and young adults (Simbayi, 2005). Black South Africans account for a majority of HIV cases in South Africa, calling attention to the need for greater understanding of risks specific to this group. Within the HIV prevention and risk literature, little information exists regarding the familial and neuropsychological contributions to HIV risk. The current study addressed this gap. Aim 1 investigated the contributions of parenting quality to HIV risk. In Aim 2, we evaluated the interactive contributions of executive function and parenting quality in predicting HIV risk.

Participants and Methods: The study sample included 77 black South African parent-child dyads living in Cape Town, SA. HIV risk was assessed by measures of child sexual attitudes, pre-coital behaviors, and externalizing behaviors that may be related to and serve as precursors of risky sexual behavior. Parents and children reported two aspects of parenting quality: 1) parent-child relationship quality and 2) parental monitoring/involvement. Using the Wisconsin Card Sorting Test (Heaton, 1993), abstract reasoning and cognitive inflexibility were the components of executive functioning measured.

Results: Child reports of better parent-child relationship quality and more parental monitoring/involvement were associated with decreased externalizing behavior. Child reports of better parent-child relationship quality were associated with decreased pre-coital behaviors. Abstract reasoning was associated with risky sexual attitudes. Cognitive inflexibility interacted with child report of parental monitoring/involvement to predict externalizing behaviors.

Conclusions: Results indicate that parenting variables may be protective against youth risk behaviors, and that executive function plays an indirect role in this relationship. Parenting and executive function may be potential targets for HIV prevention interventions for black South African youth.

Correspondence: *Christina Salama, Georgia State University, 43 25th St., Apt. 12, Atlanta, GA 30309. E-mail: chsalama@gmail.com*

P.A. SUAREZ, S. GUPTA, S. GEORGES, T. HENDRIX, R. HEATON & M. CHERNER. Relationship between HIV-associated Functional Impairment and Neuropsychological Abilities in Spanish-speakers of Mexican Origin.

Objective: Diagnosis of HIV-associated neurocognitive disorders, and dementia in general, requires knowledge of everyday functioning (EDF). Little research exists on the contribution of specific neuropsychological deficits to declines in EDF among Spanish speakers with HIV.

Participants and Methods: We examined the relationship between neuropsychological (NP) impairment and everyday functioning in 98 HIV+ Spanish-speakers [age: $m = 40.8$ (10.3); education: $m = 11.5$ (3.9)]. Each received a comprehensive NP test battery covering 7 ability domains. Using norms from Spanish speakers from the U.S.-Mexico border region, we computed demographically-corrected NP domain deficit scores and cutpoints to designate impaired performances. EDF was assessed with a performance-based 8-task battery simulating instrumental activities of daily living. A functional deficit score (FDS) was developed by averaging the 8 tasks, with an impairment cutpoint based on the performance of 102 HIV- controls [age: $m = 39.8$ (13.6); education: $m = 11.7$ (4.2)]. We evaluated the relationship between functional impairment and NP impairment using Chi-square tests.

Results: In this HIV+ sample, those impaired on the functional battery ($n = 18$, 18%) were more likely than the functionally intact to be impaired on Learning (53% vs. 25%) and Processing Speed (53% vs. 21%) (both $ps < .05$), with near-significant differences for Verbal Fluency (53% vs. 30%), Memory (53% vs. 30%), and Executive Functioning (44% vs. 22%) with p-values ranging between .06 and .07.

Conclusions: Preliminary findings suggest that HIV-associated functional decline among Spanish-speakers is linked to impaired Learning, Processing Speed, Verbal Fluency, Memory, and Executive Functioning. Future research will examine the relationship between domain-specific neuropsychological impairment and real-life measures of everyday functioning (e.g., employment status, driving) in Spanish-speakers.

Correspondence: *Paola A. Suarez, M.A., Psychiatry; UCSD, 220 Dickinson St., 3rd Floor, San Diego, CA 92103. E-mail: pasuarez@ucsd.edu*

J. VASSILEVA, W. AHN, K. WEBER, J. BUSEMEYER, E. MARTIN, R. GONZALEZ, J. STOUT & M. COHEN. Cognitive Modeling Analysis Reveals Distinct Effects of HIV and Drug Use on Decision-Making Processes in Women.

Objective: Drug users and HIV-seropositive individuals often show deficits in decision-making; however the nature of these deficits is not well understood. Recent studies have employed cognitive modeling approaches to disentangle the psychological processes involved in decision-making. Although such approaches have been used successfully with a number of clinical groups including drug users, no study to date has used cognitive modeling to examine the effects of HIV and substance use on decision-making.

Participants and Methods: Sixty women enrolled in the Women's Interagency HIV Study (WIHS), were classified into one of four groups based on their HIV status and history of crack and/or heroin use (DU): (1) HIV+/DU+ ($n = 17$), (2) HIV+/DU- ($n = 15$), (3) HIV-/DU+ ($n = 16$), and (4) HIV-/DU- ($n = 12$). Decision-making was indexed by the Iowa Gambling Task (IGT). We examined both behavioral performance on the task, as well as model parameters derived from the Prospect Valence Learning (PVL) model, the best-fitting cognitive model of the IGT in our sample.

Results: Although there were no significant group differences in behavioral performance on the IGT, all four groups made more disadvantageous than advantageous selections throughout the task. Results from cognitive modeling analyses indicate that HIV and DU had different effects on model parameters. Specifically, DU was associated with compromised learning/memory, increased reward sensitivity, and reduced loss aversion. HIV, on the other hand, was associated with reduced loss aversion, but had no significant effect on other model parameters.

Conclusions: Results reveal that HIV and DU have differential effects on psychological processes involved in decision-making in women and suggest that cognitive modeling could be a useful strategy for better characterizing their neurocognitive profiles. Future studies should determine whether the observed effects of HIV and DU would generalize to men or whether they are strictly female-specific.

Supported by U01A10-34993 (MC) and R01DA021421 (JV)

Correspondence: *Jasmin Vassileva, Ph.D., Psychiatry; Univ Illinois, 1601 W. Taylor St. (MC 912), Room 421, Chicago, IL 60612. E-mail: jvassileva@psych.uic.edu*

M.J. WILSON, R. GONZALEZ, J. VASSILEVA, L. LADD & E. MARTIN. Effects of Antiretroviral CNS Penetration on Procedural Learning Task Performance in HIV+ Drug Users.

Objective: Combination antiretroviral therapy (cART) for HIV with high CNS Penetration Effectiveness (CPE) has been associated with lowered CSF virus and improved cognitive performance. We compared HIV+ substance dependent individuals (SDIs) on high vs. low CPE cART and matched HIV- SDIs using procedural learning (PL) tasks sensitive to HIV-associated neurocognitive impairment. We hypothesized that HIV+ SDIs on low CPE cART would perform more poorly than high CPE SDIs.

Participants and Methods: We tested 118 HIV+ and 310 HIV- SDIs, primarily users of crack or heroin but abstinent at testing. HIV+ participants were classified as High or Low CPE using the CPE Index introduced by Letendre et al. (2010). All subjects completed the Rotary Pursuit and Weather Prediction Tasks. We included the Immediate Memory Task (IMT) as a control measure of sustained attention.

Results: HIV+ High CPE participants performed significantly more poorly than HIV- participants on both PL tasks (p 's < .01). However, the Low CPE group did not differ significantly from either group. Groups did not differ significantly on the IMT, suggesting some selectivity of observed differences in PL task performance.

Conclusions: High and Low CPE groups did not differ on procedural tasks and only High CPE participants performed worse than HIV- participants. These results are consistent with reported neurotoxic effects of high CPE antiretrovirals; however, baseline neurocognitive function might also have been poorer prior to cART initiation among individuals prescribed high CPE regimens. Longitudinal assessment of neurocognitive functions before and after cART initiation will characterize CPE effects more precisely. Supported by R01 DA12828 to Eileen M. Martin.

Correspondence: *Michael J. Wilson, B.S., Psychiatry, University of Illinois at Chicago, 1601 W. Taylor Street, Chicago, IL 60612. E-mail: mwilson31@uic.edu*

S. WOODS, E. WEBER, J.E. CATTIE, C. CUSHMAN & I. GRANT. Habitual Prospective Memory in HIV Infection.

Objective: The prevalence of older adults living with HIV infection is on the rise, due in large part to the success of antiretroviral therapies. Older age and HIV infection may confer additive adverse effects on neurocognitive outcomes, including prospective memory (PM), which may increase the risk of everyday functioning complications. To extend this literature, the current study evaluated the combined effects of HIV and aging on habitual PM, which is hypothesized to better reflect real-world situations in which an intention recurs at regular intervals (e.g., medication adherence).

Participants and Methods: Participants included 55 older (i.e., >50 years) HIV+ and 41 older HIV- subjects, as well as 34 younger (i.e., < 40 years) HIV+ and 39 younger HIV- participants. Subjects completed a habitual PM task in which they were instructed to press the space bar one time per one-minute trial of a computerized Stroop paradigm (but not within the first 10 seconds).

Results: Results showed main effects of HIV serostatus ($p=.04$), such that HIV-infected subjects had higher rates of omission errors ($d=.33$), but no main effect of age or interaction ($ps>.10$). No main effects or interactions were observed for early responding or errors of commission ($ps>.10$). Within the HIV+ groups, higher rates of habitual PM omission errors correlated with executive dysfunction, retrospective memory deficits, and semi-naturalistic PM failures ($ps<.05$).

Conclusions: Independent of age, persons living with HIV infection may experience difficulty fulfilling future intentions, even when such intentions recur at regular intervals. The possible unique role of HIV-associated habitual PM deficits in everyday functioning outcomes may warrant investigation.

Correspondence: *Steven Paul Woods, Psy.D., Department of Psychiatry (S231), UC San Diego, HIV Neurobehavioral Research Center, 220 Dickinson St., Ste. B, San Diego, CA 92103. E-mail: spwoods@ucsd.edu*

**Invited Address:
Neuroadaptation to Alcohol Dependence:
Consequences and Opportunity for Recovery**

Speaker: Edith Sullivan

3:45–4:45 p.m.

E.V. SULLIVAN. Neuroadaptation to Alcohol Dependence: Consequences and Opportunity for Recovery.

Alcohol dependence is one of the most highly prevalent, universal neuropsychiatric disorders and is marked by a characteristic profile of neuropsychological deficits. The damaging effect of chronic alcoholism on brain structure and function are heterogeneous in the location and extent of insult yet selective with respect to cognitive and motor processes and neural pathways potentially disrupted. For most, impairments are mild to moderate and involve executive functions, working memory, visuospatial abilities, and postural stability. Neural circuitry targeted by alcoholism involves gray matter nodes and white matter tracts of frontocerebellar and limbic brain systems. With prolonged abstinence from alcohol, both functional and brain structural recovery can ensue. Tracking alcoholism's dynamic course of sobriety and relapse reveals the potential for accommodation to and recovery from neural and neuropsychological insult. This dynamism reveals longitudinal investigation of alcoholism as a compelling model of human neuroadaptation and neural plasticity. Further, functional imaging studies provide evidence for compensation by invoking non-normal sites and circuits to achieve normal performance on tasks typically impaired. Such evidence provides hope for directed rehabilitation efforts that encourage intact neural systems to take over functions impaired because of their reliance on degraded circuitry. Support: AA010723, AA017168, AA017923, AA012388, AG017919.

The learning objectives for this course are: 1) to recognize that alcohol dependence disrupts selective brain macrostructure, microstructure, and function; 2) to appreciate that alcoholism-related functional brain changes are a form of neuroadaptation that may underlie dysfunction, making alcoholism a self-perpetuating disorder; 3) to learn that sustained sobriety can result in improvement in brain structure and function, indicative of either damage reversal or compensatory mechanisms that can be identified with formal neuropsychological testing and quantitative structural and functional brain imaging.

Correspondence: *Edith V. Sullivan, Ph.D., Psychiatry & Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 94305-5723. E-mail: edie@stanford.edu*

**Presidential Address:
Neuropsychology in the Era of Translational
Neuroscience**

INS President: Rus Bauer

5:15–6:15 p.m.

R.M. BAUER. Neuropsychology in the Era of Translational Neuroscience.

Translational science offers an alternative view to the standard dichotomy between basic and applied science, and refers to a process whereby sci-

entific discoveries can be moved more rapidly and effectively into practice for purposes of improving health outcomes. Recent advances in translational neuroscience provide exciting new opportunities and challenges for neuropsychologists to expand the scope of their work, thus enhancing and expanding our understanding of brain-behavior relationships. Neuropsychologists have access to unprecedented biologically relevant information (e.g., measures of neuronal health, biomarkers of risk and disease, imaging, and genomic information) and a broader spec-

trum of behavioral paradigms with which to work. In this address, I will highlight some of these opportunities and challenges, will discuss the implications for training the next cadre of neuropsychological researchers to be ready to survive and thrive in a rapidly changing scientific environment.

Correspondence: *Russell M. Bauer, Ph.D., Clinical & Health Psychology, University of Florida, PO Box 100165 HSC, Gainesville, FL 32610-0165. E-mail: rbauer@phhp.ufl.edu*

SATURDAY MORNING, FEBRUARY 18, 2012

Symposium 11: Are They Faking or Is It Real? Research on Symptom Validity Testing for Learning Disability and ADHD Assessment

Chair: Allyson Harrison

Discussant: Robb Mapou

9:00–10:30 a.m.

A.G. HARRISON, R. MAPOU, P. GREEN, A.G. HARRISON, L. JASINSKI, E.N. ANDRESEN, D.C. OSMON & J. SUHR. Are They Faking or Is It Real? Research on Symptom Validity Testing for Learning Disability and ADHD Assessment.

Symposium Description: Diagnosis of attention deficit/hyperactivity disorder (ADHD) and learning disabilities (LD) can be difficult, especially when there is not a documented history. Moreover, concerns have been raised regarding the ease with which unimpaired individuals can feign these disorders to gain access to testing accommodations, stimulant medications, or disability benefits. Although recent research has demonstrated clearly that such symptom exaggeration exists, less is known about how best to identify when it occurs or how to deal with it in an educational as opposed to a forensic context. Neuropsychologists have developed symptom validity tests to aid in the detection of feigned brain injury, but little is known about the ability of these tests to identify feigned or exaggerated learning or attention disorders. This symposium will discuss current research into methods of detecting symptom credibility in neuropsychological assessments completed for educational purposes, evaluate sensitivity and specificity of different stand-alone and embedded measures, examine data from confessed malingerers to gain insight into the motivation and methods chosen by such individuals, and discuss current controversies in postsecondary education settings regarding how to proceed when symptom exaggeration is identified. The symposium will conclude with reflections from a knowledgeable discussant (Dr. Robb Mapou) regarding the implications of this area of research.

Correspondence: *Allyson G. Harrison, PhD, Psychology, Queen's university, 186 Barrie St, Kingston, ON K7L 3N6, Canada. E-mail: harrisna@queensu.ca*

P. GREEN. Specificity of SVT failure in Children-what data from intellectually disabled children tell us.

It has been pointed out by Schmand and colleagues that almost all SVTs will be failed by people who have sufficiently severe cognitive impairment, for example, from Alzheimer's Disease or mental handicap. Hence, those who are considering using effort tests with children must be concerned about the possibility of false positives for poor effort in children with disabilities. Some effort tests are derived from measures of ability, such as Digit Span, and these tests usually have a major developmental component, so that age is a major consideration with children. Other SVTs may be easily passed by most adults but not by children. This presentation will focus on SVT data from healthy

children trying their best or simulating impairment and on children with various developmental disabilities, with special attention to intellectually disabled children. Practical methods will be presented which allow us to discriminate between children failing easy SVT measures because of genuine impairment versus feigned impairment or simply poor effort.

Correspondence: *Paul Green, 17107 107 Ave Nw # 2, Edmonton, AB T5S 1G3, Canada. E-mail: paulgreen@shaw.ca*

A.G. HARRISON. A review of data from confessed college-aged malingerers undergoing LD and ADHD assessments: What can they teach us?

It is almost impossible to determine the exact prevalence of exaggerated or feigned neuropsychological disorders, as individuals engaged in such behavior rarely if ever admit to their deceit. As such, much of the research on methods to identify symptom credibility is based on data generated either by probability tables, hypothesized classification schemes, or from analog malingerers. This paper will present data from five post-secondary aged students who all admitted to deliberate malingering after being evaluated and denied services. Not all of them were identified using embedded or stand alone SVT's and it is informative to examine their overall pattern of performance to learn what signs might alert an examiner or physician to potential symptom exaggeration or outright malingering. Four of the five had come questioning whether they suffered from ADHD, and three of them also felt they might have a co-morbid LD. Data indicate that they type of disability being feigned alters the pattern of symptom exaggeration, making it more challenging to develop sensitive effort measures in such assessments. Specific data and implications will be discussed.

Correspondence: *Allyson G. Harrison, 186 Barrie St, Kingston, ON K7L 3N6, Canada. E-mail: harrisna@queensu.ca*

L. JASINSKI. Applications of analogue TBI methods when using SVT tests with College ADHD assessments.

The incentives for feigning ADHD have been well-documented, and recent research is beginning to provide support for the use of several malingering tests in detecting false or exaggerated presentations of ADHD. Such tests as the Test of Memory Malingering (TOMM), Letter Memory Test (LMT), Digit Memory Test (DMT), and Reliable Digit Span (RDS) were originally developed for the detection of malingered traumatic brain injury (TBI), and have been well validated for that purpose. Research studies have relied heavily on analog, or simulated, designed studies to provide statistical support for use of the tests among a TBI population. While such analog methods lack some generalizability, their strong internal validity makes them a crucial part of the validation process. As such, several analog studies are emerging using popular malingering tests with college student populations who may feign symptoms of ADHD in order to secure academic accommodations or medication. The use of analog research methods with an ADHD population will be discussed, as well as the results of recent research on feigning of ADHD. Recommendations for future studies in this area will be made.

Correspondence: *Lindsey Jasinski, 3470 Blazer Pkwy, Lexington, KY 40509. E-mail: lindsey.jasinski@gmail.com*

E.N. ANDRESEN & D.C. OSMON. Sensitivity and specificity of the MSVT and embedded measures for the CPT-2 and TOVA when evaluating college students for possible ADHD.

Little research has yet been done delineating which effort measures are effective at identifying poor effort in college students being evaluated for ADHD. The current study investigated the sensitivity and specificity of one traditional effort measure, the MSVT, along with embedded measures developed for the CPT-2 and the TOVA. ADHD simulators were compared to students with a diagnosis of ADHD. On the MSVT, sensitivity = 66%, specificity = 97%, PPV = 95%, and NPV = 74%. On an embedded measure of effort developed for the CPT-2, sensitivity = 59%, specificity = 80%, PPV = 74%, and NPV = 67%. On an embedded measure of effort developed for the TOVA, sensitivity = 82%, specificity = 79%, PPV = 79%, and NPV = 81%. When participants failed any one effort measure, sensitivity = 93%, specificity = 60%, PPV = 69%, and NPV = 90%. When failing two, sensitivity = 76%, specificity = 90%, PPV = 88%, and NPV = 79%. When failing all three, sensitivity = 35%, specificity = 97%, PPV = 91%, and NPV = 60%. Although the MSVT is not as sensitive in this population as is typically seen in simulator studies, it was both more sensitive and specific than either of the embedded measures. Sensitivity and specificity were maximized when participants failed 2 effort measures. Implications for practicing clinicians will be discussed.

Correspondence: Elizabeth N. Andresen, 2441 E Hartford Ave., Suite 338, Milwaukee, WI 532111. E-mail: andrese2@uwm.edu

J.A. SUHR. Strategies for Addressing Noncredible Performance in Psychoeducational Assessments of Young Adults.

As clinicians increasingly recognize the importance of addressing noncredible performance in young adults presenting with concerns about ADHD or LD, clinical issues arise for which the clinician may not be prepared. Based on research and best practice literature, this presentation will discuss the pros and cons of strategies for addressing several issues that may arise when measures of noncredible responding are to be used in psychoeducational assessment, including 1) whether to warn individuals that measures of noncredible performance will be used in the assessment, 2) whether to continue an evaluation in the context of failed performance on a measure of noncredible performance, 3) whether to confront someone who has failed a measure of noncredible performance in order to potentially continue the evaluation, 4) provision of feedback to someone who has failed such measures, 5) dealing with failure on measures of noncredible performance in the context of a re-evaluation for continued services in someone previously diagnosed with ADHD or LD.

Correspondence: Julie A. Suhr, 200 Porter Hall, Ohio University, Athens, OH 45701. E-mail: suhr@ohio.edu

**Paper Session 8:
Ecologically-Valid Assessment and Treatment**

Moderator: Kathleen O'Toole

9:00–10:30 a.m.

D. BOWERS, C. SAPIENZA, U. SPRINGER, A. MIKOS, A. NISENZON, A. CLARK, R. RODRIGUEZ, H. FERNANDEZ & M.S. OKUN. Unmasking the Face of Parkinson Patients: Results from a Randomized Double-Blind Sham-Controlled Behavioral Intervention Trial.

Objective: A flat, expressionless “masked” face is one of the hallmark features of Parkinson disease and associated with negative mis-attributions about mood and motivation by family members and health care providers. Currently, there are no known treatments for the masked face. We previously used computer digitizing methods to quantify PD

facial expressions and found decreased amplitude and slowing of facial movements that were only marginally improved with dopaminergic medication. In the present study, we tested the hypothesis that participation in a behavioral intervention involving high intensity ‘oral-facial’ strength training would improve facial expressivity in PD patients.

Participants and Methods: Forty-four nondemented PD patients from the UF Center for Movement Disorders and Neurorestoration were randomly assigned (1:1) to target or sham groups. Treatment consisted of standard oral muscle strength training (MST), 5 days a week, 20 minutes/day for 4 weeks using a calibrated or sham handheld device. Treatment and sham were identical except for intensity of training (i.e., 80% vs 5% MIP). All participants underwent computer analysis of facial expressions before and after treatment. Primary outcomes were changes in facial movement (entropy), timing parameters, and subjective ratings by blinded judges.

Results: There were no differences in key characteristics between the treatment and sham groups. Participants were in their mid-60's, college-educated, 2/3 male, with mild-moderate disease severity (HY 2-3). As predicted, the treatment group exhibited significantly greater improvement in facial expressivity, relative to sham, as indexed by entropy, expression rise time, and subjective ratings by blinded judges.

Conclusions: Results provide support for brief, daily behavioral exercise intervention for masked facies in Parkinson disease immediately after completion of training. Findings will be discussed in terms of 3 possible mechanisms that might underlie these changes. Supported by NINDS R01-NS50633

Correspondence: Dawn Bowers, Ph.D., CHP/MBI, University of Florida, PO Box 100165, Gainesville, FL 32610. E-mail: dawnbowers@phhp.ufl.edu

D. DAWSON, J. RICHARDSON, M. BINNS, A. TROYER, H. POLATAJKO, Y. BAR, T. SCHWEIZER & G. WINOCUR. Managing age-related executive changes with ecologically valid strategy training: A randomized controlled trial.

Objective: To investigate (1) the efficacy of ecologically valid meta-cognitive strategy training for enabling older adults with age-related executive dysfunction to improve performance in real-world activities & (2) the generalization of these effects.

Participants and Methods: 19 healthy older adults with self-reported cognitive decline, difficulties with daily activities, and documented executive changes without mild cognitive impairment or dementia were randomized to 2 groups: each received 17 hours of training. The strategy-training (ST) group received a form of meta-cognitive training adapted from the Cognitive Orientation to Occupational Performance. Adaptations included education about cognitive changes in aging and emphasizing self-management. A meta-cognitive strategy (Goal-Plan-Do-Check) was taught and practiced on 3/5 self-identified goals and/or areas of difficulty in everyday life. The education plus cognitive stimulation (E+CS) group received education about the brain, various forms of cognition, managing stress, and nutrition and cognitively stimulating exercises (e.g., Sudoku, word searches).

Results: Performance change on self-identified everyday goals was the primary outcome of interest. Intent-to-treat analysis showed the ST group had clinically important change on 32/52 identified goals: 11/22 were untrained. The E+CS reported change on only 9/46 untrained goals (chi-square 6.6, p=0.01). The ST group also reported significantly higher rates of physical activity on the Stanford Chronic Diseases Questionnaire relative to the E+CS group (p=0.01) and a trend towards using more planful problem solving (p=0.09). Within group analyses demonstrated some positive impact on working memory in the ST group not seen in the E+CS group: improvement was noted on letter-number sequencing (p<0.05).

Conclusions: This form of ecologically valid strategy training enables older adults to improve their performance in everyday life and shows evidence of far transfer to unrelated and untrained real-world activities.

Correspondence: *Deirdre Dawson, PhD, University of Toronto, Rotman Research, Baycrest, 3560 Bathurst St., Toronto, ON M6A 2E1, Canada. E-mail: ddawson@rotman-baycrest.on.ca*

C. YAO, E. SVOBODA & B. RICHARDS. PDA and Smartphone Use by Individuals with Moderate-to-severe Memory Impairment: Long-term Application of a Theory-driven Training Program.

Objective: We describe long-term follow-up results of a structured, theory-driven training program for individuals with moderate-to-severe memory impairment in the use of emerging commercial technology (PDAs/Smartphones).

Participants and Methods: Participants were 10 individuals (6 women and 4 men; aged 18–55 years), previously published in a short-term follow-up study (Svoboda et al., in press), with various etiologies resulting in memory impairment. Using a within-subject multi-case experimental design (A¹B¹A²B²B³), real-life memory functioning was measured at baseline, immediately post-intervention, at return to baseline, at short-term follow-up (3–8 months) and at long-term follow-up (12–19 months). An errorless fading-of-cues protocol enabled all participants to successfully learn to use their PDA/Smartphone independently.

Results: All individuals showed robust improvement in day-to-day memory functioning post-intervention as quantified across a number of ecologically valid task-based measures and questionnaires. These measures included real-life prospective memory tasks (phone call schedule, behavior memory log), frequency of memory mistakes and strategies of PDA/smartphone use questionnaires, as well as confidence ratings in dealing with various memory-demanding situations. These results were further corroborated by family members who lived with six of the participants. Overall, gains in memory function were maintained from short-term to long-term follow-up.

Conclusions: The present study demonstrates long-term sustainability of memory functioning gains following completion of a theory-driven training program in the use of memory supporting technologies.

Correspondence: *Christie Yao, York University, 150 Cosburn Avenue, Apt. 1012, Toronto, ON M4J2L9, Canada. E-mail: yaoc@yorku.ca*

K. ZAKZANIS, S. YU & E. JEFFAY. Real World Disability and the Predictive Validity of Executive Test Measures.

Objective: Neuropsychological tests play a figural role in characterizing the breadth and severity of cognitive impairment that may disable a patient in terms of their ability to engage in various activities of daily living in the real world. As such, it is of paramount importance that these tests accurately predict disability in the real world. The present study examined the sensitivity of various neuropsychological tests, including those with high-purported ecological validity, in distinguishing between those who were symptomatic and suffered from a Traumatic Brain Injury (TBI) with complaints of activities of daily living (ADL) or without complaints of ADL.

Participants and Methods: Patients (n = 71) with TBI who were symptomatic or asymptomatic were assessed on the Behavioral Assessment of Dysexecutive Syndrome (BADS), Wisconsin Card Sorting test, Trail Making Test, Wechsler Abbreviated Scale of Intelligence (third edition) and the Tower of London an average of 2.61 yrs (± 1.91 yrs) post-injury.

Results: Those who reported ADL disability did not differ significantly from those who did not report ADL disability across all measures except for the Modified Six-Elements (MSE) and Rule Shift Cards (RSC) subtests of the BADS.

Conclusions: The results suggest that, except for the MSE and RSC, traditional neuropsychological tests may not be sensitive to real world disability in this patient population. These findings demonstrate limitations of neuropsychological testing, yet suggest that measures with better ecological validity may be more predictive of real world functioning.

Correspondence: *Eliyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A5, Canada. E-mail: eliyas.jeffay@utoronto.ca*

A. DOUGLAS, L. LETTS, J. RICHARDSON & E. KEVIN. Predicting incidents of harm for people with dementia being discharged from hospital.

Objective: Persons with dementia who are being discharged from hospital commonly consider how they will manage safely at home. Assessment measures that are validated for predicting safety are required. The objective was to determine the ability of two pre-discharge measures (Assessment of Motor and Process Skills (AMPS), and Cognitive Performance Test (CPT)) to predict incidents of harm for older adults.

Participants and Methods: The study followed a prospective cohort design. Consent was obtained from both caregiver and patient recruited from a geriatric rehabilitation unit (n=47). Independent variables were age, sex, education, living alone, activities of daily living, co-morbidities, cognitive screen, and caregiving hours. Post-discharge incident of harm outcome (unintentional change in health status) was measured by caregiver telephone questionnaire monthly for six months.

Results: The sample (n=45) was composed of 55% females with a mean age of 83.3 years, of whom half (n=22/45) experienced an incident of harm. Compared with all independent variables, AMPS-Process scale was the most significant predictor of harm outcome (r= 0.37, p<0.05). CPT had a high specificity (91%) for identifying persons who did not have harm. Living alone, age and sex contributed to the prediction of harm. Cognitive screen score (SMMSE) was not a significant predictor of harm.

Conclusions: Therapists and families can use AMPS-Process scores to contribute to overall planning of safe discharges. Validation of the AMPS-Process scale informs decision makers about tools to choose in effective discharge planning and use of home care resources. The Canadian Institutes of Health Research supported this study.

Correspondence: *Alison Douglas, PhD, Baycrest Centre, 67 Lake Ave Dr., Stoney Creek, ON L8G1X7, Canada. E-mail: a3indigo@gmail.com*

**Symposium 12:
Brain Electrophysiology of Cognitive Processes:
Transdisciplinarity Essential**

Chair: Mariana Moreno de Ibarra

Discussant: Salvador Rodriguez Curcio

9:00–10:30 a.m.

M. MORENO DE IBARRA, A. DOS SANTOS, M. MORENO DE IBARRA, C. JAYARO, J. ROJAS & S. RODRIGUEZ CURCIO. Brain Electrophysiology of Cognitive Processes: Transdisciplinarity Essential.

Symposium Description: Neuropsychology studies the cognitive processes and behavioral alterations in relation to brain structures; allows the assessment and diagnosis of the individual's condition and the design of cognitive rehabilitation and intervention's plans, considering the psychological, biological and sociocultural components and the ethnogeographic context in which the person is immersed. Being considered today as a subdiscipline of neuroscience, is necessary transcend the particular disciplines in a comprehensive approach, but considering the neuropsychology like the paradigmatic reference to guide the research of cognitive processes, its disorders and its neurobiological correlates. The brain electrophysiology of cognitive processes supports the aforementioned aim in neuropsychological field, providing valuable information on neurobiological correlates of cognitive processes and their subcomponents with greater temporal resolution than the behavioral measures. It presents four works about the usefulness of Event-Related Evoked Potentials and Quantitative EEG brain mapping in several samples: two in High Functioning Autistic, Attention Deficit and Hyperactivity Disorder and Without Diagnosis children, to study Theory of Mind

and Central Coherence like psychological markers; another about Executive Function with psychology's undergraduate young students during the execution of Five Digit Test, to observe its consequent brain activation and, the last one in 4 children with different arithmetical competencies in order to assess the effectiveness of a computational rehabilitation program. Technical, methodological and theoretical issues of these studies will be discussed. A new field has been opened in Venezuela with the participation of neuropsychologist, psychologists, educators, engineers and technicians in the computer, among other related disciplines, so the transdisciplinarity is essential.

Correspondence: *Marianela Moreno de Ibarra, Magister Scientiarum, Universidad Catolica Andres Bello, Escuela de Psicologia 3er. Piso Edif Aulas, Av. Teheran Montalban, Caracas 1020, Venezuela. E-mail: mmoreno_223@hotmail.com*

A. DOS SANTOS, D. PIÑERO & M. MORENO DE IBARRA. Theory of Mind (TOM) in High Functioning Autistic (HFA), Attention Deficit And Hyperactivity Disorder (ADHD) and children Without Diagnosis (WD).

There were studied the differences in theory of mind (TOM) by Happe's Strange Stories and their electrophysiological correlates (P300 and N400's latency and amplitude) in children with high functioning autism (HFA), attention deficit and hyperactivity disorder (ADHD) and children without diagnosis (WD). The sample was: 10 children per condition, 8-12 years old, middle and upper-middle socioeconomic level, IQ >70. An analysis of variance by Kruskal-Wallis and U-Mann-Whitney a posteriori contrast were done with IQ as covariable. The propensity of latencies and amplitudes between the groups and various brain regions (Fp1, Fp2, F3, F4, T3, T4, P3 and P4) were studied. Significant differences were found between TOM stories'scores for children WD and the clinical conditions; HFA and ADHD haven't significant differences. There were significative differences in P300 amplitude at P3, being higher on HFA group; in N400 amplitude at T4 HFA>WD, and Fp2 latency was higher in HFA. Considering the differential intra-and inter-hemispheric activation between groups it conclude that HFA have more local than global processing with less cognitive flexibility than ADHD, linked to dorsolateral area or prefrontal convexity. ADHD also showed problems in TOM due to deficits in attentional control and inhibition of information due to forebrain attentional network problems. It was found a differential bias in processing time (latency) and activation (amplitude) of the several brain regions studied between groups, which allowed the discussion of the cognitive processes related to TOM, considering the underlying brain structures, its connections and the electrophysiological correlates with P300 and N400.

Correspondence: *Amy Dos Santos, Colinas de Vista Alegre, Calle 14B, Qta Corazon de Jesus, Caracas 1020, Venezuela. E-mail: amy_dst@hotmail.com*

M. MORENO DE IBARRA & A. DOS SANTOS. Central Coherence in High Functioning Autistic (HFA), Attention Deficit and Hyperactivity Disorder (ADHD) and children Without Diagnosis (WD).

There were studied the differences in Central Coherence (CC) by Game of Differences Test and ERPs (P300 and N400) in children with High Functioning Autism (HFA), Attention Deficit and Hyperactivity Disorder (ADHD) and children Without Diagnosis (WD). The sample was 7 male children per condition, 8-12 years-old, middle and upper middle socioeconomic level, normal IQ (mean=102). An analysis of variance by Kruskal-Wallis and U-Mann-Whitney a posteriori contrast was done. It had found that ADHD performed more errors than the other two groups, with statistically significant differences with HFA (ADHD)>WD)>HFA). The data inclination, considering statistical media was the following: omissions HFA)>ADHD)>WD; answers correct WD)>HFA)>ADHD; global perception of differences between drawings WD)>ADHD)>HFA and, Total Score WD)>HFA=ADHD. In ERPs was found a statistically significant difference at 0.05% in P300 amplitude in the posterior parietal region (P3), being higher in the group of children with HFA in comparison with

the other two groups, implying a greater effort to perform the task. The clinical groups did worse than WD but for different reasons. These results support other studies which consider that HFA have problems in CC with a local analysis of visual information focused on details that was evidenced in this study by the largest number of omissions and a fewer number of errors when compared with the other two groups. The greatest number of errors performed by ADHD may be explained by the lack of attentional control and distractibility. It seems that CC is a psychological marker that is useful in neurocognitive research.

Correspondence: *Marianela Moreno de Ibarra, Universidad Catolica Andres Bello Edif Aulas Piso 3 Escuela de Psicologia, Caracas 1020, Venezuela. E-mail: mmoreno_223@hotmail.com*

M. MORENO DE IBARRA, M. SEDO, A. DOS SANTOS, C. RODRIGUEZ & C. JAYARO. Quantitative EEG Brain Mapping (QEEG) of Executive Function through Five Digit Test (5DT).

The 5DT is a powerful test evaluating Executive Function (EF), discriminates children with developmental disorders and without it, with more validity and fiability than other EF tests. The QEEG brain mapping was studied in 6 normal subjects: 3 males and 3 females, 18-20 years-old, during the 5DT (I-II-III-IV) to examine brain activation on Fp1, Fp2, F3, F4, T3, T4, C3, C4, P3, P4, O1 and O2, also considering baselines: Close Eyes (CE) and Open Eyes. In behavioral analysis, no error was found in I-II and few in III-IV, so performance time was analyzed. Statistically significant differences (0.05%) has found between parts A and B in each 4 subtests and between them, except I-II and I-III comparisons. The frequency's conduct spectral analysis by rhythms was analyzed by ANOVA and Tukey contrast, considering average power and average frequency. Significant differences (0.05%) had found in average power at right frontal area (Fp2) comparing CE with 5DTII and III; OE with 5DTI, III and III and, contrasting OA average frequency with all 5DT's subtests. The 5DT seems to activate the right frontal region. It's suggested continues researching with 5DT in a large number of subjects in normal young population, 18-21 years-old, when EF is considered to be mature and more brain regions to corroborate dorso-lateral prefrontal cortex's activation, like Sedo proposed. Taking into account that 5DT has showed its usefulness as a measurement of EF maturity in children between 7-11 years-old, it's also convenient to study 5DT through the life cycle.

Correspondence: *Cesar Jayaro, Universidad Catolica Andres Bello Edif Aulas Piso 3 Escuela de Psicologia Montalban, Caracas 1020, Venezuela. E-mail: crjayaro@yahoo.com*

S. RODRIGUEZ, J. ROJAS, M. MORENO DE IBARRA, G. TARRIO & I. SOLORZANO. Educational Software to Develop Mathematical Competencies in Children with Dyscalculia. Transdisciplinary Assessment with Brain Electrophysiology.

Was designed, implemented and analyzed an educational software aimed at leveling and reinforcing math skills in third grade children of a popular sector of Caracas (Venezuela) with learning disabilities in arithmetic. The software includes two modules: one for teachers through which you can check the progress of students through the system's use and another for students, consisting of a tutorial system based on interactive games. Four phases were executed: Development of Educational Software (DESDE) for the system's construction, Extreme Programming (XP) provides support in implementation phase of DESDE, developing surveys to gather software's relevant information and, program's electrophysiological recording and evaluation. The research integrated computer science, education, neuropsychology and brain electrophysiology studying cognitive processes. A pilot study of the software was performed to verify functionality, performance and behavior in 4 children of third degree from a school in Caracas: 2 males and 2 females, in each group one subject had high performance in mathematics and another poor performance. In the electrophysiological evaluation moving brain rhythms index, power spectrum, and other Quantitative EEG parameters were mapping and analyzed on FP1, FP2, T3, T4, C3, C4,

P3, P4, O1, O2 by a quasi-experimental methodology with intra-subject design with repeated measures on the following conditions: Eyes Closed, Eyes Open, Written Test and Education Program (PROEDU). It was found a differential brain regions activation in the phases studied. Specialists in each field confirmed that the software meets the objectives becoming a neuropsychological intervention strategy useful in dyscalculia.

Correspondence: *Jack Rojas, S261NW 5th St Apartment 134, Miami, FL 33126. E-mail: jack_rojas@hotmail.com*

Poster Session 10: Dementia/Stroke/Visuospatial Abilities

9:30–11:00 a.m.

Dementia (Alzheimers)

M. ALOSCO, B.R. OTT, M. SPITZNAGEL, M. CLEVELAND, K. ROYLE, S. SNYDER & J. GUNSTAD. Impaired Knowledge of Driving Laws Independently Predicts Recommended Driving Cessation Among Patients with Dementia and Cognitive Decline.

Objective: Cognitive dysfunction is an important contributor to driving performance among persons with dementia and cognitive decline. Past work has shown patients with dementia demonstrate poorer performance on knowledge tests of driving laws than healthy controls. Despite these findings, no study has examined whether knowledge of driving laws independently predicts on-the-road assessment of driving performance in patients with dementia and cognitive decline.

Participants and Methods: The current study consisted of 55 older adults (77.9 ± 6.4 years) with cognitive decline and dementia that completed an on-road driving evaluation. Participants completed a written test of driving laws, and a brief cognitive test battery during an occupational therapy assessment, and an on-the-road assessment. The knowledge test consisted of 20 multiple-choice questions abstracted from the Ohio BMV rules manual.

Results: Approximately 35% of patients were advised to discontinue driving. Logistic regression controlling for demographic and cognitive variables found poorer global cognitive function was significantly associated with increased odds of recommended driving cessation ($\beta = .165$; $p < .05$). The knowledge test demonstrated incremental predictive validity, as it significantly predicted driving cessation beyond the demographic and cognitive variables ($\beta = -.131$; $p < .05$). Poorer performance on the knowledge test was associated with greater likelihood of recommended driving cessation.

Conclusions: Findings suggest that memory clinic patients' ability to drive may be partly related to their knowledge regarding common driving laws, in addition to current level of cognitive functioning. Prospective studies are needed to determine whether driving law knowledge predicts driving performance over time in this population.

Correspondence: *Michael Alosco, B.A., Kent State University, 4710 Waterford Circle, Stow, OH 44224. E-mail: malosco@kent.edu*

J. ANSADO, L. COLLINS, M. PETRIDES, S. FAURE & Y. JOANETTE. Interhemispheric coupling can improve the brain's ability to compensate neural decline related to Alzheimer's disease in low cognitive demand.

Objective: Alzheimer disease's (AD) is a progressive neurodegenerative disorder that affects the Corpus Callosum (CC) which plays a key role for interhemispheric coupling in high demanding conditions. Using 3D callosal measures and a variant of the letter matching paradigm in which demand is parametrically varied, the present two-fold study investigated the inter-hemispheric dynamics in individuals with AD and with amnesic-mild cognitive impairment (a-MCI).

Participants and Methods: Thirty-three right-handed participants constituting three groups (Alzheimer's vs aMCI vs. matched control)

were recruited. All participants were MRI-scanned (3T) to measure the total volume of the CC according to five anterior to posterior sections, C1-Rostrum, C2-Genu, C3-Anterior part of the body, C4-Posterior part of the body and C5-Splenium. In the first study (S1), the participants performed a low-demanding letter shape matching task (e.g., A-A, 1 target and 2 probes) while in the second study (S2), they performed a more complex semantic matching (e.g., a-A) and a high attentional load task (e.g., 1 target and 4 probes).

Results: In Study 1 (low-demanding), there was a negative correlation between the behavioral interhemispheric indices and the total CC and C1-Rostrum volumes for control group and a positive correlation with C2-Genu volume for AD group. In Study 2 (high-demanding), the behavioral interhemispheric indices were positively correlated with total volume of CC, and with regional volumes of C2-Rostrum, C3-Anterior, and C4-Posterior for the control group. For the most high attentional load situation, the volume of C2-Rostrum was negatively correlated with the behavioral interhemispheric indices in the low-demanding condition for the a-MCI group.

Conclusions: Together, these results show the existence of an inter-hemispheric compensation mechanism in AD relying on the integrity of the CC and similar processes to those allowing normal elderly to cope with cognitive demand. These mechanisms are not optimal in a-MCI individuals.

Correspondence: *Jennyfer Ansado, PhD, Faculty of medicine - University of Montreal, 4565, Chemin Queen-Mary, Montreal, QC H4B2C7, Canada. E-mail: jennyfer.ansado@videotron.ca*

J. BEN-AMI, G. YANEZ, N.N. LIZARRAGA, M.J. WRIGHT, P.H. LU, L. APOSTOLOVA, J. RINGMAN, J.L. CUMMINGS & E. WOO. The Impact of Memory Strategy Use on Activities of Daily Living in Mild Cognitive Impairment.

Objective: Executive and memory functioning are important for the maintenance of activities of daily living (ADLs). The goal of the current study was to examine the unique roles of strategy use, an executive skill that enhances recall, and memory on specific ADLs in mild cognitive impairment (MCI).

Participants and Methods: Participants were 37 healthy older controls and 67 individuals with MCI. All participants completed the California Verbal Learning Test-II (CVLT-II). To assess learning and recall, we examined performances on Trial 5, Short-Delay Free Recall, and Long-Delay Free Recall. To evaluate strategy use, we examined semantic clustering during each of these trials. The participants' significant others completed the Functional Activities Questionnaire (FAQ), an informant-based measure regarding ADLs.

Results: For each group, hierarchical regressions were employed to determine if strategy use predicted ADLs over and above memory performance. There was no multicollinearity between the predictors. For the controls, only memory performance predicted management of bills, stove use, and dates. For the MCI participants, semantic clustering at learning accounted for significant variance, over and above that accounted for by Trial 5 recall, for the ADLs of shopping and stove use. Semantic clustering at the short delay predicted stove use over and above short-delay free recall.

Conclusions: These results indicate that memory is important for the maintenance of ADLs in healthy older adults and individuals with MCI. In persons with MCI, the executive skill of strategy use is additionally influential in performing some ADLs. This suggests that strategy use can help compensate for memory difficulties when performing complex tasks in everyday life.

Correspondence: *Ellen Woo, UCLA, 10911 Weyburn #200, Los Angeles, CA 90095. E-mail: ewoo@mednet.ucla.edu*

P.W. BREWSTER, S.S. MACDONALD, E.J. LAUKKA, L. FRATIGLIONI & L. BACKMAN. Protective Effects of Late-Life Mental Activities Against Cognitive Decline in Prodromal Alzheimer Disease and their Relation to Earlier-Life Reserve Proxies.

Objective: Engagement in cognitively demanding leisure activities (LA) late in life may delay the onset of cognitive deficits in prodromal

Alzheimer disease (AD). Before LA can be recommended as an effective way of preventing or delaying dementia for individuals at risk, it is important to evaluate whether the protective effects of LA are uniform across individuals independent of earlier-life proxies for cognitive reserve. Our objective was to examine the relative impact of late-life LA on the trajectory of cognitive decline in individuals with high vs. low levels of early-life reserve (e.g., educational attainment, occupational complexity) who subsequently developed AD.

Participants and Methods: The cognitive decline trajectories of 113 initially nondemented participants from the Kungsholmen Project (KP) who progressed to a diagnosis of probable AD at one of four follow-up assessments were characterized using mixed linear modeling. A test of verbal recall was used to measure cognitive decline. Early-life reserve capacity was characterized by calculating a factor score for each participant derived from their level of educational attainment and occupational complexity in adulthood. The cognitive trajectories for participants with high levels of early-life reserve capacity (HRC; $n = 56$) and those with lower levels (LRC; $n = 57$) were modeled separately, followed subsequently by the examination of the role of later-life LA for moderating the onset and rate of cognitive decline in both samples.

Results: Late-life LA did not significantly moderate decline trajectories in the HRC sample. In contrast, those in the LRC sample who reported higher levels of LA had significantly slower trajectories of memory loss than those reporting lower levels of LA.

Conclusions: The protective effects of late-life engagement in cognitive activities may be most pronounced for individuals with lower levels of early-life reserve capacity.

Correspondence: *Paul W. Brewster, M.Sc., Psychology and Centre on Aging, Univ of Victoria, 450 Dallas Rd, Apt 704, Victoria, BC V8V 1B1, Canada. E-mail: pbrew@uwic.ca*

Y.I. CABRERA, D. NATION, L. DELANO-WOOD, K. BANGEN & M. BONDI. Blood Pressure and Cerebrovascular Comorbidity in Alzheimer's Disease.

Objective: Hypertension is a risk factor for Alzheimer's disease (AD) in midlife, but both high and low blood pressure (BP) have been associated with AD in laterlife. BP elevation may convey increased risk of Alzheimer's dementia in laterlife through increased cerebrovascular comorbidity, yet other studies suggest a decline in BP may occur as a result of AD itself. In order to test whether BP measures vary by dementia etiology we compared several BP measures (systolic, diastolic, mean arterial [MAP], and pulse pressure [PP]) among three groups of older adults: normal cognition (NC), "pure" AD (pAD), and AD with comorbid cerebrovascular disease (AD+CVD). We hypothesized that patients with AD+CVD would show elevated PP and MAP and that pAD patients would not differ from NCs on BP measures.

Participants and Methods: Sixty-nine dementia patients and fifty-three age and education matched controls were recruited from the University of California San Diego (UCSD) Alzheimer's Disease Research Center (ADRC) for BP readings, cognitive testing, and clinical diagnosis. Autopsy confirmation of definite AD according to NIA CERAD criteria was obtained for all 69 patients clinically diagnosed with probable AD. Definite AD patients were divided into those with pAD ($n=16$) vs. AD+CVD ($n=53$). Participant groups (NC, pAD, AD+CVD) were compared on antemortem BP measures using ANOVA with post-hoc Tukey tests.

Results: AD+CVD patients exhibited significantly higher diastolic pressure and MAP relative to NC participants, and elevated PP relative to pAD participants.

Conclusions: Findings indicate that the relationship between laterlife BP elevation and AD may depend on both the BP measure of interest and the presence of overlying CVD. Preliminary evidence suggests that MAP, diastolic pressure, and PP elevation may characterize AD patients with comorbid CVD. These results could explain the mixed findings concerning the relationship between BP and AD in studies that do not utilize neuropathological measures of comorbid CVD.

Correspondence: *Yuliana I. Cabrera, Psychology, San Diego State University, 4057 Sundance Ln, Norco, CA 92860. E-mail: yulicabrera@gmail.com*

S. CINES, J. KARLAWISH, E. SULLO & S. COSENTINO. A Tale of Two Measures: When Clinical Ratings and Objective Scores of Memory Awareness Conflict.

Objective: Patients with mild Alzheimer's Disease (AD) have variable levels of memory awareness. We developed an objective tool for assessing memory awareness that captures clinical variability in awareness in mild AD (Cosentino et al., 2007). While these two metrics of awareness are correlated, however, there are instances in which they are discordant. The current study examined whether or not demographics, mood, or neuropsychological functioning differed in individuals who obtained discordant versus concordant scores.

Participants and Methods: 79 individuals with mild AD received clinical ratings of awareness and completed a comprehensive battery of objective metamemory and neuropsychological tests.

Results: 49% of participants were clinically rated as unaware of their memory loss, and 51% as aware. Consistent with previous results, objective metamemory scores were correlated with clinical ratings of awareness ($r = -.28, p = .013$). However, 39% of participants had discrepant scores. Specifically, of the 44 individuals who demonstrated intact objective metamemory, 43% were clinically rated as unaware of their memory loss. Individuals with discrepant scores did not differ in age, education, sex, depression, anxiety, or most aspects of cognition from those with concordant scores. However, they achieved lower scores on a test of delayed nonverbal memory ($F = 10.98, p = .002$).

Conclusions: While objective and subjective measures of awareness are correlated, they are not always concordant. Neither demographic variables, mood, global cognition, nor verbal memory influenced the extent to which awareness scores were discrepant. However, nonverbal memory results suggest that the neural networks that support broad assessments of one's memory may differ from those that support online memory monitoring. Identifying factors that influence different types of memory awareness will enhance detection of awareness deficits, and our understanding of their etiology and clinical consequences.

Correspondence: *Sarah Cines, Sergievsky Center, Columbia University Medical Center, 622 W. 168 Street, New York, NY 10032. E-mail: sc3311@columbia.edu*

L.R. CLARK, C.E. WIERENGA, S.I. DEV, D.D. SHIN, S.M. JURICK, R.A. RISSMAN, T.T. LIU & M.W. BONDI. Differential Effects of Aging and APOE Genotype on Cerebral Blood Flow at Rest.

Objective: Antagonistic pleiotropy is an evolutionary biological concept asserting that certain genes exert different survival effects throughout the lifespan. APOE has been proposed as one such gene given its demonstration of cognitive benefits in early life and deterioration in late life among $\epsilon 4$ carriers. Evidence also indicates reductions in resting cerebral blood flow (CBF) accompany normal aging and further reductions occur in Alzheimer's disease (AD). Thus, we investigated the impact of APOE genotype on CBF in older and younger adults.

Participants and Methods: 40 cognitively normal older adults (16 $\epsilon 4$, 24 non- $\epsilon 4$) and 30 younger adults (15 $\epsilon 4$, 15 non- $\epsilon 4$) completed a resting-state arterial spin labeling (ASL) MR scan. A voxel-wise ANOVA examined the effects of age and APOE on whole-brain gray matter CBF. Correlations were conducted between significant clusters and neuropsychological composite scores.

Results: Older adults had decreased CBF compared to younger adults in several brain regions. APOE $\epsilon 4$ carriers displayed greater CBF in the left lingual gyrus than non-carriers. An interaction between age and genotype in the left anterior cingulate cortex was characterized by reduced CBF in older $\epsilon 4$ carriers and increased CBF in young $\epsilon 4$ carriers ($p < .001$). CBF in the ACC was negatively associated with verbal memory in non-carriers and positively associated with executive functioning in $\epsilon 4$ carriers across age groups.

Conclusions: Our results demonstrate APOE genotype differentially impacts cerebrovascular function across the lifespan as well as the relationship between CBF and cognition. Findings may partially support suggestions that the gene exerts antagonistic pleiotropic effects.

Correspondence: *Lindsay R. Clark, Clinical Psychology, San Diego State University/University of California, San Diego, 4573 Florida Street, Apt 3, San Diego, CA 92116. E-mail: ltermini@gmail.com*

M.K. FOSTER, M. SEIDENBERG, J. WOODARD, K. NIELSON, J. SMITH, M. LANCASTER, M. MATTHEWS, N. HANTKE, A. BUTTS & S. RAO. Risk Factors for Alzheimer's Disease and Longitudinal Memory Performance.

Objective: Greater risk for Alzheimer's disease (AD) is associated with carrying the apolipoprotein E (ApoE) $\epsilon 4$ allele and a family history (FH) of AD. Little research has examined the long-term cognitive effects of these risk factors. We examined longitudinal memory performance over five years in elders with a combination of risk factors.

Participants and Methods: Sixty cognitively intact elders underwent neuropsychological assessment at baseline, 1.5 years, and five years. Among ApoE $\epsilon 4$ non-carriers, 16 participants had a FH of AD, while 20 participants had no FH of AD. Twenty-four ApoE $\epsilon 4$ carriers comprised a third group of participants, either with ($n=17$) or without ($n=7$) a FH of AD. We used univariate repeated measures ANOVAs to identify possible group differences in memory performance and to examine potential time-by-group interactions.

Results: Longitudinally, there were significant interaction effects for time and group on the Rey Auditory Verbal Learning Test Immediate Learning, Delayed Recall, and Percent Retention variables, with ApoE $\epsilon 4$ carriers declining from baseline differently than the other groups. Follow-up analyses revealed that differences in memory across groups were not apparent until the five-year follow-up assessment, when the ApoE $\epsilon 4$ carriers performed worse than those without the ApoE $\epsilon 4$ allele.

Conclusions: Results suggest that the $\epsilon 4$ allele is associated to a greater degree than FH for AD with reduced memory performance over time. Longitudinal studies of cognitively intact individuals may require long follow-up periods, perhaps 5 years or more, to detect the influence of AD risk factors between groups.

Correspondence: *Mary K. Foster, Ph.D., Psychiatry & Psychology, Cleveland Clinic Foundation, P57, 9500 Euclid Ave, Cleveland, OH 44195. E-mail: mary.foster@gmail.com*

T. FUJITA, M. NOTOYA, N. SUNAHARA, K. KATO, T. NAGAI & Y. HATTORI. Differences in behavioral disorders in Alzheimer's disease patients with regard to dementia severity measured using the at-the-desk instrumental activities of daily living (IADL) test.

Objective: We developed a test for the desk evaluation of instrumental activities of daily living (IADL) in Alzheimer's disease (AD) patients, and examined its credibility and adequacy. In this study, we examined whether differences in behavioral disorders can be mapped using the at-the-desk IADL (ATD-IADL) test in AD patients classified using the clinical dementia rating (CDR) scale.

Participants and Methods: The study included 24 normal control (NC) patients (CDR0), 24 mild AD patients (CDR1), and 11 moderate AD patients (CDR2). The ATD-IADL test comprised 8 tasks (4 tasks with 2 patterns) that included 2 object and classification tasks, a parallel task, and a prospective memory task. The subjects were instructed to determine the sequence of the 8 tasks. We recorded the number of people performing a task and the task sequence being performed, and thus calculated the score.

Results: A significant difference was observed between the NC and the 2 AD groups in the number of subjects who performed all the tasks (χ^2 test, $p < 0.05$); however, not much difference was noted in the number of people who performed the classification and 2 object tasks. The 2 AD groups had significantly lower implementation sequence scores than the NC group (Kruskal-Wallis test, $p < 0.05$)

Conclusions: This results indicated that AD patients faced a high degree of difficulty while performing prospective memory or parallel tasks. We suppose that the AD patients' ability of efficiently assessing the task sequence starts deteriorating during the mild AD stage.

Correspondence: *Takashi Fujita, Dr., Seijoh university, Fukinodai 2-172, Toukai 476-8588, Japan. E-mail: takafuji120@yahoo.co.jp*

J.M. GRABYAN, P.J. MASSMAN, B. PORTER & R.S. DOODY. Plasma Cortisol does not Predict Rate of Cognitive Decline in Alzheimer's Patients.

Objective: The presence of HPA axis dysregulation, and concomitant cortisol elevation, is well established in Alzheimer's disease. Disagreement exists on what role this increased cortisol plays in the progression of the disease. It was hypothesized that higher levels of serum cortisol would predict greater rate of decline in functioning in future years.

Participants and Methods: Archival data was obtained from the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center in Houston, Texas and the Texas Alzheimer's Research Consortium. Subjects were 40 patients with a diagnosis of probable AD. Serum cortisol was measured using immunoassay human Multi-Analyte Profile. APOE genotype was also determined. Patients were then administered a full neuropsychological battery which included measures of memory (WMS-R LM and VR), language (Boston Naming Test, FAS), attention (VSAT), visuospatial functioning (Block Design), and dementia severity (MMSE, CDR-Sum of Boxes). This battery was repeated yearly for 2 to 4 years.

Results: Growth curve analyses within a multilevel fixed effects model framework were used to predict the decline in performance on neuropsychological tests and disease progression. Serum cortisol levels did not significantly predict the decline in functioning in any of the neuropsychological measures or the increase in disease severity. Inclusion of APOE $\epsilon 4$ status as a predictor moved results closer to, but did not reach, significance for increase in CDR-Sum of Boxes.

Conclusions: Higher cortisol levels did not predict an increased rate of decline in AD patients' neuropsychological test scores or dementia severity, implying there is not a substantial relationship between the physiological stress response and disease progression. Analyses did suggest that APOE $\epsilon 4$ carriers with high cortisol levels may exhibit more rapid increase in dementia severity, but this possible effect needs to be demonstrated in future, more statistically powerful studies.

Correspondence: *Jonathan M. Grabyan, M.A., University of Houston, 7490 Brompton, Apt 279, Houston, TX 77025. E-mail: jgrabyan@gmail.com*

V.A. GUZMAN, O.T. CARMICHAEL, C. SCHWARZ, M.E. ZIMMERMAN & A. BRICKMAN. White matter hyperintensities and amyloid are independently associated with entorhinal cortex volume in the Alzheimer's Disease Neuroimaging Initiative.

Objective: Current hypothetical models of Alzheimer's disease (AD) pathogenesis emphasize the role of beta amyloid, tau deposition, and neurodegenerative changes in the mesial temporal lobe (particularly entorhinal cortex). However, many individuals with clinical AD who come to autopsy also exhibit cerebrovascular disease. The relationship between AD and vascular pathology is unclear, especially whether they represent additive or independent effects on neuronal injury. We used data from the Alzheimer's Disease Neuroimaging Initiative (ADNI) to 1) confirm whether entorhinal cortex volume (ECV) is associated with cognitive functioning among individuals with mild cognitive impairment (MCI) who are at risk for AD; and 2) determine whether regional white matter hyperintensity (WMH) volume, a radiological marker for small vessel cerebrovascular disease, is associated with ECV above-and-beyond putative AD biomarkers.

Participants and Methods: Data from 397 subjects with MCI (mean age=74.89+/-7.47) were utilized, including ECV, intracranial volume, total tau, A β 1-42, and cognitive test scores. Lobar WMH volumes were

derived from T1-, proton density, and T2-weighted MRI scans. We examined the association between ECV and cognition. Next, we examined the association of tau and A β 1-42 with ECV and between lobar WMH and ECV. Finally, tau, A β 1-42, and regional WMH volumes were entered simultaneously to predict ECV. All analyses used multiple regression, controlling for age and cranial volume.

Results: Larger ECV was associated with better cognition, particularly memory. Lower levels of A β 1-42 and higher temporal WMH volumes were associated with smaller ECV. When entered simultaneously, temporal lobe WMH volume and A β 1-42 had a similar association with ECV.

Conclusions: The findings confirm the selective role of EC volume reduction in memory decline and suggest that both A β 1-42 and regionally distributed WMH are independently associated with ECV loss.

Correspondence: Adam M Brickman, Ph.D., Taub Institute, Columbia University, 630 West 168th Street, New York, NY 10032. E-mail: amb2139@columbia.edu

N.A. HAUGRUD, M. CROSSLEY, M. VRBANCIC & D. MORGAN. Clustering and Switching Strategies During Verbal Fluency Performance Differentiate Dementia Subtypes.

Objective: To differentiate dementia subtypes using verbal fluency measures of clustering (grouping semantically or phonemically related words) and switching (shifting between clusters; Troyer et al., 1997).

Participants and Methods: Healthy older adults (N = 26) were compared to patients diagnosed with amnesic mild cognitive impairment (MCI; N=14), Alzheimer's disease (AD; N=22), vascular dementia (VD; N=23), Lewy Body dementia (DLB; N=11), behavioural-variant frontotemporal dementia (FTD-bv; N=10), and language-variant frontotemporal dementia (FTD-lang; N=10). Measures of phonemic (C, F, L) and semantic (animal naming) verbal fluency were scored for total word production and clustering and switching strategies as defined by Troyer et al. (1997), Abwender et al. (2001) and Lanting et al. (2009).

Results: Using univariate ANOVA, compared to healthy participants, all clinical groups showed impaired total word production during semantic fluency, but phonemic fluency was preserved for both MCI and early stage AD groups. The MCI group performed normally on all clustering and switching strategies. The FTD-lang group showed consistent impairment across all measures and produced the largest number of errors. The VD and DLB groups were impaired on all measures except average cluster size, in contrast to the AD group with impaired semantic average cluster size. The FTD-bv group was more impaired on phonemic than semantic fluency.

Conclusions: Although total word production was a sensitive measure of dementia in this study, clustering and switching strategies differentiated dementia subtypes. Results are consistent with impaired semantic memory storage in AD, impaired processing speed and set shifting in DLB and VD, and impaired complex strategic search processes in FTD-bv.

Correspondence: Nicole A. Haugrud, University of Saskatchewan, 2 410 Keevil Crescent, Saskatoon, SK S7N4R6, Canada. E-mail: nicole.haugrud@usask.ca

A. HAYASHI, T. KIMPARA, A. OHNUMA & E. MORI. Pure Agraphia for Kanji Characters in a Japanese Patient with Probable Alzheimer's Disease: A 2-year Follow-up Study.

Objective: Here we report a patient with probable Alzheimer's disease whose initial symptom was pure agraphia for Kanji characters without generalized dementia.

Participants and Methods: A 59-year-old, right-handed farmer with a 12th-grade education complained of difficulty in writing Kanji. His medical history and family history were not remarkable. Examination revealed mild amnesia and constructional disability as well as Kanji agraphia. On brain MRIs, mild hippocampal atrophy was noted. Regional cerebral blood flow measurement with single photon emission computed tomography showed hypoperfusion in the bilateral tempo-

ral, parietal, and occipital cortices, greater on the left side. The Apolipoprotein E allele status was e3/e4. Neuropsychological tests [MMSE, Alzheimer's Disease Assessment Scale (ADAS), Western Aphasia Battery (WAB), Wechsler Memory Scale-Revised (WMS-R)] and writing tasks [writing to dictation of 50 two-character Kanji words (total characters were 100) and 20 Kana words, and copying 10 Kanji words] were repeated at the interval of one year for 2 years.

Results: MMSE: 27 (2009), 27 (2010), 21 (2011), ADAS: 7.4, 7.0, 22.7, WAB AQ: 95.6, 96, NA, Writing: 6.3, 3.8, NA, Construction: 6.1, 5.5, NA, WMS-R Verbal Memory: 77, NA, 54, Visual Memory: 74, NA, <50, Attention/Concentration: 84, NA, 62, Delayed Recall: 79, NA, <50. In writing task, he could write all Kana words in 2009, but showed mild impairments in 2010. He revealed severe impairments in writing Kanji words: 33 errors/100 [non-response (NR) 63.6%, peripheral error (PE) 36.4%], 51/100 (NR 43.1%, PE 56.9%), 17/20 (NR 47.1%, PE 52.9%). Copying Kanji words was also defective: 6 errors/10, NA, 9/10.

Conclusions: Pure agraphia for Kanji was out of proportion at the early clinical stage. It gradually deteriorated during two years, and memory and overall cognitive decline developed. Progressive pure agraphia could be an early sign of Alzheimer's disease.

Correspondence: Atsuko Hayashi, Ph.D, Tohoku University, Seiryomachi, Aoba-ku, Sendai 980-8575, Japan. E-mail: a-hayashi@tohoku.ac.jp

D. HOWIESON, N. MATTEK, T. BURACCHIO, D. ERTEN-LYONS, H.H. DODGE & J.A. KAYE. Risk of Conversion to Alzheimer's Dementia within Two Years of MCI Onset.

Objective: When patients are given a diagnosis of mild cognitive impairment (MCI), they and their families want to know their prognosis. The purpose of this study was to refine prediction of conversion to dementia within two years of MCI onset.

Participants and Methods: All participants were cognitively intact at entry (CDR = 0). Neuropsychological evaluations and Clinical Dementia Ratings (CDRs) were conducted annually. MCI was defined as a CDR = .5 followed by CDR \geq .5 during the next two years. The onset of MCI was considered the date of the first CDR = .5.

Clinical data included CIRS, ADL, Cognistat, category fluency (animals and vegetables), Block Design, Digit Span, CERAD Word-list acquisition and recall, Logical Memory I and II Story A, Tinetti Balance and Gait, walking speed, UPDRS, prior falls history, Hachinski score, APOE, and depression.

Results: At the onset of MCI the 25 of 89 (28%) participants who converted to AD within two years of MCI onset were older (92.4 vs. 89.7 years) and had a lower MMSE (25.2 vs. 26.9) than those who did not convert.

No differences were found between groups for the non-cognitive variables except for Tinetti balance. Most cognitive test scores were significantly lower among participants who converted.

Conclusions: Using Hsomer & Lemeshow's model-building strategies, the best model (AUC = .82) for predicting which participants would progress to an AD diagnosis within two years included only age, Logical Memory I Story A, and animal fluency. These data were used to calculate an individual's predicted probability of conversion to AD within two years.

Correspondence: Diane Howieson, Ph.D., Neurology, Oregon Health & Science University, Mail Code CR131, 3181 SW Sam Jackson Park Road, Portland, OR 97239-3098. E-mail: howiesod@ohsu.edu

S.C. JOHNSON, G. XU, B.B. BENDLIN, M. DOWLING, O. OKONKWO, S. ASTHANA, C. CARLSSON, R. KOSCIK, E. JONAITIS, B.P. HERMANN, A. LARUE & M.A. SAGER. Brain atrophy precedes cognitive change in asymptomatic late middle-aged adults at risk for AD: A four year longitudinal study.

Objective: Both APOE ϵ 4 allele and first-degree family history (FH) of Alzheimer disease (AD) are major risk factors for developing sporadic

AD and putatively cause early brain changes before symptomatic disease. However, this has not been empirically tested in middle-aged adults. This study evaluated the influence of AD FH and APOE on brain atrophy and cognitive decline over 4 years among asymptomatic late-middle-age individuals.

Participants and Methods: 110 participants (mean age 54 at baseline) from the Wisconsin Registry for Alzheimer's Prevention (WRAP) underwent APOE genotyping, detailed medical record verification of parental FH of AD, neuropsychological testing emphasizing episodic memory and executive functions, and a T1-weighted high resolution MRI scan at 3.0T at baseline and 48.60 months later. A voxel wise 2x2 ANCOVA examined gray matter (GM) volume at 4-year followup using GM at baseline as a voxelwise covariate. A similar model was used for cognition. The AVLT was the primary cognitive outcome, though composite scores for memory and executive function were also examined.

Results: At baseline there were no significant differences between groups in cognition or brain morphometry. Longitudinally, an interaction was found in the posterior hippocampus bilaterally, and this was driven by a very significant difference between the FH+ and FH- subjects who were APOE4 negative. Additionally, main effects for FH were observed elsewhere in the hippocampus; an APOE4 main effect was found in the left retrosplenial cortex. Cognitive measures did not differ between groups.

Conclusions: Over a 4 year interval, asymptomatic late middle aged subjects exhibit significant atrophy but not cognitive decline. FH was associated with mesial temporal atrophy and APOE4 associated with medial parietal atrophy. These results provide further evidence that detectable disease-related anatomic changes do occur very early in the disease process. How these changes correspond to amyloid load and metabolic function has yet to be described.

Correspondence: *Sterling C. Johnson, PhD, Alzheimer's Disease Research Center, University of Wisconsin, UW CSC, MC2420 J5/Mez, 600 Highland Ave, Madison, WI 53792. E-mail: scj@medicine.wisc.edu*

N.A. KIEWEL, M. BRADSHAW, A.M. STRUTT & L.K. HANE. Patterns of Reliable Digit Span Performance in Patients with Alzheimer's Disease.

Objective: Reliable Digit Span (RDS; Greiffenstein, Baker, & Goal, 1994) has been used as an effort test; however, research applying an RDS cut-off of ≤ 6 to individuals with dementia has been limited. The present study examined RDS performance in individuals with probable Alzheimer's disease (AD). Based on previous findings, it was hypothesized that RDS scores would be impacted by dementia severity, and the traditional cut-off scores would be minimally useful.

Participants and Methods: Participants included 143 patients with probable AD enrolled in the Baylor College of Medicine AD and Memory Disorders Center (89 females; 54 males). Mean age was 74.4 (SD=9.8), mean education was 14.3 years (SD=2.7), and mean MMSE was 19.0 (SD=6.5). As part of a neuropsychological battery, patients were administered Digit Span from the Wechsler Adult Intelligence Scale-Third Edition (Wechsler, 1997). RDS was calculated by summing the longest number of digits forward and backward that were consistently recalled on two trials. To assess for the effect of dementia severity, participants were assigned to groups based on MMSE (≥ 21 =mild; 14-20=moderate; ≤ 13 =severe).

Results: No significant group differences were found for age, gender, education, or dementia symptom duration ($p > .11$). Univariate analyses of variance revealed significant group differences in RDS scores ($p = .000$), with the severe group performing significantly worse ($p = .000$). 7.4% of the mild, 28.6% of the moderate, and 76.0% of the severe group obtained RDS scores of ≤ 6 .

Conclusions: Results suggest that caution should be used when applying traditional RDS cut-off scores to individuals with AD, particularly as severity increases.

Correspondence: *Nicole A. Kiewel, MS, Psychology, University of Houston, 126 Heyne Building, University of Houston, Houston, TX 77204-5022. E-mail: nicole.kiewel@gmail.com*

L.P. LESKIN, R.J. MELROSE, T.A. NARVAEZ, T.K. ANDO, A.K. WALSTON, D.G. HARWOOD, M.A. MANDELKERN & D.L. SULTZER. FDG-PET Cortical Metabolic Activity Associated with List Learning Serial Position Effect in Alzheimer's Disease.

Objective: Multiple studies of serial position effect in Alzheimer's disease (AD) have found a characteristic pattern of relative advantage for the recency section on verbal list learning tasks, with poorer performance in the primacy and middle sections. The goal of this study was to identify patterns of cortical functioning associated with performance on serial position measures in AD.

Participants and Methods: Eighty-one participants with AD (mean MMSE=20.2) completed neuropsychological assessment and FDG-PET imaging. Percentage scores for primacy, middle, and recency were calculated across three trials on the CERAD list learning task. The association between regional cortical metabolic activity and serial position scores were examined using SPM2.

Results: As expected, a repeated measures ANOVA revealed a significant advantage for the recency section compared to the primacy and middle sections ($p < .001$). There were no significant associations between scores on the primacy or middle sections of the CERAD and cortical metabolism. However, higher recency scores correlated positively with metabolic activity in the left temporal lobe extending across the entire length of the middle and inferior temporal gyri, and the fusiform gyrus ($p < .01$, corrected at the cluster level.)

Conclusions: Recency performance in AD is associated with preserved cortical activity in the left temporal cortex, likely related to the relative sparing of simple sustained attention, or the ability to hold/repeat information in the phonological loop. In contrast, performance on the primacy and middle sections do not show distinct localization, and thus likely reflect alternative neuropsychological processes.

Correspondence: *Lorraine P. Leskin, Ph.D., Geriatric Psychiatry, VA Greater Los Angeles Healthcare Center, 11301 Wilshire Blvd., Los Angeles, CA 90073. E-mail: lorraine.leskin@va.gov*

K.J. MANNING, J.D. DAVIS, S. HEWITT & B.R. OTT. Empirical Evaluation of Dementia Driving Risks Proposed by the American Academy of Neurology.

Objective: The American Academy of Neurology recently published an updated practice parameter on the evaluation of driving risk in dementia (Iverson et al., 2010). Proposed risk factors include a Clinical Dementia Rating (CDR) of .5 or greater, informant report of unsafe driving, history of violations/accidents, driving < 60 miles per week, and a MMSE of 24 or less. We attempted to validate these risk factors, as well as the use of brief neuropsychological tests, in a sample of older drivers with very mild or mild dementia.

Participants and Methods: We obtained data on proposed risk factors from 65 older drivers with very mild or mild dementia. All patients completed brief neuropsychological tests and a standardized on-road test. Driving performance outcomes were road test error severity and a global rating by a professional driving instructor. Regression analyses and between-group comparisons were used to validate risk factors with driving outcomes.

Results: Regression methods failed to find a significant relationship between proposed risk factors and driving outcomes. Furthermore, when patients were divided into 3 groups based on the total number of risk factors, groups did not significantly differ on driving outcomes. In contrast, worse performance on Trails B was significantly associated with more errors on the road test, albeit explaining only a fraction of the total variance.

Conclusions: Using the clinical recommendations proposed by Iverson et al. (2010) to predict road test performance in dementia proved ineffective. These findings question the use of these risk factors to determine the need for a formal driving assessment of drivers with dementia.

Correspondence: *Kevin J. Manning, M.S., Psychiatry and Human Behavior, Warren Alpert Medical School of Brown University, 167 10th Street, Providence, RI 02906. E-mail: kevin.j.manning@gmail.com*

C. MCHENRY, V. TALER, S. BAUM & N.A. PHILLIPS. Comprehension of phonetic and prosodic information with audio-visual and linguistic cues in Alzheimer's disease and mild cognitive impairment.

Objective: During audio-visual (AV) speech, visual speech information interacts with auditory (A) speech sounds and enhances speech perception in suboptimal listening conditions. However, little is known about multisensory integration in patients with Alzheimer disease (AD) or in patients with mild cognitive impairment (MCI), who are at risk for developing AD.

Participants and Methods: We examined the effect of unimodal (A-only) and multisensory (AV) presentations on speech perception and comprehension of grammatical prosody in noise in younger adults (YA; $n=12$), older adults (OA; $n=12$) and patients with AD ($n=8$) and MCI ($n=13$). The speech perception task compared sentences with high or low semantic context.

Results: YA and OA demonstrated equivalent visual enhancement (VE) effects, as well as greater VE due to AV presentation in low ($M=2.8$, $SD=2.8$) compared to high semantic context ($M=0.6$, $SD=0.6$, $F(1,22)=14.4$, $p=.001$). Both MCI ($M=52.08\%$, $SD=7.79$) and AD ($M=53.8\%$, $SD=6.2$) patients displayed impaired speech perception relative to NECs ($M=61.17\%$, $SD=8.60$, $F(2,30)=4.58$, $p=.018$) across both modalities, but intact VE and context effects. Thus, the ability to benefit from AV speech appears intact in MCI and AD. In the grammatical prosody task, MCI and AD patients demonstrated intact performance across modalities as well as normal VE and comprehension of prosody.

Conclusions: The observed impairment in speech perception in noise with intact multisensory enhancement has important implications for communication with MCI and AD patients, which caregivers report as problematic.

Correspondence: *Cristina McHenry, Centre for Research in Human Development, Concordia University, 7141 Sherbrooke Ouest, PY-170, Montreal, QC H4R 1B6, Canada. E-mail: cristina.mchenry@gmail.com*

A.E. MIKOS, I. PIRYATINSKY, G. TREMONT, A. FERNANDEZ, A. HUI & P. MALLOY. APOE4 is Associated with Increased Frontally Mediated Neurobehavioral Symptoms in Amnesic MCI and Alzheimer's Disease.

Objective: The APOE4 allele is a risk factor for late-onset Alzheimer's disease (AD) and may accelerate disease pathology and progression. Although AD has traditionally been thought to initially affect posterior cortical areas, the frontal lobes may be among the brain regions that manifest effects of APOE4 even very early in the disease process. We applied a measure of neurobehavioral functioning that is sensitive to frontal lobe integrity to patients with amnesic Mild Cognitive Impairment (aMCI) and AD. We predicted that in each disease group, APOE4 carriers would demonstrate increased frontally-mediated neurobehavioral symptoms relative to non-carriers.

Participants and Methods: We obtained cognitive data and caregiver ratings on the Frontal Systems Behavior Scale (FrSBe) for aMCI patients ($N=29$ APOE4 positive; $N=29$ APOE4 negative) and AD patients ($N=47$ positive; $N=42$ negative).

Results: In the aMCI group, APOE4 carriers had significantly lower scores on tests of memory and increased FrSBe Executive Dysfunction scores relative to non-carriers. Carriers and non-carriers in the aMCI group did not differ on cognitive screening measures, cognitive tests of executive functioning, or demographic factors. In the AD group, APOE4 carriers were significantly younger, had more years of education, lower memory scores, and higher FrSBe Apathy scores compared to non-carriers.

Conclusions: Frontally-mediated behavior change occurs early in the course of AD in patients with the APOE4 allele, and the APOE4 allele is associated with different patterns of neurobehavioral symptoms along the AD spectrum. Controlling for demographic factors, the APOE4 allele was associated with increased behavioral executive dysfunction in aMCI and with increased apathy in AD.

Correspondence: *Ania E. Mikos, PhD, Psychiatry and Human Behavior, Brown University, 130 Pitman St, Apt 3, Providence, RI 02906. E-mail: mikos.ania@gmail.com*

D. MOGRABI, R. BROWN & R. MORRIS. Emotional reactivity and awareness of task failure in Alzheimer's disease.

Objective: Limited awareness about performance in tasks is a common feature of Alzheimer's disease (AD). Nevertheless, clinical anecdotes have suggested that patients may show behavioural responses to the experience of failure despite expressing reduced awareness. The current study investigated emotional reactions to success or failure in tasks despite unawareness of performance in AD.

Participants and Methods: Computer tasks which expose participants to systematic success or failure were developed and used in a group of AD patients ($n=23$) and age-matched controls ($n=21$). Two experiments, the first with reaction time tasks and the second with memory tasks, were carried out, and in each experiment two parallel tasks were used, one in a success condition and one in a failure condition. Awareness of performance was measured comparing estimations of performance with actual performance and was contrasted with emotional reactivity, assessed with a self-report questionnaire and filming of facial expressions.

Results: In both experiments results indicated that, relative to controls, patients exhibited impaired awareness of performance, but comparable differential reactivity to failure relative to success tasks, both in terms of self-report and facial expressions.

Conclusions: The results suggest that affective valence of failure experience is processed despite unawareness of task performance, which might indicate implicit processing of information in neural pathways bypassing consciousness.

Correspondence: *Daniel Mograbi, PhD, Institute of Psychiatry - King's College London, De Crespigny Park, London SE5SAF, United Kingdom. E-mail: daniel.mograbi@kcl.ac.uk*

N. PARE, C. MOLETTIERE & R. REILLY. Diagnostic Predictive Value of the MOCA and the MMSE in Alzheimer's Disease, Vascular Dementia, and Fronto-Temporal Dementia.

Objective: In the last years, multiple screening instruments have emerged, differing in their accuracy at predicting various neurodegenerative processes. While the MMSE has been observed to be sensitive to early memory changes related to medial temporal lobe dysfunction, it is not as sensitive in detecting executive dysfunction such as seen in fronto-temporal and vascular dementias. Conversely, the MOCA instrument has been observed to have a floor effect in AD but to be sensitive to cognitive changes in FTD and VaD. We compared the predictive validity of both instruments in these clinical populations.

Participants and Methods: We compared the total MOCA and MMSE scores in AD, VaD, and FTD. Given that the MMSE has a ceiling effect in MCI, this group was also included. Two hundred patients assessed at our Geriatric Evaluation and Management Clinic between September 2009 and August 2011 were included in the analyses. Diagnosis was established in a multidisciplinary team meeting following a five-hour assessment by a board-certified geriatrician, a nurse, a social worker, and a neuropsychologist. A discriminant function analysis was used to determine which instrument would best predict group classification.

Results: The MOCA was most accurate in classifying FTD and VaD versus AD. When misclassification occurred, it was most likely between MCI and FTD. The MMSE was most accurate in classifying AD versus MCI, FTD, and VaD.

Conclusions: When screening for dementia, a MMSE score within normal limits should not lead to assumption of normal cognitive functions until further investigation with an instrument screening a wider range of cognitive domains, such as the MOCA, is administered.

Correspondence: *Nadia Pare, PhD, Geriatric Evaluation and Management Clinic, Nebraska Methodist Hospital/Nebraska Medical Center, 2717 N. 56th Street, Omaha, NE 68104. E-mail: nad.pare@gmail.com*

J.S. PERRY, J.G. KEILP, G.H. PELTON, Y. STERN & D.P. DEVANAND. Prediction of Conversion From Mild Cognitive Impairment to Alzheimer's Disease.

Objective: The pattern of neurocognitive deficits in Alzheimer's Disease (AD) is well-known, but the course leading from mild cognitive

impairment (MCI) to AD is not well-characterized. Deficits in delayed savings on the Selective Reminding Test (SRT) and slowed performance on WAIS-R Digit Symbol are evident at baseline assessment for patients progressing to dementia (Tabert, et al. 2006) at the group level, however the time course of other impairments is unknown. We hypothesized that information about the time course of cognitive impairment can be used to improve individual classification of AD.

Participants and Methods: Patients with MCI (n=108) were assessed with a battery of neuropsychological tests yearly over 3 years. Change scores and rates of change in test performance were computed and used to optimize the prediction of conversion from MCI to AD.

Results: In addition to the previously identified baseline predictors of AD, change scores of Category Fluency, the SRT Delayed Recall, Long Term Recall, total Long Term Savings, WMS Memory Quotient, Delayed Logical Memory, Immediate and Delayed Paired Associates, Delayed Visual Reproduction, and the Mini Mental Status Exam significantly improved the discrimination between AD-converters, those that remained at questionable dementia status, and those that were clear of signs of dementia above and beyond baseline classification rates.

Conclusions: Follow-up neuropsychological assessment of MCI provides critical additional information for classifying those at risk of conversion to AD. Specifically, early declines in performance on various measures of memory suggest a deepening of memory deficits as well as a decline in semantic fluency in the initial stages of AD, even prior to the deterioration of other functions.

Correspondence: *Justin S. Perry, Psychology, Fordham University, 441 E Fordham Rd., Dept of Psychology, Dealy 226, Bronx, NY 10458. E-mail: jperry11@fordham.edu*

J.L. POOCK, M. CROSSLEY, V. DAL BELLO-HAAS & L. ELIAS. Simple and Complex Gait Dual-Task Performance in Groups of Patients with Preclinical, Mild, and Moderate Alzheimer's Disease Compared to Healthy Older Adults: The Differential Effect of Task Complexity is Evident Only in the Moderately Impaired AD Group.

Objective: Recent research suggests that the ability to divide attention while walking (i.e., gait dual-task performance) is particularly vulnerable to the effects of Alzheimer's disease (AD). However, previous studies have been limited by failure to control for the group differences in single-task walking rate, variability in the types of gait-dual tasks employed, and the inclusion of heterogeneous groups of patients at different stages of disease severity.

Participants and Methods: In the present study, 16 individuals diagnosed with mild cognitive impairment-amnesic disorder (MCI-amnesic; Petersen et al., 1999; M age = 76.1 yrs, 2 males, 14 females); 15 individuals with early-stage AD (M age = 73.9 yrs, 2 males, 13 females); 17 individuals with moderate stage AD (M age = 73.4 yrs, 6 males, 11 females) and 27 healthy older adults (M age = 74.6 yrs, 11 males, 16 females) performed a timed walking task and simple and complex verbal counting tasks (i.e., counting forward by 1's or backward by 2's) in single and dual-task combinations.

Results: Although all groups showed significantly more interference during the complex vs. simple walking and counting dual-task, in keeping with previous research in our lab (i.e., Poock et al., 2007) there were no significant differences between the early stage AD group, MCI-amnesic group and healthy older adults on the gait dual-task, regardless of task complexity. However, as predicted, individuals with moderately advanced AD produced significantly higher levels of gait interference during complex but not simple dual tasks when compared to healthy older adults.

Conclusions: Overall, the moderate AD group showed a unique pattern of interference suggesting that the ability to divide attention during a complex walking and counting dual task is relatively spared until the moderate stages of the illness.

Correspondence: *Jocelyn L. Poock, Ph.D., Psychology, University of Saskatchewan, 26 Windfield Road, Regina, SK S4V 0E7, Canada. E-mail: jlp756@mail.usask.ca*

D. PREDOVAN, D. GANDINI, I. ROULEAU, S. BELLEVILLE, S. JOUBERT & S. BRAMBATI. Altered Semantic Priming Effect in the Recognition of Famous People in Alzheimer's Disease.

Objective: Growing evidence indicates that individuals with Alzheimer's disease (AD) manifest semantic deficits that are often more severe for items that are characterized by a unique semantic and lexical association, such as famous people. However, it is still controversial whether these deficits are determined by a degradation of semantic information or by a deficit in intentional access to semantic knowledge. Here we used semantic priming paradigm of visually-presented names of famous people in order to assess the integrity of the semantic system without requiring explicit access to this system.

Participants and Methods: Five individuals with AD (mean age = 82 +/-1.5 years, F/M = 3/2) and 10 age-matched controls (mean age = 77 +/-8.0 years, F/M = 10/0) were engaged in a familiarity judgment task of famous names. We compared the facilitation effect in recognizing a famous target name when it was preceded by the name of a famous person with the same occupation (Tom Cruise - Brad Pitt) between AD and controls (semantic priming condition). In order to verify whether possible differences between AD and controls in the semantic priming task performance were determined by a semantic deficit rather than by a general difficulty in performing the task, a repetition priming condition (Charlie Chaplin - Charlie Chaplin) was also included.

Results: The results showed a defective priming effect in AD in the semantic but not in the repetition priming condition. Specifically, AD patients did not show a facilitation effect in responding to the same occupation prime-target pairs, but they show equivalent facilitation effect when the target and the prime were identical.

Conclusions: The present results provide support to the hypothesis that the semantic impairments observed in AD cannot be uniquely ascribed to a deficit in intentional access to semantic information, but they rather point out the semantic nature of these deficits.

Correspondence: *Simona Maria Brambati, Centre de Recherche - IUGM, 4565, Chemin Queen-Mary, Montreal, QC H3W1W5, Canada. E-mail: simonabrambati@gmail.com*

S. RAHAYEL, J. FRASNELLI & S. JOUBERT. The Effect of Alzheimer's Disease and Parkinson's Disease on Olfaction: a Meta-Analysis.

Objective: Impaired olfactory function is one of the earliest clinical features in both Alzheimer's disease (AD) and Parkinson's disease (PD). We performed a meta-analysis on the PubMed database in order to determine what aspects of olfaction were affected in these two neurodegenerative diseases and whether different patterns of impairment emerged.

Participants and Methods: By applying strict criteria, we included a total of 81 studies. These inclusion criteria were the following: 1. Patients had a clinical diagnosis of AD or PD; 2. Patients were compared to a healthy control group; 3. Patients and controls were age-matched; 4. Olfactory function was assessed by means of a psychophysical olfactory test; 5. Mean and standard deviation of the tests were reported.

Results: Results indicate that AD and PD patients are more impaired on odor identification and odor recognition tasks than on odor detection threshold tasks. In addition PD patients are more impaired on detection thresholds than AD patients. These results suggest that PD patients are more impaired on low-level perceptual olfactory tasks, while AD patients are more impaired on higher-order olfactory tasks relying on specific cognitive processes such as long-term memory. However, the effect appears to be much more pronounced for AD, while much less so for PD which appears to affect olfactory function homogeneously over different tests.

Conclusions: Results suggest that odor detection threshold tests may represent the best screening tools to differentiate AD from PD patients when examining olfaction. Odor identification and recognition tests, in turn, may help differentiate AD and PD from normal olfactory age-related decline.

Correspondence: *Shady Rahayel, Université du Québec à Montréal, 2840, rue Louis-Veuillot, Montreal, QC H1N 2P6, Canada. E-mail: shady.rahayel@gmail.com*

J.R. SADEK, J.C. ADAIR & K.Y. HAALAND. Behavioral Problems and Depression Symptoms Are Not Associated with Performance-Based IADLs in Dementia.

Objective: Studies of behavioral disturbance in dementia with such instruments as the Neuropsychiatric Inventory (NPI) indicate significant association between NPI symptom severity and cognitive impairment. Increased behavioral problems are associated with cognitive impairment. The relationship between psychiatric symptoms and functional impairment is not well studied. Bouwens et al. (2008) found little correlation ($r=.19$) between NPI scores and performance-based tasks of daily living, while Rasovska & Rektorova (2011) found modest correlations between the NPI and caregiver reported IADLs ($r=-.36$). Because both functional impairment and behavioral disturbance contribute to caregiver burden, it is important to understand the relationship between them.

Participants and Methods: This study included 20 healthy controls and 20 demographically matched patients with mild to moderate dementia (mean MMSE = 20.6, SD=3.9). Participants were administered a performance-based battery of everyday functioning and a neuropsychological battery. Caregivers were interviewed with the NPI, and the patients and caregivers completed the Geriatric Depression Scale for the patient's depressive symptoms.

Results: Neither the NPI Frequency/Severity index nor the Caregiver Stress index correlated significantly with everyday functioning ($r=.08$ and $r=.16$, respectively). Patient and caregiver rated symptoms of the patient's depression also were not significantly associated with everyday functioning ($r=.22$ and $r=0.05$, respectively). The average T-score from the neuropsychological battery was strongly associated with everyday functioning ($r=.76$).

Conclusions: Our data suggest that in mild to moderate dementia, performance-based measurement of everyday functioning is not associated with depressive symptoms or behavioral disturbance. This is in contrast to some previous findings and support the hypothesis that cognitive and IADL impairment are separate entities from behavioral and mood disturbances in dementia.

Correspondence: *Joseph R. Sadek, Ph.D., Psychiatry, University of New Mexico, 1501 San Pedro Dr. SE, Mail code 116, Albuquerque, NM 87108. E-mail: jsadek@unm.edu*

G. SANTORELLI, A. SAPERSTEIN, J. HELCER, J.M. FISZDON, M.D. BELL, P. KIRWIN, C.H. VAN DYCK, A. MEDALIA, M. RIVERA MINDT & J. CHOI. Hopelessness and Defeatist Beliefs as Predictors of Poor Cognitive Remediation Outcome in Elderly Patients Diagnosed with Alzheimer's Disease.

Objective: Feelings of hopelessness in geriatric patients with dementia seem uniquely derived from being prone to experiences of a shortened time perspective and awareness of life's finitude. Hopelessness in this population is often manifested through ideational disturbances, such as self-depreciative thoughts and defeatist beliefs for treatment. Such perceptions may hinder participant engagement and response to cognitive remediation (CR), which relies partially on motivation for the training tasks. This study examined hopelessness and defeatist beliefs in patients with Alzheimer's disease (AD) enrolled in a computer-based memory training program. We hypothesized that higher baseline ratings of hopelessness would be related to lower baseline expectations of success for training and eventually less cognitive improvement following the CR intervention.

Participants and Methods: Participants included 39 patients (age: $M=69$; $SD=9.24$) with early AD.

Results: Self-reports of hopelessness (i.e., *Cornell Scale for Depression in Dementia; CSDD*) were negatively associated with expectations of success (i.e., *Perceived Competency Scale [PCS]*; $r=-.48$, $p<.05$) at baseline. Further, while CSDD hopelessness scores were also correlated with

the amount of pre-post improvement in memory performance on the *Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog; $r=.39$, $p<.05$)*, a multiple regression revealed that only PCS expectations of success ($\beta =.37$, $p=.04$) significantly predicted cognitive outcome at post-treatment, even after accounting for the significant covariates of baseline memory ability, dementia symptoms, and geriatric depressive symptoms.

Conclusions: This study is the first to examine the relationship between hopelessness, expectations of success, and cognitive outcome following CR in this population. Findings suggest that hopelessness and poor expectations of success are limiting factors in CR for AD, and that treatment benefits may be enhanced if such programs also focus on expectations of success for treatment.

Correspondence: *Gennarina Santorelli, B.S., New York State Psychiatric Institute, Columbia University Medical Center, 1051 Riverside Drive, New York, NY 10032. E-mail: gds2117@columbia.edu*

M.A. SEDO & S.I. NAVARRO. Five-Minute Digital Stroop of Alzheimer's Patients: Time and Error Scores.

Objective: This study validates on older subjects a language-independent digital alternative to the Stroop (DS) which is based on decoding five digits and recognizing quantities of one to five signs. Serial responses recombine five digit-words into 50-word "pseudo-sentences" that lack any kind of semantic or syntactic structure; and these "pseudo-sentences" are repeated in situations of increasing complexity (from simple automatic naming to prefrontal inhibiting and shifting). Since asymmetry and kurtosis of the DS are some 6 times higher than those of the Stroop, this should increase enormously the distance between healthy and clinical scores.

Participants and Methods: 36 illiterate Alzheimer patients over age 70 from the Santoyanni Hospital in Buenos Aires and 20 healthy illiterates in a recreational program were compared as to their DS, MMSE and CGE scores.

Results: Slower times and the presence of errors discriminated both groups beyond .01; and correlated beyond .01 with the CGE and MMSE.

Conclusions: This 5-minute Stroop test predicts Alzheimer's disease. Unhappily, clinicians never measure errors in shifting, as commercial forms of the SCWT do not yet score for errors (!!!!)

Correspondence: *Manuel A. Sedo, Ph.D., Test creation, UniLingual-Testing, 9 Ingleside Rd., Natick, MA 01760. E-mail: manuel@sedo.net*

G.T. VALLET, C. HUDON, M. SIMARD & R. VERSACE. When Patients with Alzheimer's Disease Do not Show Perceptual Priming Effects: Insight from the Cross-Modal Priming Paradigm.

Objective: If a disconnection syndrome characterizes Alzheimer's disease -AD- (Delbeuck et al., 2003), perceptual priming effects involving interaction between brain areas should be impaired. The aim of this study is to test a perceptual cross-modal priming paradigm in AD.

Participants and Methods: Thirty-four patients with mild AD and 34 matched healthy elderly (HE) took part in two cross-modal priming (auditory to visual) experiments. Experiment 1 ($n=18$ per group) was a long-term priming paradigm (two phases) and Experiment 2 ($n=16$) a short-term priming paradigm. Familiar bimodal objects (sound-photograph) were used. Half of the sound primes were presented with a visual meaningless mask (masked condition). Participants had to categorize the picture targets into animals or artefacts. The semantic congruency was manipulated (Exp. 2).

Results: The ANOVAs on the latencies showed an interaction between the group and the item-type (Exp. 1 and 2). The HE presented a significant priming effect for unmasked primes, but no priming effect for masked primes (Exp. 1 and 2). In Exp. 2, the mask slowed down the categorization in the semantic congruent condition, but accelerated the categorization in the semantic incongruent condition. The AD patients showed no significant effect (Exp. 1 and 2).

Conclusions: The mask interference in the HE demonstrates the perceptual nature of the cross-modal priming and thus of knowledge (Vallet et al., 2011). The lack of priming effect in AD for perceptual priming suggests that only repetition priming may be preserved in AD. These results illustrate the disconnection syndrome in AD and support sensory-dependent approach of memory in HE.

Correspondence: *Guillaume T. Vallet, MPs, School of psychology, Laval University, 2325 rue des Bibliothèques, Pav. Felix Antoine-Savard (1518), Quebec City, QC G1V0A6, Canada. E-mail: guillaume.vallet.1@ulaval.ca*

S.C. VICK, K. POLLARD & C. MANNING. Predicting Depression in Older Adults Based on Cognitive Status.

Objective: Depression and memory difficulties frequently co-occur in dementia. While the direction of this relationship remains equivocal, depression is theorized to increase as cognitive decline worsens. However, limited insight during the severe stage of cognitive impairment may result in decreased reports of depressive symptoms. This study examined whether cognitive status predicted level of depression in older adults with memory loss.

Participants and Methods: Participants (N=253; 141 females) were community-dwelling adults from 53 to 89 years old (M=75.56; SD=6.74) who received neuropsychological assessment at a memory disorders clinic. Adults were primarily Caucasian (90%) and well educated (M=14.12 years of education). Based on neurological evaluation, 148 participants were diagnosed with Mild Cognitive Impairment and 105 with probable or possible Alzheimer's Disease. As part of full neuropsychological testing, participants completed the Geriatric Depression Scale (GDS) and the Mattis Dementia Rating Scale, second edition (DRS-2).

Results: While results were not significant when a curvilinear regression model was applied, a linear regression analysis revealed that increased cognitive impairment (i.e., lower DRS-2 total score) predicted more depression (i.e., higher GDS total score), $p < .05$. Cognitive status accounted for 1.8% of the variance in depressive symptoms.

Conclusions: This supports the theory that depression worsens with increased cognitive impairment. The relationship between insight and depression is unclear as our findings suggest that depression is more prevalent as dementia increases. Recognition and treatment of depression even in late stages of memory loss is critical in order to minimize excess cognitive disability that may be exacerbated by depression.

Correspondence: *Stephanie C. Vick, M.A., University of Virginia, 310 E. Spencer St. #1, Culpeper, VA 22701. E-mail: scv3q@virginia.edu*

J.L. WOODARD, M. SEIDENBERG, K.A. NIELSON, M.A. SUGARMAN, J. SMITH, S. DURGERIAN, A.M. BUTTS, M.A. LANCASTER, M.K. FOSTER, N.C. HANTKE, M.A. MATTHEWS & S.M. RAO. Measures of Episodic Forgetting Complement Structural and Functional MRI for Detection of Cognitive Decline in Apolipoprotein E $\epsilon 4$ Carriers.

Objective: Apolipoprotein E (APOE) $\epsilon 4$ allele carriers demonstrate greater risk for cognitive decline and Alzheimer's disease than non-carriers. However, factors associated with risk of decline among APOE $\epsilon 4$ carriers are not well-known. In this longitudinal study, we investigated whether discrete aspects of baseline episodic memory performance and structural (sMRI) and functional (fMRI) magnetic resonance imaging were associated with cognitive decline in older APOE $\epsilon 4$ carriers and non-carriers.

Participants and Methods: Seventy-eight healthy older adults underwent cognitive testing at baseline and after 18 months, baseline serum APOE genotyping, manually-traced hippocampal volume measurement from sMRI, and task-activated fMRI. Cognitive decline was defined as a one SD or greater reduction from baseline on at least one of three cognitive measures at follow-up (Rey Auditory Verbal Learning Test [AVLT] Delayed Recall and Trials 1-5 Sum, Mattis Dementia Rating Scale-2 Total Score).

Results: Declining APOE $\epsilon 4$ carriers (n=14) exhibited reduced hippocampal volume ($p < .009$) and fMRI semantic processing activity in

cortical ($p < .04$) and hippocampal ($p < .05$) regions relative to stable carriers (n=12). On the AVLT, declining APOE $\epsilon 4$ carriers showed greater baseline susceptibility to retroactive interference ($p < .006$), intertrial forgetting (lost access; $p < .001$) and recognition false alarms ($p < .05$) compared to stable carriers. Stable (n=39) non-carriers showed slightly more susceptibility to proactive interference than declining (n=13) non-carriers ($p < .02$).

Conclusions: Along with sMRI and fMRI, AVLT measures of rapid forgetting can help to identify APOE $\epsilon 4$ carriers with elevated risk for cognitive decline. These effects appear to be largely unique for APOE $\epsilon 4$ carriers, perhaps due to preclinical structural and functional alterations in structures subserving memory.

Correspondence: *John L. Woodard, Ph.D., Psychology, Wayne State University, 5057 Woodward Ave., 7th Floor, Detroit, MI 48202. E-mail: john.woodard@wayne.edu*

C.W. YEATMAN, S.A. ROGERS & D.A. LOWE. Does Gender Buffer Against Visuospatial Decline?

Objective: Previous research has determined that men tend to perform better than women on visuospatial tasks, whereas women tend to integrate the functions of their two hemispheres better than men.

Keeping these differences in mind, research examining visual memory in Alzheimer's disease has found that gender might be a modulating factor in the cognitive manifestation of Alzheimer's disease.

This study seeks to explore the impact of gender on cross-sectional and longitudinal changes in visuospatial functioning, with attention to diagnostic categories.

Participants and Methods: Longitudinal data was collected from 73 older adults (ages 49-99; 19 men, 54 women) on two sessions separated by at least one year

WAIS-III Performance IQ (PIQ), Picture Completion, Digit Symbol, & Block Design; Trailmaking A & B; WMS-III Visual Reproduction I & II (VR I & II); and Rey Osterreith Complex Figure (ROCF) Copy, 3', & 30' delays.

Results: At time 1, t-test analyses that did not consider diagnostic categories showed no significant differences in visuospatial functioning between men and women. However, when participants were divided into diagnostic categories, several significant differences emerged.

There were significant differences in WAIS-III PIQ and Block Design between men and women who met criteria for normal aging, $t(43) = 2.19$ and 2.05 , $ps < .05$, respectively.

There was also a trend toward men performing better than women on ROCF 3' and 30' delays, $ps < .06$.

Conclusions: These results suggest that the visuospatial performance of older adults within distinct diagnostic categories may differ between men and women in terms of visuospatial performance over time.

This suggests that men have an advantage in visuospatial functioning when they are experiencing normal aging, but this benefit seems to disappear with the onset of MCI.

The second major finding demonstrates how gender may impact changes in visuospatial performance over time.

Correspondence: *Chase W. Yeatman, westmont college, 955 la paz road, Santa Barbara, CA 93108. E-mail: Cyeatman@westmont.edu*

J.C. YOUNG, A.M. RACH, E.M. CROUSE & P.W. HELMER. Differentiation of Alzheimer's Dementia versus Vascular Dementia Using the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS).

Objective: Within dementia evaluations, the RBANS is popular screening instrument as it samples multiple domains and has a brief administration time. To date, limited research has examined performance differences between individuals diagnosed with Alzheimer's dementia (AD) and those with vascular dementia (VaD). The purpose of the current investigation was to develop a logistic regression formula to predict diagnostic group membership.

Participants and Methods: Archival data were collected from 179 veterans administered the RBANS during a comprehensive neuropsychological evaluation and diagnosed with either AD ($n = 112$) or VaD ($n = 67$). The AD group was significantly older (AD = 77.7 years, VaD = 72.4 years) and had a lower mean MMSE score (AD = 20.0, VaD = 22.2). Groups did not significantly differ in education.

Results: The AD group performed significantly worse ($p < .001$) on RBANS List Learning, Story Memory, List Recall, List Recognition, Story Recall, and Figure Recall subtests. Performance on the Immediate Memory and Delayed Memory domains, as well as Total Index Score, was lower in the AD group ($p < .001$). Forward stepwise logistical regression retained List Learning, Figure Copy, Semantic Fluency, Story Recall, and Figure Recall subtest scores and effectively differentiated between dementia subtypes ($\chi^2 = 86.86$, $p < .001$). Overall model prediction accuracy was 82.1% (AD = 89.3%, VaD = 70.1%).

Conclusions: The current investigation developed an empirically-derived formula that outperforms individual subtest and domain scores in the prediction of DAT and VaD. Additional results and implications will be presented.

Correspondence: *John C. Young, Ph.D., Memphis VAMC, 1031 Jefferson Ave, Memphis, TN 38104. E-mail: cyoungphd@gmail.com*

Dementia (Subcortical, Specific Disorders, MCI, etc.)

J.C. YOUNG, B.L. ROPER & A.G. DOWD. Characterization of Primary Progressive Aphasia Variants with the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): A Case Series Report.

Objective: Three variants of Primary Progressive Aphasia have been characterized based upon distinct neuropsychological, anatomical, and histological changes. Semantic Dementia (SD), Progressive Nonfluent Aphasia (PNFA), and Logopenic Progressive Aphasia (LPA) are differentiated based upon patterns of preserved or impaired speech fluency, semantic knowledge, verbal repetition, and use of grammar/syntax. The RBANS is a well-validated cognitive screening battery that has displayed sensitivity to neurodegenerative syndromes, including Alzheimer's disease, Parkinson's disease, and Huntington's disease. Despite the frequency with which the RBANS is used in adult and geriatric evaluations, we are not aware of any report of RBANS performance patterns in individuals with variants of PPA.

Participants and Methods: The current case series describes 3 individuals administered the RBANS within the context of a neuropsychological evaluation and diagnosed with PPA (SD=1, LPA=1, PNFA=1).

Results: Testing revealed subtle yet distinct performance differences on multiple RBANS subtests, including Picture Naming, Semantic Fluency, Digit Span, and List Recognition. The Language Index was also substantially lower than the Visuospatial/Constructional Index in all patients.

Conclusions: While differential diagnosis requires additional language assessment, the RBANS appears useful in the assessment of PPA and in distinguishing it from primary dementias. Neuroimaging correlates and additional impressions will be presented.

Correspondence: *John C. Young, Ph.D., Memphis VAMC, 1031 Jefferson Ave, Memphis, TN 38104. E-mail: cyoungphd@gmail.com*

D.A. NATION, L. DELANO-WOOD, A.J. JAK & M.W. BONDI. Pulse Pressure Predicts Cognitive and Functional Decline in Mild Cognitive Impairment.

Objective: Pulse pressure (PP) elevation has been associated with decline in executive and lexical-semantic retrieval abilities, increased subcortical white matter lesions, and increased risk of dementia in older adults. Recent clinical trials have focused on the secondary prevention of dementia in patients with mild cognitive impairment (MCI) through

aggressive control of vascular risk factors. This underscores the importance of understanding the relationship between PP and the risk of conversion to dementia in patients with MCI. The present study sought to examine the relationship between PP and both cognitive and functional decline in older adults with MCI.

Participants and Methods: Twenty-five older adults diagnosed with MCI underwent blood pressure assessment and neuropsychological testing. Multiple linear regression was used to examine the relationship between PP (systolic blood pressure – diastolic blood pressure) and measures of executive function (D-KEFS Trail Making, Sorting, Color-Word Interference), lexical-semantic retrieval (Boston Naming Test, D-KEFS Verbal fluency) and independent functioning (Independent Living Scales of Health and Safety and Money Management) after controlling for age, gender, and education.

Results: MCI patients with elevated PP exhibited reduced performance on executive functioning, lexical-semantic retrieval measures, and independent living scales after controlling for all covariates.

Conclusions: Findings indicate that PP elevation may convey added risk of dementia in patients with MCI, including more severe cognitive impairment and decline in independent functioning. These results highlight the importance of addressing vascular risk factors in individuals with MCI. Correspondence: *Daniel A. Nation, Ph.D., Psychiatry, University of California San Diego, School of Medicine, 3350 La Jolla Village Dr., 151B, San Diego, CA 92161. E-mail: dnation@ucsd.edu*

N. SUN, D.A. NATION, L. DELANO-WOOD, A.J. JAK & M.W. BONDI. Qualitative Aspects of Semantic Fluency in Amnesic and Nonamnesic MCI.

Objective: Semantic fluency impairment has been reported in mild cognitive impairment (MCI). Cognitive models indicate that semantic fluency performance is influenced by two distinct cognitive processes, semantic memory (cluster size) and retrieval function (switching). To examine whether qualitative measures identify distinct mechanisms of impairment, we compared patients with amnesic and nonamnesic MCI on qualitative aspects of semantic fluency performance. We hypothesized that amnesics would exhibit greater semantic memory impairment and that nonamnesics would show reduced retrieval functions.

Participants and Methods: Thirty-three MCI patients (12 amnesic; 21 nonamnesic) were compared on quantitative and qualitative measures from two semantic fluency tests (Animals and Supermarket Items) using T-tests. Performance indices included total score, switching, clustering, and errors.

Results: Although groups did not differ in total score on either measure, amnesics exhibited significantly smaller cluster sizes, reduced response association, and increased repetitions on Animal fluency. There was also a nonsignificant trend toward a reduced number of Supermarket subcategories in the amnesics. Switching did not significantly distinguish the groups, but there was a nonsignificant trend toward fewer Animal fluency switches in nonamnesics.

Conclusions: Findings provide support for qualitative distinctions in semantic fluency performance between amnesics and nonamnesics. Specifically, amnesic patients showed a pattern of performance indicative of semantic memory loss (fewer subcategories, smaller clusters, reduced response association, increased repetitions) and non-amnesic patients exhibited a tendency toward retrieval dysfunction (trend toward fewer switches). Findings suggest qualitative measures distinguish different mechanisms of semantic fluency impairment even in patient groups with equivalent total scores, providing greater test sensitivity and implicating distinct neural system involvement.

Correspondence: *Daniel A. Nation, Ph.D., Psychiatry, University of California San Diego, School of Medicine, 3350 La Jolla Village Dr., 151B, San Diego, CA 92161. E-mail: dnation@ucsd.edu*

E. HERNANDEZ, C. HERNANDEZ-GIL, P. VELASCO, J. ROJO, E. CHINEA, A. NIETO & J. BARROSO. Behavioral Variant Ftd and Phenocopy: A Neuropsychological Differentiation in Early Stages. Objective: Behavioral-variant Frontotemporal Dementia (bvFTD) is characterized by behavioral and cognitive progressive deterioration. Cer-

tain patients, initially diagnosed as bvFTD, do not present a clear clinical progression as it would be expected in a degenerative disease. The term Phenocopy has been proposed for these cases. Our aim was to study differences in the initial neuropsychological profile between bvFTD patients and Phenocopy, in order to facilitate differential diagnosis at early stages.

Participants and Methods: We performed a retrospective analysis of patients initially diagnosed of possible bvFTD at Hospital Universitario de Canarias to select those whose symptoms did not show progression within 3 years. Three patients were identified (age range 56-72 years). We also selected 3 patients whose symptoms progressed in the same age range. The following instruments were used: MMSE; Digits span (WMS-R); CVLT and Visual Reproduction (WMS-III) and COWAT. Raw scores were transformed into z scores using normative data. Z-scores equal or below -2 were considered as impaired.

Results: Related to the Phenocopy group, no impaired performance was observed in any test, with the exception of only a measure of one subject (CVLT Recognition). By contrast, all patients of bvFTD group showed impaired performance in the MMSE (<24), in the short-term recall of CVLT ($x=-3.07$) and long-term recall of Visual Reproduction ($x=-2.89$). In addition, 2 out of 3 patients bvFTD also presented alterations in CVLT: learning curve ($x=-3.60$), cued short-term recall ($x=-2.85$) and long-term recall (free: $x=-2.78$; cued: $x=-2.51$).

Conclusions: The results of this preliminary study suggest that patients who at early-stages present a profile compatible with bvFTD characterized by behavioural disorders and preservation of cognitive functions, or only mild cognitive impairment, could be considered as potential Phenocopies. In our sample, the measures which better discriminate bvFTD from Phenocopy group are verbal and visual short-term recall.

Correspondence: *Jose Barroso, Psychology; Psychobiology; Universidad de La Laguna, Facultad de Psicología, Campus de Guajara, La Laguna 38205, Spain. E-mail: jbarroso@ull.es*

J. BERTRAND, R.B. POSTUMA, D. GÉNIEUR-MARCHAND & J. GAGNON. Color discrimination and cognitive impairment in Parkinson's disease.

Objective: Cognitive impairment, characterized by attention, executive, episodic memory and visuo-spatial dysfunctions, is an important non-motor manifestation of Parkinson's disease (PD). Color discrimination deficits are also widely reported in PD using the Farnsworth-Munsell 100 hue test (FM-100). However, the pathophysiology of this dysfunction remains poorly understood (retinal structure changes versus contribution of cognitive impairment). We conducted a study to determine the contribution of cognitive impairment to color discrimination in PD.

Participants and Methods: Sixty-six PD patients without dementia, including 35 PD patients with mild cognitive impairment (MCI), and 20 healthy controls performed the FM-100 combined with a comprehensive neuropsychological evaluation. The diagnosis of MCI was determined using standard criteria. One-way analysis of covariance, with age taken as a covariant, was performed to compare the groups (PD with MCI, PD without cognitive impairment and controls). In the PD group, linear regressions were done, controlling for gender differences, between the performances at the FM-100 and neuropsychological measures.

Results: PD patients with MCI performed poorly at the FM-100 compared to PD patients without cognitive impairment and controls ($p = 0.001$). Performances between PD patients without cognitive impairment and controls were comparable. In PD, the performances at the FM-100 correlated with measures of executive functions and visuo-spatial abilities ($p < 0.006$).

Conclusions: Our results suggest that the color discrimination deficits in PD are strongly related to cognitive impairment. This study was supported by the CIHR and the FRSQ.

Correspondence: *Josie-Anne Bertrand, Psychology; Université de Montréal, 90 Vincent d'Indy, Montréal, QC H2V 2S9, Canada. E-mail: jo_030@hotmail.com*

J. BERTRAND, R.B. POSTUMA, J. MONTPLAISIR, C. DES-JARDINS, M. VENDETTE, S. RIOS ROMENETS, M. PANISSET & J. GAGNON. Risk of dementia in Parkinson's disease with rapid eye movement sleep behavior disorder.

Objective: Non-motor manifestations such as cognitive impairments and sleep disturbances are widely reported in Parkinson's disease (PD). Rapid eye movement (REM) sleep behavior disorder (RBD) is a parasomnia in which patients apparently "act out" the content of their dreams as a consequence of the loss of REM sleep muscle atonia. RBD affects approximately 40-50% of PD patients. The presence of RBD in PD is associated with a more pronounced cognitive decline. We conducted a prospective follow-up study of a cohort of PD patients to assess if the presence of RBD at baseline predicted future development of dementia.

Participants and Methods: Forty-two PD patients without dementia, including 27 patients with RBD and 15 patients without RBD, were studied. All had a polysomnographic recording at baseline and a comprehensive neuropsychological evaluation at baseline and at follow-up. The diagnosis of dementia was given by consensus between a neuropsychologist and a neurologist according to Movement Disorder Society dementia criteria. Fisher's exact test was used to compare the proportion of PD patients with dementia between the groups at follow-up.

Results: Over a mean 4-year follow-up, 48% (13/27) of PD patients with RBD at baseline developed dementia compared to none of PD patients without RBD ($p < 0.001$).

Conclusions: This suggests that RBD is an important risk factor for dementia in PD. This study was supported by the CIHR and the FRSQ. Correspondence: *Josie-Anne Bertrand, Psychology; Université de Montréal, 90 Vincent d'Indy, Montréal, QC H2V 2S9, Canada. E-mail: jo_030@hotmail.com*

C.L. BURROWS, D.A. NATION, S. GOLSHAN, A.J. JAK & M.W. BONDI. Is Subjective Memory Complaint Related to Cognitive Deficits in Mild Cognitive Impairment?

Objective: Many studies suggest that subjective memory (SM) ratings correlate with depression. However, the Subjective Memory Rating Scale (SMRS) has been validated in one large study (Wang et al., 2004) with high ratings on the SMRS associated with cognitive decline. The current study examined whether SMRS ratings are elevated in those with Mild Cognitive Impairment (MCI), and whether these ratings are related to objective cognitive impairment in amnesic MCI and nonamnesic MCI subtypes.

Participants and Methods: Participants were 99 community dwelling adults, aged 48 to 93, who were enrolled in a larger study of normal aging and deemed cognitively normal (NC $n = 53$) or diagnosed with MCI (amnesic MCI $n = 20$, nonamnesic MCI $n = 26$). Participants underwent comprehensive neuropsychological testing and medical evaluation to reach a consensus diagnosis based on comprehensive criteria for subtype classification. The Geriatric Depression Scale (GDS) was also completed.

Results: SMRS ratings in the amnesic MCI group were significantly higher than NC and nonamnesic MCI ratings, although SMRS ratings did not differ between NC and nonamnesic MCI groups. SMRS scores were modestly correlated with depression ratings. Groups did not differ significantly on age, education or presence of an APOE $\epsilon 4$ allele. SMRS did not predict performance on neuropsychological tests of memory or executive functioning in the overall MCI group. The SMRS was a significant predictor of MCI subtype in logistic regression analyses.

Conclusions: Wang et al. demonstrated cognitive deficits associated with high ratings on the SMRS. Our findings suggest that even moderate ratings on the SMRS are related to cognitive status, despite lack of direct association with cognitive measures. Given variability in the association of SM complaints and objective memory performance by MCI subtype, caution is urged in its use as a necessary criterion for the diagnosis of MCI.

Correspondence: *Christina L. Burrows, Ph.D., Veterans Medical Research Foundation, cburrows@vapop.ucsd.edu, 3350 La Jolla Village Dr., San Diego, CA 92161. E-mail: cburrows@vapop.ucsd.edu*

R. BURTON, M.E. O'CONNELL, M. CROSSLEY & D.G. MORGAN. Exploring the Natural History of Mild Cognitive Impairment in a Memory Clinic Sample Using a Multiple Case Report Format.

Objective: Mild cognitive impairment (MCI) is heterogeneous and accompanied by different trajectories. The objective of the present study was to explore the clinical and neuropsychological trajectories for Memory Clinic patients diagnosed with either amnesic or non-amnesic MCI at their initial assessment and followed for three years.

Participants and Methods: Participants were eight patients diagnosed with MCI at the interdisciplinary Rural and Remote Memory Clinic and followed for at least two additional assessments conducted at one-year intervals. Three participants were diagnosed with amnesic MCI (aMCI) single domain, two with aMCI multi-domain, and three with non-amnesic single domain MCI. Using a multiple case report design, longitudinal change in neuropsychological testing profile was examined based on MCI subtype and a clinical assessment of outcome (i.e., stability or progression to dementia over 3 years).

Results: When the 8 MCI patients were examined longitudinally, 3 had converted to dementia by three years. In contrast to patients who remained stable (3 were non-amnesic MCI), all converters had an initial aMCI diagnosis (2 single domain aMCI and 1 multi-domain aMCI). One of the two individuals with aMCI who did not convert at three years did so at their recent four year follow-up assessment. No one neuropsychological test differentiated those who progressed to dementia from those who did not, with the exception of poor initial episodic memory, a criterion of the aMCI diagnosis.

Conclusions: The differential conversion rates for aMCI versus non-aMCI support conceptualizations of aMCI as a separate diagnostic entity (likely preclinical AD) from other forms of MCI.

Correspondence: *Rachel Burton, Psychology, University of Saskatchewan, 202-215 Tait Place, Saskatoon, SK S7H 5L5, Canada. E-mail: rlbarton@ualberta.ca*

M. BUSSE, D. WHITESIDE, C. RENFROW-STARRY, A. SERVICE, J. MISNER & P.D. FITZGERALD. Differentiating Depression and Dementia: An Exploration of Various Measures.

Objective: To date, many studies have compared the neuropsychological profile of patients with dementia and depression, yet findings have been inconsistent and a diagnostic neuropsychological profile has yet to be established (Braaten et al., 2006). This study further explored the area by examining the performance of patients who were diagnosed with depression or dementia on measures of attention, visual/verbal memory, and language.

Participants and Methods: Participants included 43.7% males and 56.3% females, age 18 and over (mean=49.89, SD=14.91). All participants had received a primary diagnosis of dementia (N=81) or depression (N=167) based on a clinical interview, medical history review, and comprehensive neuropsychological evaluation. All raw scores were transformed to z-scores.

Results: Results indicated all measures were significantly different between the two groups ($p < .001$). Dementia patients performed significantly worse on measures of verbal/visual memory and language, whereas patients with depression performed worse on a measure of attention. Receiver Operator Characteristic (ROC) analysis indicated delayed visual memory scores on the Rey Complex Figure Test had acceptable classification accuracy (.71) in distinguishing individuals with dementia from depression, while Trail Making Test A had quite poor classification accuracy (.35). Using an optimal cut-off z-score of -.93 for the RCFT-delay, resulted in sensitivity (SN) of .74 and specificity (SP) of .61. Combining memory measures did not improve classification accuracy.

Conclusions: Results support the use of visual memory measures for assisting in the differential diagnosis of the two disorders.

Correspondence: *Michelle Busse, M.A., Argosy University, Seattle, 1900 Alaskan Way, #409, Seattle, WA 98101. E-mail: michelle.busse@hotmail.com*

B.L. CALLAHAN, M. SIMARD, F. ROUSSEAU, S. POULIN & C. HUDON. The Effect of Depressive Symptoms on Memory for Emotional Word Lists in Older Adults at Risk for Developing Dementia.

Objective: It is often difficult to distinguish between amnesic mild cognitive impairment (aMCI) and late-life depression (LLD), especially in cases of aMCI with comorbid depressive symptoms (aMCI/D+). While these conditions all increase the risk of dementia, differential diagnosis is crucial for accurate prognosis and treatment plans. Finding cognitive profiles specific to each condition is an important research and clinical challenge. This study aimed to elucidate the similarities and differences in cognitive processing of emotional stimuli between aMCI, aMCI/D+ and LLD. We hypothesized that aMCI and healthy subjects would recall more positive than negative and neutral items, while aMCI/D+ and LLD subjects would recall more negative than positive and neutral items.

Participants and Methods: Fifteen aMCI, 14 aMCI/D+, 19 LLD and 25 healthy elderly adults assessed the emotional valence (implicit learning) of 36 words (12 positive, 12 negative, 12 neutral). Explicit recall was tested immediately and after 20 minutes.

Results: The proportion of positive, negative and neutral words was compared between groups using repeated-measures ANOVAs. At immediate and delayed recall, controls, aMCI/D+ and LLD subjects recalled more positive and negative than neutral words, while aMCI patients recalled more positive than negative or neutral words.

Conclusions: In partial support of our hypotheses, aMCI subjects showed a unique pattern of performance which differed from that of all other subjects and which resembled that of Alzheimer's patients reported in the literature. Performance in the aMCI/D+ and LLD groups resembled that of healthy adults, suggesting that mild and/or treated depressive symptoms may not alter normal affective processing. Overall, these findings are among the first to indicate that aMCI and aMCI/D+ present different cognitive profiles (the former being closer to that of Alzheimer's disease and the latter being closer to that of LLD), and raise important questions regarding the pathophysiology underlying each syndrome.

Correspondence: *Brandy L. Callahan, B.A., Psychology, Université Laval, 245 René-Lévesque O., 245 René-Lévesque O., Québec, QC G1R2A7, Canada. E-mail: brandy.callahan.1@ulaval.ca*

H. CHERTKOW, H. BERGMAN, C. BOCTI, W. CHRISTINA, R. MCKELVEY & V. WHITEHEAD. Amnesic Mild Cognitive Impairment in a Memory Clinic: Longitudinal Course and Predictors of Progression.

Objective: To examine the long-term natural history of Mild Cognitive Impairment (MCI) in a North American Memory Clinic, and evaluate differences between those who progress to dementia, and those who do not.

Participants and Methods: Eighty-nine elderly subjects (mean age 74.8 years) referred to a teaching hospital Memory Clinic and meeting criteria for Amnesic MCI (with or without added cognitive deficits), were followed longitudinally up to 10 years since symptom onset. All received detailed clinical, neuropsychological, and genetic assessments, including a detailed evaluation of time of onset of symptoms and MRI volumetrics (in half the cohort).

Results: At end of a mean seven year follow-up period (10 years since symptom onset) 60 subjects had deteriorated to dementia, and 29 had not. Kaplan-Meier curve analysis indicated an s-shaped curve of progression, with a "decline to dementia" rate initially of about 15% of the subjects per year, tapering off after four years. Even up to 10 years after onset of symptoms, 25% of the cohort remained non-demented. Presence or absence of Apo-E4 genotype had minimal impact on progression to dementia over follow-up. Medial temporal lobe atrophy was present in significantly more progressors (56%) compared with non-progressors (7%). Progressors had significantly older age of symptom onset, along with worse delayed verbal memory performance (Logical Memory). Non-progressors did not have more co-morbidities than Progressors.

Conclusions: MCI in the Memory clinic appears heterogeneous but is sometimes a stable diagnosis over the long term. There appears to be a clear clinical subgroup of 1/4 of the subjects who will not deteriorate to dementia over long-term follow-up. Atrophy on MRI was specific, but not sensitive for progression to dementia.

Correspondence: *Howard Chertkow, MD, FRCP, Neurology, Lady Davis Institute, Rm 40S, 3777 Cote Ste. Catherine Road, Montreal, QC H3T1E2, Canada. E-mail: howard.chertkow@mcgill.ca*

H. CHERTKOW, Z. NASREDDINE, N. PHILLIPS, L. LITWIN & V. WHITEHEAD. Low Tech Diagnostic Approach with the MoCA (Montreal Cognitive Assessment) Fails to Distinguish Alzheimer's Disease from Frontotemporal Dementia.

Objective: As new treatments specific for AD and FTD arise, it would be ideal to be able to use simple screening tools like the Montreal Cognitive Assessment (MoCA) in order to clarify diagnostic category. MoCA contains subtests focused on executive function, and others focused on Memory and Orientation. We therefore sought to assess the utility of the MoCA to tease apart Alzheimer's Disease from Frontotemporal dementia cases.

Participants and Methods: 104 subjects (97 AD, 7 FTD by usual clinical criteria) were assessed. Clinical classification after lengthy clinical and neuropsychological assessment in a tertiary Memory Clinic, was considered the gold standard. All were administered the MoCA, which was rescored according to "executive/frontal subtests" vs. "episodic memory (delayed verbal memory, orientation) subtests". The hope was that the FTD individuals would show preferential impairment on the executive/frontal subtests compared to the AD subjects.

Results: The low tech (MoCA) approach did not produce non-overlapping groups. Indeed, the variability of scores among the AD subjects overlapped completely with the distribution of scores for FTD patients.

Conclusions: Analysis of subtests of the MoCA did not allow simple differentiation of cases into AD vs. FTD diagnoses, even utilizing cases that had been fairly distinguishable clinically. This demonstrates the overlap seen in FTD and AD cases when only neuropsychological variables are evaluated.

Correspondence: *Howard Chertkow, MD, FRCP, Neurology, Lady Davis Institute, Rm 40S, 3777 Cote Ste. Catherine Road, Montreal, QC H3T1E2, Canada. E-mail: howard.chertkow@mcgill.ca*

P.M. DEAN, G.E. SMITH, J.E. PARISI, D.W. DENNIS & K.A. JOSEPHS. Distinguishing Characteristics of Cognitive Phenotypes across Frontotemporal Lobar Degeneration (FTLD) TDP-43 subtypes.

Objective: Frontotemporal lobar degeneration (FTLD) is a pathophysiologically heterogeneous neurodegenerative disorder. The most common biochemical abnormality in FTLD is deposition of the protein TDP-43. Distinct atrophy patterns have been identified across TDP types, with type A showing greater frontotemporal and parietal atrophy, type B predominantly anterior temporal lobe, and type C involving posterior frontal lobe. We hypothesized that type A would show greater difficulty with cognitive flexibility, type B difficulty with confrontation naming, and type C slowed cognitive speed.

Participants and Methods: Forty eight subjects, ages 38-87, were identified as part of a larger study of pathologically confirmed FTLD with TDP-43 (FTLD-TDP). Participants were classified into types A, B, or C by two Neuropathologists and a Neurologist. Subjects had completed the Trail Making Test-A & B (TMT) and Boston Naming Test (BNT) as part of their diagnostic neuropsychological battery.

Results: Twenty six subjects were identified as FTLD-TDP 43 type A, 13 as type B, and nine as type C. Non-parametric Kruskal Wallis Test showed overall significance on TMT-A & B and BNT ($p < .05$ respectively). Posthoc independent comparisons revealed Type A performed more poorly on TMT-B compared to types B and C, whereas type C was worse than type B on TMT-A & B. Type B showed focal a deficit on BNT, greater than type A and C.

Conclusions: These findings suggest different cognitive phenotypes across TDP-43 types. Further delineation of subtle differences between TDP-43 subtypes may assist in deciphering trends underlying the various clinical syndromes.

Correspondence: *Pamela M. Dean, Ph.D., Psychiatry and Psychology, Mayo Clinic, 200 First Street SW, Rochester, MN 55905. E-mail: dean.pamela@mayo.edu*

J. TAN, B. SPRINGATE, V. WILLIAMS & G. TREMONT. Physicians' Perceptions of Alcohol-Related Dementia.

Objective: It is important for neuropsychologists to know what referring physicians believe about alcohol-related dementia because of the uncertainty over its conceptualization and diagnosis. The purpose of this study was to gain an understanding of physicians' beliefs and practices regarding this disorder.

Participants and Methods: 136 physicians specializing in neurology, psychiatry, and geriatrics completed an anonymous online survey about alcohol and dementia.

Results: Almost all responders (94%) believed alcohol has direct neurotoxic effects on the brain, but only 23% believed moderate alcohol use is neuroprotective. "Alcohol-related dementia" was the most frequently endorsed diagnostic term, though other terms such as "dementia associated with alcoholism" and "Wernicke-Korsakoff Syndrome" were also used. Frequency and amount of alcohol consumption (lifetime more than current), presence of cognitive impairments, and ruling out of other degenerative disorders were rated as the most important factors to consider when making this diagnosis. Impairments in executive functions, memory, and processing speed were the most frequently observed cognitive changes. Responders were significantly less confident at diagnosing alcohol-related dementia than Alzheimer's disease. Although laboratory workup was not a major diagnostic consideration, 68% of responders recommended vitamins and nutritional supplements as treatment. A minority (3%) encouraged non-drinkers to have moderate amount of alcohol, although responders defined moderate use as ranging from 1-30 drinks per week.

Conclusions: Findings suggest that physicians believe alcohol can have direct neurotoxic effects, but they were highly variable in their diagnostic and treatment approach. Future research should focus on the disconnect between the conceptualization and treatment of alcohol-related dementia, and a comparison to neuropsychologists' beliefs regarding this disorder.

Correspondence: *Jing Ee Tan, PhD, Brown Medical School, 593 Eddy Street, POB 430, Providence, RI 02903. E-mail: jingee.tan@gmail.com*

J.B. FRTUSOVA, H.D. DUNCAN, H. CHERTKOW, Z. NASREDDINE & N.A. PHILLIPS. Logistic Regression Analysis of the MoCA: Which Items Distinguish Normal Aging, Mild Cognitive Impairment, and Alzheimer Disease?

Objective: The Montreal Cognitive Assessment (MoCA) is a 10-minute screening test developed to detect mild cognitive impairment (MCI). Since its publication (Nasreddine et al., 2005), the test has become widely used. The MoCA consists of 12 subtests assessing executive functions, visuospatial abilities, naming, attention, working memory, long-term memory, and orientation. This study evaluated which subtests can distinguish between normal elderly controls (NEC), MCI patients, and Alzheimer disease (AD) patients.

Participants and Methods: The patients (320 MCIs and 94 AD patients) were recruited from the Memory Clinic at the Jewish General Hospital, Montréal, and the NECs (n=158) through our laboratory databases. The data were analyzed using a logistic regression.

Results: A logistic regression conducted on NECs and MCIs, with all subtests entered, correctly classified 82% of NEC and 91% of MCI patients. Trail-making, clock-drawing, delayed recall, digit span, serial 7s, verbal fluency, abstraction and orientation were significant predictors of group membership. A second logistic regression, conducted on MCIs and AD patients, correctly identified 95% of MCI patients and 31% of AD patients, with abstraction and orientation being significant predictors. The MoCA total score of AD patients misclassified as MCI patients was significantly higher ($M=21.8$) than those of correctly identified AD patients ($M=13.9$, $p < .001$), suggesting that AD patients ranged in severity of cognitive impairment.

Conclusions: Overall, the brief items included in the MoCA are effective for distinguishing MCIs from NECs but may be less sensitive for distinguishing between MCI and early AD. In these cases, a full neuropsychological assessment might be warranted. Thus, the MoCA is a valid measure of its objective, which is the identification of people with early cognitive decline.

Correspondence: *Jana B. Frtusova, MA, Concordia University, 7141 Sherbrooke St. W, Montreal, QC H4B 1R6, Canada. E-mail: jana.baranyai@gmail.com*

P. GAUDREAU, J. GAGNON, J. MONTPLAISIR, R. POSTUMA, K. GAGNON & N. GOSSELIN. Abnormal event-related potentials in patients with Parkinson's disease: effects of REM sleep behavior disorder and mild cognitive impairment.

Objective: Parkinson's disease (PD) is known to be frequently associated with co-morbid conditions such as REM sleep behavior disorder (RBD) and mild cognitive impairment (MCI). The aim of this study was to understand the contribution of RBD and MCI to abnormal cerebral functioning in PD using event-related potentials (ERP).

Participants and Methods: 31 non-demented PD patients (age: 63.9±7.0 years; education: 14.6±3.7 years; PD duration: 5.4±3.6 years; H&Y stage, 2.2±0.8) were included. The presence of MCI and RBD were evaluated using neuropsychological testing and polysomnographic recording. For ERP testing, subjects performed a visual attention task in which three types of stimuli were presented (i.e. Standard, Target, and Novel). The amplitude and latency of ERP components (P2, Novel P3 and Target P3) were measured. Statistical analyses were made using ANOVAs with two independent factors (RBD +/-, MCI +/-).

Results: MCI was diagnosed in 11 of 31 subjects and RBD in 16 of 31 subjects. No group differences were found for demographic or clinical variables. A MCI group effect was found for Novel P3 amplitude on Pz: the presence of MCI was associated with a lower amplitude ($p<0.05$). A MCI group effect was also found for Target P3 latency on Cz: MCI patients had a delayed latency compared to patients without MCI ($p<0.01$). No other group effects, including those related to the presence of RBD, were found for ERP components.

Conclusions: Altered ERP in PD were associated with the presence of MCI, but not with that of RBD, suggesting a specific association between abnormal ERP and cognitive deficits in the PD population.

Correspondence: *Pierre-Olivier Gaudreault, University of Montreal, C.P. 612S succursale Centre-Ville, Montréal, QC H3C 3J7, Canada. E-mail: pierre-olivier.gaudreault@umontreal.ca*

D. GÉNIER MARCHAND, J. MONTPLAISIR, J. BERTRAND, R. POSTUMA & J. GAGNON. Frequency of Mild Cognitive Impairment in Rapid Eye Movement Sleep Behavior Disorder.

Objective: Idiopathic rapid eye movement sleep behavior disorder (iRBD) is a parasomnia considered as a risk factor for Parkinson's disease (PD) and dementia with Lewy bodies (DLB). Studies have reported cognitive dysfunctions and mild cognitive impairment (MCI) in iRBD. However, these studies have been performed on relatively small samples of participants. The aim of this study was to investigate the frequency of MCI and the cognitive profile in a large cohort of iRBD patients.

Participants and Methods: Sixty iRBD patients and 60 healthy subjects underwent a comprehensive neuropsychological evaluation. Three cognitive domains were defined: attention/executive functions, episodic verbal memory, and visuospatial abilities. MCI was defined as 1) a subjective cognitive complaint; 2) objective evidence of cognitive decline; and 3) preserved activities of daily living.

Results: The χ^2 test was used to compare the proportion of MCI in each group. Independent-samples t-tests or Mann-Whitney U tests were used for between-group comparisons. Statistical significance was set at $p<0.05$. No between-group differences were found for age, gender or education. MCI was more frequent in iRBD patients than controls (60% versus 15%; $p<0.001$). iRBD patients also performed worse than controls on neuropsychological tests assessing attention/executive and episodic verbal memory.

Conclusions: MCI and poor cognitive performance affecting attention/executive functions and episodic verbal memory are frequent features in iRBD. Prospective studies will allow us to establish how MCI and neuropsychological testing can predict PD or DLB in iRBD. This study was supported by the CIHR and the FRSQ.

Correspondence: *Daphné Génier Marchand, Centre d'Études Avancées en Médecine du Sommeil, Hôpital du Sacré-Coeur de Montréal, 5400, Boulevard Gouin Ouest, Montréal, QC H4J2B7, Canada. E-mail: daphnegeniern@gmail.com*

D. GÉNIER MARCHAND, J. BERTRAND, R. POSTUMA & J. GAGNON. Mild Cognitive Impairment in Parkinson's Disease is associated with Rapid Eye Movement Sleep Behavior Disorder.

Objective: Cognitive impairment and sleep disturbances are common manifestations of Parkinson's disease (PD). Rapid eye movement sleep behavior disorder (RBD) is a parasomnia frequently reported in PD. The presence of RBD in PD is associated to a more pronounced cognitive decline. The aim of this study was to evaluate the frequency of mild cognitive impairment (MCI) in a large cohort of PD patients in association with RBD.

Participants and Methods: Thirty-seven PD patients with RBD (PD-RBD), 37 PD patients without RBD (PD-NoRBD), and 60 healthy controls, underwent a polysomnographic recording and a comprehensive neuropsychological evaluation. Three cognitive domains were defined: attention/executive functions, episodic verbal memory, and visuospatial abilities. MCI was defined as 1) a subjective cognitive complaint; 2) objective evidence of cognitive decline; and 3) preserved activities of daily living.

Results: The χ^2 test was used to compare the proportion of MCI in each group. No between-group differences were found for age and education. The two PD groups did not differ for PD duration, Hoehn and Yahr stage, UPDRS-III scores, and levodopa converted dosage. MCI was more frequent in PD-RBD (68%) than in PD-NoRBD (22%; $p=.000$) or controls (15%; $p=.000$). MCI prevalence did not differ between PD-NoRBD and controls.

Conclusions: In PD, the presence of RBD is an important risk factor for MCI. Prospective studies will allow us to establish if the presence of RBD is a risk factor for the development of dementia in PD. This study was supported by the CIHR and the FRSQ.

Correspondence: *Daphné Génier Marchand, Centre d'Études Avancées en Médecine du Sommeil, Hôpital du Sacré-Coeur de Montréal, 5400, Boulevard Gouin Ouest, Montréal, QC H4J2B7, Canada. E-mail: daphnegeniern@gmail.com*

M. GILLIS & B.M. HAMPSTEAD. The Frontal and Medial Temporal Lobes Contribute Differentially to Temporal Order Memory in Amnesic Mild Cognitive Impairment.

Objective: The ability to remember the order in which events occur has been linked to both frontal and medial temporal lobe (MTL) functioning. Patients with amnesic mild cognitive impairment (aMCI) generally demonstrate medial temporal lobe (MTL) dysfunction/atrophy within the context of relative preservation of frontal/executive abilities. Thus, the current study examined whether the contributions of frontal and MTL processes changed over time and whether they were affected by disease status (aMCI).

Participants and Methods: Thirty-eight healthy elderly controls (HEC) and 32 aMCI completed the Temporal Sequencing Task (TST), which is a novel test that requires the reconstruction of sequences of 3, 4, or 5 line-drawings immediately after presentation and again following a 10-minute delay. Participants also completed a brief neuropsychological battery. Twenty participants from each group underwent structural MRI and the volumes of the hippocampus, amygdala, and inferior lateral ventricles were obtained.

Results: Sequence reproduction was comparable between groups immediately after presentation; however, the HEC outperformed aMCI after the 10-minute delay. The groups made a similar number of errors

for living vs. nonliving items regardless of delay. Within aMCI, TST immediate sequence reproduction was significantly correlated with measures of executive functioning and, to a lesser extent, the RBANS-Delayed Memory Index (DMI) whereas delayed sequencing reproduction correlated significantly with the RBANS-DMI and the volume of the inferior lateral ventricles. HEC performances were unrelated to any neuropsychological or volumetric measure.

Conclusions: Although both the frontal and medial temporal lobes are important for temporal order memory, their contributions appear to differ with time of recall.

Correspondence: *M. Meredith Gillis, M.A., Emory University; 1441 Clifton Road NE, Atlanta, GA 30322. E-mail: mary.m.gillis@emory.edu*

M.E. GOMEZ, D. YEH, A.M. YU, S.S. SHINEY, D.A. MARTINEZ, J. KIM, K.J. MILLER & G.W. SMALL. Reduced Abstract Reasoning and Memory Decline are Strong Predictors for Converting to Mild Cognitive Impairment.

Objective: To characterize those at greatest risk for converting from normal aging to MCI. While cognitive reserve may play a role in delaying cognitive decline, the approach in which to measure this protective factor is still under exploration, including how to best measure cognitive reserve and what is the best predictor of decline.

Participants and Methods: Neuropsychological data was collected on 38 participants at baseline and follow-up within a 2-year period.

Results: Of these 38 participants, 9 converted (24%) from normal cognition to MCI. Gender, age, education, APOE-4 status, ethnicity were not correlated with conversion. However, using a direct hierarchical logistic regression, there was statistical significance for predictors of abstract reasoning skills at time 1 (WAIS-3: Similarities) and decline in memory functioning (time 2 - time 1 on Buschke Selective Reminding Immediate Total Score), $X^2(2, N = 38) = 16.43, p < .001$. Model as a whole explained between 35% (Cox and Snell R square) and 53% (Nagelkerke R squared) of variance in conversion to MCI, and correctly classified 82% of cases. Similarities was positively correlated ($r = .51$) with estimate of IQ (WTAR and AMNART). Abstract reasoning skills at time 1 uniquely accounted for 6% (Nagelkerke R squared) of the variance for those who converted to MCI, and decline in memory functioning uniquely accounted for 37% (Nagelkerke R squared).

Conclusions: Results suggest those with reduced abstract reasoning demonstrating decline on even 1 memory test are at greatest risk for converting from normal aging to MCI within 2 years. This has implications for cognitive screening and better understanding of pre-clinical markers for cognitive decline.

Correspondence: *Megan E. Gomez, M.A., Aging and Memory Research Center, UCLA Semel Institute for Neuroscience and Human Behavior, University of California, Los Angeles, UCLA Longevity Center, Peter V. Ueberroth Building Suite 3119, 10945 Le Conte Avenue, Westwood, CA 90024. E-mail: MeganEGomez@gmail.com*

L. HEIDARIAN, E. ZAMRINI, A. WANG & G.J. CHELUNE. FDG-PET Correlates of Semantic (SF) and Phonemic (PF) Fluency Discrepancies.

Objective: Because Semantic (SF) and Phonemic (PF) fluency are reported to be differentially affected in Alzheimer's (AD) and Frontotemporal (FTD) dementias, we examined whether the Semantic Index [$SI = SF / (SF + PF)$] was differentially related to regional left-hemisphere ^{18}F FDG-PET hypometabolism.

Participants and Methods: 205 patients referred for differential dementia evaluation (age > 55; MMSE > 18) had ^{18}F FDG-PET and neuropsychological testing. ^{18}F FDG-PET stereotaxic surface projection images warped to Talairach space using Neurostat were normalized to pons and standardized against normal controls. A priori consensus ratings identified 2 distinct regions characteristic of AD and FTD patterns of hypometabolism, with 102 subjects showing significant hypometabolism (z -score ≤ -1.64 of normal) in one-or-both regions. Upper and lower terciles of the differences between regions resulted in 2 prototypic groups of 34 subjects. Mayo-Older-Adult-Normative-Study age-adjusted SF and PF were used to calculate SI.

Results: SF was significantly ($p < 0.01$) correlated with both FTD (.328) and AD (.325) composite regions ($n = 205$), whereas PF only correlated with the FTD region (.220); SI ratio only correlated with the AD region (.372). ROC analysis of SI with the prototypic AD and FTD regions ($n = 34$ each) was significant ($p < .031$), and an optimal cutoff of $SI \geq 0.3$ best identified an FTD pattern of hypometabolism ($p < .017$), with a sensitivity of 82.4% and specificity of 44.1%; odds ratio 3.68 and likelihood ratio of 1.47.

Conclusions: Differences between SF and PF are differentially related to regional ^{18}F FDG-PET hypometabolism. While SF and PF discrepancies can inform clinical decision making, they are not sufficiently strong to be used in isolation from other clinical and neuropsychological findings.

Correspondence: *Lahdan Heidarian, University of Utah, 1774 S. Laurelhurst Dr., Salt Lake City, UT 84108. E-mail: lauren.heidarian@hsc.utah.edu*

J. INGLES, R. DARVESH, S. OFFMAN, R. MACAULAY & J. FISK. Semantic Fluency Patterns in Mild Cognitive Impairment, Autopsy-Confirmed Alzheimer's Disease and Healthy Elderly.

Objective: Individuals in early stage Alzheimer's disease (AD) typically generate fewer words in semantic fluency tasks than healthy controls. They may also produce words with different linguistic characteristics (e.g., higher usage frequency, shorter length). Semantic fluency performance has been less well studied in Mild Cognitive Impairment (MCI) (i.e., circumscribed memory loss without dementia), a diagnosis that represents increased risk of developing AD. We examined the total number, usage frequency and length of words produced in a semantic fluency task by individuals with MCI, with autopsy-confirmed AD and with no cognitive impairment (NCI).

Participants and Methods: Thirty-five MCI and 107 NCI cases were drawn from a population-based study. Thirty AD cases, assessed at a mild disease stage, were drawn from a clinical brain bank. Age and education were approximately matched between groups. Total number, mean usage frequency and length of words produced in an animal naming fluency task were compared.

Results: Total number of words produced was lower in the MCI and AD groups compared to the NCI group. Mean usage frequency decreased progressively across groups (AD > MCI > NCI). Mean word length did not differ between groups.

Conclusions: Semantic fluency performance in MCI is similar to that in mild stage, autopsy-confirmed AD. Cognitive decline in MCI therefore extends beyond episodic memory to include subtle semantic dysfunction. Examination of the usage frequency as well as the total number of words produced in semantic fluency tasks may assist in the diagnosis of both MCI and AD.

Correspondence: *Janet Ingles, Ph.D., School of Human Communication Disorders, Dalhousie University, 5599 Fenuick Street, Halifax, NS B3H 1R2, Canada. E-mail: janet.ingles@dal.ca*

T.A. KEARY, C. CONANT, D. FLODEN & C. KUBU. Cardiovascular Risk Factors and Neuropsychological Outcome Following Deep Brain Stimulation (DBS) in the Subthalamic Nucleus (STN).

Objective: Isolated reports suggest that advanced age and/or pre-operative neuropsychological deficits confer greater risk of cognitive decline following STN DBS for Parkinson disease (PD). These putative risk factors may reflect an underlying pathophysiological process such as cardiovascular risk factors (CVRFs).

Participants and Methods: We conducted a retrospective chart review of 44 patients who underwent STN DBS. Dependent variables included measures previously shown to be sensitive to STN DBS including mood, anxiety, executive function, visuospatial, and memory. Repeated measures ANOVAs were conducted with groups defined on the basis of CVRFs (i.e., documented history of hypertension, hyperlipidemia, and/or diabetes mellitus).

Results: Significant main effects of time following DBS were observed, with improvements in mood and anxiety and declines in visuospatial

skills, word fluency and word list learning. There was a significant interaction for word fluency and a trend toward a significant interaction for delayed recall of a word list, with greater declines in patients with CVRFs. Although no other interactions were statistically significant, effect sizes revealed moderate to large effect sizes for time x CVRFs group interactions for word fluency, word list memory, visuospatial skills, and perseveration; CVRFs were associated with greater declines on word fluency and memory measures, and greater declines were observed for visuospatial skills and perseveration among those with no or one CVRF.

Conclusions: These preliminary data suggest CVRFs are associated with greater declines in memory and word fluency following STN DBS. The role of CVRFs in visuospatial skills and perseveration is more complex. The data do not indicate which aspects of STN DBS (e.g., anesthesia, lead insertion, stimulation) are associated with increased risk in patients with CVRFs. Larger prospective studies with appropriate control groups are needed to better identify risk factors associated with neuropsychological morbidity following STN DBS for PD.

Correspondence: *Therese A. Keary, Ph.D., Neurological Institute, Cleveland Clinic, 9500 Euclid Avenue/ P57, Cleveland, OH, OH 44195. E-mail: tamatthe@kent.edu*

M. KRAYBILL, K. POSSIN, R. KETELLE, A. BOSTROM & J. KRAMER. Predicting future cognitive decline in individuals with mild cognitive impairment: The role of executive and everyday functioning.

Objective: A growing literature suggests that many patients with Mild Cognitive Impairment (MCI) have subtle deficits in everyday functioning, but the clinical utility of evaluating these deficits is not well-understood. This study evaluated 1) whether baseline deficits on the Functional Assessment Questionnaire (FAQ) predict subsequent cognitive decline, and 2) the degree to which memory and executive dysfunction contribute to the functional deficits assessed by the FAQ.

Participants and Methods: Participants included 311 subjects with MCI enrolled in a longitudinal study. Mini-Mental State Exam (MMSE) was used to compute a reliable change index identifying subjects with a significant decline after approximately one year and to evaluate the test operating characteristics of the FAQ in identifying decliners. A composite of executive functioning and memory measures was entered into hierarchical regression models to evaluate their relative contributions to FAQ scores.

Results: Endorsing one or more functional problems on the FAQ was sensitive (89.7%) to predicting subsequent cognitive decline but specificity was low (31.7%). Alternatively endorsing six or more items offered better specificity (75.0%; sensitivity: 68.2%). The executive composite score was significantly correlated with FAQ ($p < .001$) and when both memory and executive composites were included in the same model only the executive score predicted FAQ above and beyond age, education, and MMSE, $p < .01$.

Conclusions: Brief screening measures of everyday functioning may help identify individuals with MCI at risk for future cognitive decline. Furthermore, deficits in executive functioning may contribute more than memory to difficulties in everyday functioning.

Correspondence: *Matthew Kraybill, Ph.D., Psychology, San Francisco VA, 4150 Clement Street, San Francisco, CA 94121. E-mail: mkraybill@gmail.com*

A.K. LAMARRE, T. SHANY-UR, S. SHA, W. SEELEY, A. BOXER, J. KRAMER, B. MILLER & K. RANKIN. Objective Social Cognitive Deficits in Fourteen Pathology-Confirmed Patients with Progressive Supranuclear Palsy.

Objective: Despite the clinical and pathological overlap between progressive supranuclear palsy (PSP) and frontotemporal dementia (FTD), few studies have objectively measured whether PSP is associated with early socio-emotional changes.

Participants and Methods: Fourteen consecutive patients with PSP at autopsy, along with a comparison group of 231 older normal con-

trols (NC), were selected from a larger, diagnostically-mixed sample with comprehensive socio-emotional testing at initial presentation. Participants completed the UCSF Cognitive Theory of Mind Test (cToM), measuring cognitive perspective-taking, and tests of emotion sensitivity and cue detection from The Awareness of Social Inference Test (TASIT). Informants rated participants' real-life empathy and social sensitivity using the Interpersonal Reactivity Index (IRI) and Revised Self-Monitoring Scale (RSMS).

Results: Participant scores were standardized to the NC sample, and Z-scores were dichotomized to "preserved" ($Z > -1.30$) and "impaired" ($Z \leq -1.30$). Chi-square analyses revealed PSP patients performed normally on cognitive perspective-taking (75%) and comprehension of sincere, non-emotional social interactions (90%). However, significantly more PSP patients displayed impaired emotion reading (46%) and comprehension of paralinguistic sarcasm (50%) on the TASIT compared to NCs ($p < 0.05$). Correspondingly, informants rated more PSP patients as having impaired empathic concern (50%) and emotional perspective-taking (43%) (IRI), and sensitivity to social-emotional cues (64%) (RSMS).

Conclusions: PSP patients showed objective deficits in socio-emotional cognition and altered real-life social behavior. Cognitive perspective-taking (e.g., ability to identify another's thought content) was preserved, while emotional cue sensitivity was impaired (e.g., emotion identification, inferring intentions from emotional cues). Moreover, informant ratings confirmed PSP patients displayed deficient emotional perspective-taking outside the laboratory setting.

Correspondence: *Amanda K. LaMarre, PhD, Neurology, University of California, San Francisco, 350 Parnassus Avenue, Suite 905, San Francisco, CA 94143-1207. E-mail: alamarre@memory.ucsf.edu*

Y. MANSOOR & J. KRAMER. Alzheimer's Disease and Behavioral Variant Frontotemporal Dementia: Memory Profiles in Pathology-Confirmed Clinical Groups.

Objective: Studies comparing memory performances in clinically diagnosed Alzheimer's disease (AD) and behavioral variant frontotemporal dementia (bvFTD) patients have yielded inconsistent results, partly because antemortem diagnosis is often inaccurate. Our goal was to study memory in patients with pathology-confirmed diagnoses. We hypothesized that path-confirmed AD patients would show a more hippocampal driven performance with rapid forgetting, and bvFTD patients would show a more frontal pattern with more errors and improvement with cues.

Participants and Methods: Subjects were patients whose clinical diagnoses of AD and bvFTD were pathologically confirmed at autopsy. Cognitive data was drawn from baseline visit; all were administered the CVLT-II short form. The sample contained 42 patients with AD (mean age=65.6, education=15.7, MMSE=21.1) and 20 patients with bvFTD (mean age=61.3; education=16.2; MMSE=23.9).

Results: Covarying for age and MMSE score, repeated measures ANOVAs revealed a trial by group interaction, with AD patients displaying less learning and more rapid forgetting than bvFTD [$F(3.8,290) = 7.3, p < 0.001$]. Contrary to our predictions, bvFTD patients benefitted less from cues and committed significantly fewer intrusion errors than AD patients.

Conclusions: Results supported the first hypothesis that path-confirmed AD patients would show more rapid forgetting over a 10-minute delay than bvFTD patients. Our second hypothesis was not supported; bvFTD patients did not show a more "dysexecutive" pattern of performance characterized by benefitting from cues and making more intrusion errors. This study therefore clarifies some of the previously found memory performance inconsistencies and indicates that bvFTD memory impairment may not conform to any specific pattern.

Correspondence: *Yael Mansoor, Pacific Graduate School of Psychology, Palo Alto University, 15350 Amberly Drive, #3022, Tampa, FL 33647. E-mail: ymansoor@paloalto.edu*

S. MARCONE, J. GAGNON, S. LECOMTE, H. IMBEAULT, F. LIMOGES, J. BERTRAND & I. ROULEAU. The Envelope Task: Clinical Sensitivity in the Detection of Prospective Memory Impairment in Normal and Pathological Aging.

Objective: Prospective memory (PM) refers to the ability to accomplish an intention at the appropriate moment in the future. Although rarely used in clinical practice, the envelope task (Huppert et al., 2000) was developed to evaluate the integrity of PM and its components, retrospective (RC) and prospective (PC). The task, simple and rapid to administer, involves initial instruction to write a dictated name and address onto an envelope and then to immediately perform two intended actions—to seal and to write initials on the back of an envelope—following a 10-minute delay. The purpose of this study is to analyze the clinical sensitivity of this instrument in the normal and pathological aging processes, in the hopes of promoting its utility in the healthcare field. **Participants and Methods:** One hundred eighty-five participants were included in this study: 52 Parkinson's disease (PD) patients (27 with mild cognitive impairment (MCI)), 44 idiopathic rapid eye movement sleep behaviour disorder (iRBD) patients (20 with MCI), 40 Alzheimer's disease (AD) patients and 49 healthy controls. In addition to the envelope task, all subjects underwent a systematic neuropsychological assessment. **Results:** None of the healthy controls failed the task: all spontaneously performed at least one of the two actions (PC) and all benefited from prompting, when needed (RC). AD patients proved to be the most deficient, indicated as failure in responding spontaneously (PC: 75%) and after prompting (RC: 50%). Within the combined PD/iRBD patient group, success rate on the PC was of 91% (87/96). Of those who failed, 8/9 benefited from prompting whereas only 1/9 still couldn't recall the specifics of the intended actions. When comparing their performance to healthy controls, significant differences were found only on the PC, particularly when patients had an associated MCI diagnosis ($\chi^2=6.667$, $p < 0.05$).

Conclusions: Although simple, the envelope task appears to be a sensitive clinical instrument for the individual assessment of the specific PM components.

Correspondence: *Sonia Marcone, Doctorate candidate in Neuropsychology, Université de Québec à Montréal (UQAM), 80 Kingsley, Dollard-Des-Ormeaux, QC H9B 2K9, Canada. E-mail: marcone.sonia@courrier.uqam.ca*

J.S. MCGEE, E.J. DARBY, J. BIERNOT & R.S. DOODY. Amnestic MCI, Sleep Disturbance, and Cognitive Functioning.

Objective: While research suggests that sleep is important for cognition and mood these relationships have not been well-examined in people "at risk" for dementia.

Participants and Methods: In this study, 117 individuals (men=57; women=60) with amnestic mild cognitive impairment or amnestic-subthreshold MCI (mean age=72.15 years, SD=8.18 years) received neurological and neuropsychological evaluation.

Results: Participants reported a high degree of sleep disturbance including early morning waking (n=69; 61.1%); snoring/breathing difficulties at night (n=42; 38.5%), initial insomnia (n=36; 32.1%), nightmares (n=16; 14.8%), difficulty staying awake during the day (n=15; 13.5%), and sleep walking (n=1; .9%). Approximately, 80% reported at least one sleep symptom with 50% reporting two or more sleep symptoms. More rapid pre-progression rate was associated with snoring/breathing difficulties at night $r(107)=-.257$, $p < .01$ and having nightmares $r(106)=-.389$, $p < .01$. Delayed recall errors were related to snoring/breathing difficulties at night $r(103)=-.256$, $p < .01$ and day-time sleepiness $r(104)=-.195$, $p < .05$. Word recognition errors were associated with difficulty staying awake during the day $r(103)=-.227$, $p < .05$ and total number of sleep symptoms $r(108)=-.225$, $p < .05$. Activities of daily living were associated with snoring/breathing difficulties at night $r(94)=-.578$, $p < .01$ and nightmares $r(93)=-.665$, $p < .01$. Severity and distress of neuropsychiatric symptoms was related to waking up in the night or early morning waking (NPI Severity: $r(71)=-.31$, $p < .01$; NPI Distress: $r(72)=-.284$, $p < .05$) and number of sleep symptoms (NPI Severity: $r(72)=-.284$, $p < .05$; NPI Distress: $r(72)=-.312$, $p < .01$).

Conclusions: Data suggest that sleep disturbance is common in individuals with amnestic forms of MCI and may impact rate of progression, memory, activities of daily living, and frequency/severity of neuropsychiatric symptoms. A focus on early identification and intervention of sleep disturbance in this population should be emphasized.

Correspondence: *Jocelyn S. McGee, Ph.D., Baylor College of Medicine, 1977 Butler Blvd, Suite E5.101, Houston, TX 77030. E-mail: jmcgee@bcm.edu*

J.L. MICKLEWRIGHT, P.M. DEAN, J. WHITWELL, M.M. MACHULDA, J.R. DUFFY, E. STRAND & K.A. JOSEPHS. Neuropsychological Correlates of Parietal Atrophy in Logopenic Progressive Aphasia.

Objective: Logopenic progressive aphasia (LPA), characterized primarily by profound word finding difficulties and impairments in phrase repetition, is associated with left posterior temporoparietal atrophy and glucose hypometabolism. Despite known parietal lobe involvement, no studies to date have examined visuospatial functioning in this population. We hypothesized that greater parietal lobe atrophy would be associated with poorer performances on measures of basic visuospatial perception and visuospatial planning and construction.

Participants and Methods: Nine adults between the ages of 49-83, recruited through a larger speech and language disorder study, received a consensus diagnosis of LPA by two Speech-Language Pathologists. Participants completed the Rey-Osterrieth Complex Figure Test (Rey-O copy) and cube analysis and incomplete letters subtests of the VOSP battery. We used SPM5 to examine the association between Rey-O and VOSP performances and gray matter volumes.

Results: Seventy-eight percent of participants performed below the average range on the Rey-O. Initial analyses revealed negative correlations between Rey-O performance and gray matter volumes in the left temporal pole and left superior parietal, right inferior frontal, and bilateral occipital lobes ($p < .001$ uncorrected). Only findings within the left superior parietal lobe survived correction for multiple comparisons ($p < .05$, false discovery rate). There was no association between VOSP performances and gray matter volumes.

Conclusions: Individuals with LPA exhibit cognitive changes that extend beyond the language domain. Results suggest that the association between left superior parietal atrophy and Rey-O performances cannot solely be explained by deficits in basic visuospatial processing. Impairments in Rey-O performances may be best explained by compromised higher-order visuospatial planning and organizational skills.

Correspondence: *Jackie L. Micklewright, Ph.D., Department of Psychology, Mayo Clinic, 200 First Street SW, Rochester, MN 55901. E-mail: jmicklewright1@gmail.com*

C.E. MYERSON, H.L. KATZEN & B.E. LEVIN. Expanding the Model of Apathy in Parkinson's Disease: Conceptual Domains and Neuropsychological Correlates.

Objective: Apathy is a debilitating non-motor symptom in Parkinson's disease (PD) that is closely associated with cognitive dysfunction, depression, and caregiver burden. The operational definition of apathy involves a tripartite model including cognitive, behavioral, and emotional manifestations. This theoretical model has not been statistically validated or studied in a PD cohort. We examined the factor structure of apathy in PD, and investigated the associations between apathy factors and demographic, disease, and neuropsychological variables.

Participants and Methods: One hundred forty-one patients with idiopathic PD underwent neurological examination and comprehensive neuropsychological testing including the Apathy Evaluation Scale (AES). Statistical analyses included structural equation modeling, confirmatory factor analysis, item analysis, correlation and regression.

Results: Our findings did not support the previously described tripartite structure of apathy in PD. Rather, three alternative factors were identified: mental engagement, active initiation and participation, and self-perception, with good model fit ($\chi^2 = 72.751$, $df = 70$,

$p = .3876$, CFI/TLI = .997/.997). A significant association was also found between education and the overall apathy construct ($p = .025$), with individuals with lower education demonstrating increased apathy. Further, apathy was associated with executive function ($p = .021$) and visuospatial skills ($p = .038$) after controlling for education and depression.

Conclusions: This study identified an alternative factor structure for apathy in PD suggesting variation in apathy presentation across groups. Our findings support research showing apathy is correlated with specific areas of neuropsychological dysfunction apart from the influence of depression, and also raise questions about education as a protective factor. Apathy remains an important construct in the study of neurodegenerative disease and an apathy assessment should be included as a standard part of a Parkinson's evaluation.

Correspondence: *Connie E. Myerson, Ph.D., Physical Medicine and Rehabilitation, Johns Hopkins University, 1200 S. Conkling St. #313, Baltimore, MD 21224. E-mail: connie.myerson@gmail.com*

A. PAQUIN-MORELLI, J. GAGNON, S. MARCONE & I. ROULEAU. The clinical value of the Clock Drawing Test in the detection of MCI in Parkinson's disease and patient with idiopathic REM sleep disorder.

Objective: The Clock drawing test (CDT) is a simple instrument widely used in clinical practice. Its value in dementia assessment has been repeatedly confirmed. However, many clinicians have questioned its value in the evaluation of patients with mild cognitive impairment (MCI). The objective of the present study was to examine CDT performance in patients with Parkinson's disease (PD) and idiopathic REM sleep behavior disorder (iRBD) a risk factor to develop dementia.

Participants and Methods: The CDT (copy and command conditions) was administered to three groups of participants: 32 patient with MCI (13 PD, 19 iRBD), 23 patients without MCI (12 PD, 11 iRBD) and 28 normal controls along with a detailed neuropsychological evaluation. Drawings were scored by three independent judges blind to diagnosis on a 10-point scale (Rouleau et al, 1992) and an error analysis was performed.

Results: A Group X Condition ANOVA with repeated measure on Condition (command-copy) revealed a significant main effect of Condition, main effect of Group and a Group X Condition interaction. Simple effects revealed that MCI patients' scores in the command condition were significantly lower than those observed in PD and iRBD patients without MCI and control subjects, who did not differ from each other. No differences were observed between the groups in the copy condition. With a cut-off score of 8/10, the specificity was 90.2% and the sensitivity was 28.1%, much lower than what is reported in dementia (Rouleau et al, 2011).

Conclusions: Although the sensitivity of the CDT was low in our sample of MCI patients, it might be higher with other MCI populations and its specificity is high enough to continue using it as a screening tool.

Correspondence: *Isabelle Rouleau, Ph.D., Psychology, Université du Québec à Montréal, CP 8888, succ. centre-ville, Montréal, QC H3C 3PS, Canada. E-mail: rouleau.isabelle@uqam.ca*

L.Q. PARK, D. MUNGAS, C. DECARLI, D. HARVEY & S. FARIAS. Apathy Has Detrimental Effects on Functional Impairment that is Independent of Depression and Cognitive Impairment.

Objective: The functional abilities of older adults are impacted by memory impairments and executive dysfunction. Apathy and depression also contribute to disability, however there is significant overlap in their clinical presentations and few studies account for both of these constructs when studying activities of daily living. The goal of this study was to assess the relative contribution of apathy over and above depression, memory, and executive functioning across different aspects of everyday function.

Participants and Methods: Subjects included 319 older adults (dementia, MCI, or normal cognition). Mean age was 76.01 ± 7.14 and ed-

ucation was 13.25 ± 4.05 . Apathy and depression were measured via the NPI. Neuropsychological variables of Memory and executive functioning were taken from the SENAS. The ECog, assesses Everyday Memory, Language, Visuospatial, Planning, Organization, and Divided Attention. Separate multiple regression analyses were employed using each ECog domain as an outcome; predictors included apathy, NPI depression subscale, SENAS executive functioning, SENAS memory, age, gender and education.

Results: Results from the multiple regression analyses for the entire sample indicated that SENAS memory ($p < .001$) and SENAS executive function scores ($p < .001$), depression ($p < .05$) and apathy ($p < .001$) significantly accounted for 25-32% of the variability across five different domains of daily function (Everyday Language, Everyday Visuospatial, and Everyday Divided Attention, Planning, and Organization). Everyday Memory was only related to depression, apathy, and SENAS memory scores ($p < .001$).

Conclusions: The findings confirm that the deleterious effects of apathy are widespread and affect multiple aspects of daily life. Thus, it is important to acknowledge that symptoms such as indifference, decreased motivation, and reduced initiation are separate from the effects of depression, memory decline, and executive dysfunction.

Correspondence: *Lovingly Q. Park, Ph.D., Department of Neurology, UC Davis Medical Center, 4860 Y Street, Sacramento, CA 95810. E-mail: lovinglyq@gmail.com*

E. PIROGOVSKY, S.P. WOODS, J. FILOTEO, B. BLOOM, G.M. BRUSATI, S. GLUHM, H. HOLDEN & P.E. GILBERT. Prospective Memory Deficits are Associated with Functional Impairment in Parkinson's Disease.

Objective: Prospective memory (ProM), or remembering to perform an intended action at some designated point in the future, is thought to be critical for everyday functioning. Although studies have shown that Parkinson's disease (PD) patients demonstrate impairments in ProM, no study to our knowledge has investigated the relationship between ProM and functional outcomes in PD.

Participants and Methods: PD patients ($n = 33$) were administered laboratory (Memory for Intentions Screening Test; MIST) and self-report (prospective scale from the Prospective and Retrospective Memory Questionnaire; PRMQ) measures of ProM. Participants also were administered measures of everyday function, including 1) self-report measures of instrumental activities of daily living (IADL) and medication management, 2) performance-based measures of medication management and financial skills, and 3) a measure of health-related quality of life (QOL).

Results: Results revealed that deficits on the MIST significantly correlated with poorer performance on performance-based measures of medication management (spearman's rho ($\rho = .45$) and financial capacity ($\rho = .58$), and self-reported medication management ($\rho = .37$). Self-reported ProM declines correlated with self-reported medication management ($\rho = .73$), IADLs ($\rho = .64$), and QOL ($\rho = .66$). Significant relationships were not detected between self-reported ProM and performance-based measures of everyday function.

Conclusions: These findings provide preliminary evidence for the relationship between ProM impairment and difficulties in everyday functioning in PD. Although future studies with larger samples are needed, these results have implications for the clinical assessment of PD and for the development of ProM-based interventions in order to improve everyday functioning in individuals with PD.

Correspondence: *Eva Pirogovsky, MA, Joint Doctoral Program in Clinical Psychology, SDSU/UCSD, 1488 Reed Ave #9, San Diego, CA 92109. E-mail: epirogov@sciences.sdsu.edu*

W. RAMRATAN, L.A. RABIN, C. WANG, M.E. ZIMMERMAN, M.J. KATZ, R.B. LIPTON & H. BUSCHKE. Level of Recall, Retrieval Speed, and Variability on the Cued-Recall Retrieval Speed Task in Amnesic Mild Cognitive Impairment.

Objective: Individuals with amnesic mild cognitive impairment (aMCI) show deficits in level of retrieval on traditional episodic mem-

ory tasks and reductions in speed of performance on reaction time tasks. We used a novel computerized task, the Cued-Recall Retrieval Speed Test (CRRST), to simultaneously measure level and speed of retrieval in a community-based sample of older adults (mean age 80.2 years).

Participants and Methods: In the encoding phase of the CRRST, participants ($n=390$) learned 16 words based on corresponding categorical cues. In the retrieval phase, category cues alone were presented in order to aid in the retrieval of correct responses. We measured accuracy (% correct) and retrieval speed or reaction time (time from cue presentation to voice onset of a correct response) across 6 trials. We compared the trajectory and variation of speed and accuracy over trials between healthy adults and individuals with aMCI and evaluated whether the combination of accuracy and speed would have better discriminative validity than accuracy alone.

Results: Compared to healthy adults ($n=303$), those with aMCI ($n=87$) exhibited poorer performance in retrieval speed (difference = -0.1296 , $p<.0001$) and accuracy on the first trial (difference = -0.188 , $p<.0001$), and their rate of improvement in retrieval speed was slower over subsequent trials. Those with aMCI also had greater within-person variability in processing speed (variance ratio= 1.22 , $p=0.0098$) and greater between-person variability in accuracy (variance ratio= 2.083 , $p=0.0001$) relative to the healthy older adults. ROC analyses, obtained from logistic models adjusted for age, gender, education, and depression, showed that combining speed and accuracy performed better in diagnosing impairment than accuracy alone ($p=0.0118$).

Conclusions: These data suggest that measures of retrieval speed, in addition to measures of level of performance, aid in the detection of aMCI. Future research will determine whether these measures may also improve the prediction of dementia.

Correspondence: *Wendy Ramratan, M.A., Neurology, Albert Einstein College of Medicine, 1165 Morris Park Ave, Rousso Building, Room 343, Bronx, NY 10461. E-mail: wendy.ramratan@einstein.yu.edu*

S.C. SELIGMAN, T. GIOVANNETTI, D.J. LIBON, C. SETER, B.M. BETTCHER, M. IAPIETRO & G. SEIDEL. Cluster Analysis of Error Types on a Test of Everyday Action in Dementia.

Objective: Using variable centered approaches, we have shown that everyday action errors of commission are distinct from errors of omission. Here we use a person-centered approach to examine whether these error types meaningfully distinguish groups of dementia participants. **Participants and Methods:** 142 participants ($M_{age}=78.21$; $M_{edu}=12.36$) with mild-moderate dementia ($M_{MMSE}=22.68$) due to various clinical syndromes (e.g., AD, vascular dementia) were videotaped as they performed the Naturalistic Action Test (NAT), a performance-based test of everyday action. Videotapes were analyzed for various types of errors according to an error taxonomy that includes omission (i.e., steps are never performed) and 4 types of commission errors (i.e., steps are performed incorrectly - perseveration, sequence, etc.). A k-means cluster analysis was conducted on the number of errors from each category to identify groups with homogeneous error profiles. Neuropsychological test data were also analyzed.

Results: A 2-cluster solution converged following 5 iterations. Between-group analyses showed significantly different error distributions ($p<.01$ for all). Group 1's ($n=102$) errors were predominantly commissions ($M_{commission}=64\%$; $M_{omission}=29\%$); whereas Group 2 ($n=40$) showed the opposite error pattern ($M_{commission}=31\%$, $M_{omission}=66\%$). Groups did not differ in age, education, gender distribution, or clinical diagnosis ($p>.22$ for all). Groups did not differ significantly on executive measures (Mental Control, $p=.85$, FAS, $p=.83$, Clock Drawing, $p=.20$), but Group 2, which showed a high proportion of omissions, obtained significantly lower caregiver ratings of functioning ($p<.01$), significantly lower scores on the Boston Naming Test ($p=.02$), and showed a trend for lower scores on tests of episodic memory ($p=.07$).

Conclusions: Groups of dementia participants differ according to their everyday action error profile. Clinical examination of error patterns will meaningfully characterize functional deficits and identify intervention targets for future research.

Correspondence: *Sarah C. Seligman, Psychology, Temple University, 1701 N. 13th Street, 5th Floor Weiss Hall, Philadelphia, PA 19122. E-mail: sarah.seligman@temple.edu*

M. STEPHENS, A.K. LAMARRE, B.L. MILLER & J.H. KRAMER. Does a "Frontal" Memory Pattern Exist? Comparisons Between Behavioral Variant Frontotemporal Dementia and Early Alzheimer's Disease.

Objective: Patients with behavioral variant Frontotemporal Dementia (bvFTD) and Mild Cognitive Impairment due to Alzheimer's disease (MCI/AD; Albert, 2011) are presumed to display different episodic memory profiles. A widely held assumption is that bvFTD patients display inefficient performance on free recall, but show significant improvements with cues and on recognition testing, presumably due to frontally-mediated retrieval deficits; whereas MCI/AD patients have a consolidation deficit and would not show improvement. Despite the appeal of this assumption, there has been little empirical support. The purpose of this study is to investigate differences between bvFTD and MCI/AD on delayed cued recall and recognition memory.

Participants and Methods: We studied 25 bvFTD (age: 60.7, MMSE: 27.3) and 56 MCI/AD (age: 69.2; MMSE= 26.7) patients with mild disease (CDR=0.5). Participants were administered the CVLT-II-SF as a part of a comprehensive neuropsychological battery.

Results: Hypotheses were tested using general linear model controlling for age, gender, and education. When comparing free recall and cued recall, there was no diagnosis by trial interaction ($p>0.44$): both groups improved by approximately 1 point. Similarly, when comparing free recall and recognition discriminability, the diagnosis by trial interaction was not significant ($p>.23$). BvFTD patients displayed a more liberal response bias on recognition ($p=.029$), reflecting a stronger propensity to endorse both targets and distracters.

Conclusions: Results offer no empirical support for the idea that frontal patients have retrieval deficits that are mitigated by cues and recognition testing. In contrast, bvFTD patients differed from MCI/AD on a signal detection parameter, consistent with other reports linking a liberal response bias with the frontal lobes.

Correspondence: *Melanie Stephens, University of California, San Francisco, 21455 Millard Lane, Cupertino, CA 95014. E-mail: mstephens14@gmail.com*

M.R. TIMPANO SPORTIELLO, D.M. CANNISULI & S. DANTI. Characterizing Mild Cognitive Impairment Neuropsychological Profile: A Cross-sectional Study.

Objective: To describe the neuropsychological features of Mild Cognitive Impairment (MCI) subtypes.

Participants and Methods: 162 subjects (M:F=47:53%, age 73 ± 7 , education 6 ± 3 yrs) with a diagnosis of MCI were assessed by a global cognitive screening (Milan Overall Dementia Assessment), an evaluation of autonomy, and a specific evaluation of each cognitive domain: Memory System (Digit Span, Corsi Span, Pairs Associates Learning, Story Recall, Corsi Learning Suvra-span, Rivermead Behavioural Memory Test); Attentional System (Attentive Matrices, Stroop Test); Language (Boston Naming Test, Category Fluency); Visual Agnosia (Street's Completion Test); Constructive Apraxia (Constructive Apraxia Test); Executive Functioning (Frontal Assessment Battery, Tower of London, Brixton Test). Data analysis was made using non-parametric tests (Bonferroni corrected).

Results: Within Memory System, episodic memory showed to be the most fragile subdomain: Type I performed more poorly than Type II at the Story Recall ($p<0.05$). Prospective and ongoing memory were broadly impaired (51% and 41%, respectively). Visual agnosia abilities deteriorated more frequently than the other instrumental extra-memory functions (70%). Anomia represented the most relevant language deficit (14%). Planning and sensitivity to interference were more damaged than selective attention, mental flexibility and inhibitory control. Type II reported the lowest score of the whole sample in all tests of executive functioning; significant differences were found between Type II and Type III on the Stroop Interference/Time ($p<0.006$) and between Type I and Type II on the Stroop Interference/Error ($p<0.003$).

Conclusions: As recently suggested by converging evidences from neuropsychological and neuroimaging studies, the selective deficit of executive functioning (i.e. dorsolateral cortex injury) plays a substantial role in predicting MCI conversion into dementia, as well as the episodic memory impairment.

Correspondence: *Davide M. Cammisuli, Ph.D. in Clinical Psychology, Psychiatry, Neurobiology, Pharmacology and Biotechnologies, Pisa University School of Medicine, 6, Via Bonanno Pisano, Pisa 56126, Italy. E-mail: d.cammisuli@med.unipi.it*

P. WATSON, P.J. ALLEN, D. EIDELBERG, A. FEIGIN & P. MATTIS. Early Deficits in Executive Functioning Identify Presymptomatic Huntington's Disease.

Objective: Cognitive impairment in Huntington's disease (HD) patients is characterized by progressive declines in attention, visuospatial functioning, memory, and executive functioning. Recognition of abnormalities prior to full disease manifestation could prove useful for early intervention in presymptomatic carriers of the HD gene mutation (p-HD). The objective of this study was to determine if measures of processing speed and executive functioning could serve as early markers of disease onset in p-HD subjects.

Participants and Methods: Twelve p-HD subjects (7 F, 5 M; age = 47 ± 11.1 years; CAG repeat length = 41.6 ± 1.7) underwent neuropsychological testing at four time points (baseline, 1.5, 4, and 7 years). Four subjects met clinical diagnosis for HD by time point three (phenocconverters). Measures of processing speed and executive functioning were analyzed individually and as composite scores.

Results: HD phenoconverters performed worse than non-phenoconverters on measures of processing speed ($F(1,7) = 11.232, p < 0.05$) and executive functioning ($F(1,7) = 26.105, p < 0.05$), and this effect was seen at all time points. Moreover phenoconverters trended toward worse processing speed as they approached disease onset ($F(1,7) = 5.032, p = 0.06$). Overall group differences in executive functioning remained when accounting for processing speed ($F(1,3) = 11.574, p < 0.05$). However, analysis of the individual time points revealed that this effect was only seen prior to phenoconversion. ($p = 0.034$).

Conclusions: Deficits in executive functioning commonly found in HD patients may be exacerbated by slower processing speed. However, decline in executive functioning may serve as an early indication of HD phenoconversion.

Correspondence: *Philip Watson, M.A., Psychology, City University of New York and Queens College, 65-30 Kissena Boulevard, Flushing, NY 11367. E-mail: phil.watson@yahoo.com*

S. WILKINS, B. BETTCHER, C. BUTLER, L. CHAO, M.W. WEINER & J.H. KRAMER. Very Long-Term Consolidation of Verbal Material in Mild Cognitive Impairment.

Objective: Neuroscience models of memory indicate that consolidation of new information may occur over a period of several days or weeks. Standard verbal memory tests, however, measure recall only after relatively brief delays, and thus may not adequately capture mild memory impairment. Our aim was to investigate the effect of an extended versus standard delayed recall period on consolidation of verbal episodic memory in Mild Cognitive Impairment (MCI).

Participants and Methods: Subjects included 21 community-dwelling older adults with MCI (mean age = 70.64) and 14 Normal Controls (age = 73.86). A brief prose passage was read to all subjects over a minimum of five trials, until they achieved at least ninety percent recall accuracy. Free recall was assessed at standard (30 minutes) and extended (1 week) delays.

Results: Differences in memory consolidation were analyzed using general linear model with diagnosis as the between-group variable and recall trial (standard vs. extended delay) as the within-subject variable. Memory data revealed a significant group by trial interaction ($p = 0.041$). Although MCI participants evidenced worse memory performance after 30 minutes (95.4% vs 84.1%; $p = 0.003$), they demonstrated an even larger decline in memory consolidation over the 1 week delay (75.7% vs 49.5%; $p = 0.001$) relative to controls.

Conclusions: MCIs exhibited a greater decline in recall between 30-minute and 1-week delays relative to controls despite learning the information to the same initial criterion. These results demonstrate that memory consolidation can occur over several days, and raise the possibility that typical 30-minute delays may not always be sufficient to capture memory deficits in some patients.

Correspondence: *Sarah Wilkins, B.A., Neurology, UCSF, 350 Parnassus Ave, Suite 905, San Francisco, CA 94143. E-mail: swilkins@memory.ucsf.edu*

L.B. ZAHODNE & G. TREMONT. Neuropsychological Correlates and Functional Impact of Apathy and Depression in Amnesic Mild Cognitive Impairment.

Objective: Apathy and depression are common neuropsychiatric symptoms in Mild Cognitive Impairment (MCI), but little is known of their unique relationships with neuropsychological performance or their relative impacts on daily functioning.

Participants and Methods: Data from 90 individuals referred for outpatient clinical neuropsychological evaluation and subsequently diagnosed with amnesic MCI based on Petersen criteria were obtained from a clinical research database. Demographic (age, sex, education) and caregiver-reported psychological variables (Frontal Systems Behavior Scale- apathy, Memory and Behavioral Problems Checklist-depression) were entered into stepwise regressions (entry: $< .05$, exit: $> .1$). Dependent variables included neuropsychological performances and the Lawton-Brody Instrumental Activities of Daily Living (IADL) Scale.

Results: Depression ($\beta = -.22; p < .04$) and education ($\beta = .32; p < .01$) were associated with composite scores of executive functioning. Neither apathy nor depression was associated with composite scores of attention, memory, or language. In subsequent stepwise regressions, raw scores on individual tests composing the executive functioning composite were regressed on the demographic and psychological variables. Depression ($\beta = .24; p < .03$) and education ($\beta = -.27; p < .02$) were independently associated with worse Trails B performance. Apathy ($\beta = -.22; p < .05$) and education ($\beta = .24; p < .03$) were independently associated with worse FAS performance. Apathy ($\beta = -.33; p < .01$) and male sex ($\beta = .24; p < .02$), but not depression, were associated with greater IADL impairment.

Conclusions: Apathy and depression were independently associated with different aspects of executive functioning in amnesic MCI. Specifically, apathy corresponded to poorer initiation, and depression corresponded to poorer speeded set-shifting. Apathy may have a greater impact on daily functioning than depression. These results support the separability of these neuropsychiatric states in amnesic MCI.

Correspondence: *Laura B. Zahodne, MS, Psychiatry and Human Behavior, Alpert Medical School of Brown University, Neuropsychology Program, POB 430, 539 Eddy St., Providence, RI 02903. E-mail: laura_zahodne@brown.edu*

A. ZANJANI, K. ZAKZANIS & E. JEFFAY. On the Use of Repetitive Transcranial Magnetic Stimulation in the Treatment of Motor Symptoms in Parkinson Disease: A Quantitative Review of the Literature.

Objective: The aim of the present quantitative review was to examine the effects of repetitive transcranial magnetic stimulation (rTMS) as a treatment of motor symptoms for patients with Parkinson's disease (PD).

Participants and Methods: A meta-analysis of 30 published studies with 593 patients with PD was conducted to estimate the magnitude of improvement after rTMS treatment. Outcome variables used to measure motor functioning consisted of UPDRS and the ballistic aiming task. Moderating variables analyzed included age, comorbidity or complications, pulse, site of stimulation, Hoehn and Yahr stage, design, medication "on" or "off", coil and number of sessions.

Results: A pooled fixed effect size of -0.39 (95% CI $[-0.539, -0.25]$; $p = 0.0001$; %OL = 73) was obtained which indicated small to moderate improvement in motor functioning. The pooled fixed effect size for the follow up studies conducted at least 30 days after last rTMS session was -0.49 (95% CI $[-0.712, -0.28]$; $p = 0.0001$; %OL = 66) which indicated moderate long lasting effects.

Conclusions: The meta-regression results suggest that design, PD medication, and coil showed a significant positive correlation with rTMS effects on motor functioning. Effect size analysis of moderating variables favour “off” medication, within subject designs, over 10 sessions of rTMS, no comorbidity or complications, M1 motor area as the site of stimulation and circular coils. It appears that rTMS is clinically useful and should be considered as an alternative treatment of motor symptoms in patients with PD.

Correspondence: *Eliyas Jeffay, M.A., University Of Toronto, 1265 Military Trail, Scarborough, ON M3A1A8, Canada. E-mail: eliyas.jeffay@utoronto.ca*

Stroke/Aneurysm

D.Y. HAN, A.J. ANDERSON, J. JONES, B.P. HERMANN & J. SAT-TIN. Multidisciplinary Stroke Care Associated with Increased Neuropsychology Utilization and High Patient/Provider Satisfaction.

Objective: Neuropsychological assessments can enhance both acute and chronic post-stroke management by identifying pertinent cognitive sequelae: 64% of stroke patients exhibit cognitive impairment and a third develop dementia (Hachinski et al., 2006). However, due to scheduling incompatibilities between traditional neuropsychology and stroke services in most settings, neuropsychological assessments often remain underutilized in stroke care. To address this, we developed a novel model of care that incorporated neuropsychological screening into comprehensive stroke care by utilizing the Vascular Cognitive Impairment (VCI) half-hour assessment protocol, proposed by the National Institute of Neurological Disorders and Stroke–Canadian Stroke Network (NINDS-CSN) VCI harmonization standards (Hachinski et al., 2006) and by analyzing subsequent patient/provider satisfaction.

Participants and Methods: A Multidisciplinary Stroke Clinic (MSC) model was implemented by administering the NINDS-CSN VCI screening protocol before and after patient discharge from the stroke service. After a pilot year, modified Press Ganey scales (an industry standard) were used to assess patient and provider satisfaction.

Results: Results from the 10-item provider surveys revealed high provider satisfaction with improved clinic efficacy, improved data turnaround time, and with the neuropsychology service’s added value to the Comprehensive Stroke Service. Results from the 18-item surveys derived from Press Ganey showed all scores above 4.4/5.0 for patient satisfaction.

Conclusions: The MSC model was successfully associated with high provider and patient satisfaction after the pilot year. The NINDS-CSN VCI assessment protocol demonstrated high clinical utility, proving to be an efficient method of providing focused neuropsychological services in a clinical setting that is prohibitive for full, traditional cognitive assessments.

Correspondence: *Amelia J. Anderson, Ph.D., Neurodiagnostics, University of Wisconsin Hospital and Clinics, 600 Highland Avenue, Madison, WI 53792-6180. E-mail: AAnderson@uhealth.org*

S.L. CARTER, L.J. RITCHIE & B. MERRITT. The Collaborative Use of Neuropsychological and ADL Assessment in a Case of Ruptured ACoA Aneurysm.

Objective: To determine the collaborative utility of neuropsychological and ADL assessments in making rehabilitation recommendations for a case of ruptured anterior communicating artery aneurysm

Participants and Methods: A 49 year old female with a Grade IV SAH from a ruptured ACoA aneurysm completed a standardized neuropsychological assessment measuring attention, memory, language, visuospatial, motor, and executive functioning skills. The Assessment of Motor and Process Skills (AMPS) was administered as a quantitative evaluation of personal and instrumental ADL abilities. Results from the two assessments were compared. AMPS established cutoffs for functional independence were expected to correspond to neuropsychological score ranges of normal, mild, and moderately to se-

verely impaired. We predicted that motor speed and strength would correspond with the AMPS ADL Motor scale classification. The AMPS ADL Process scale was expected to correspond with classification ranges on neuropsychological tests of attention, memory, and executive functioning.

Results: Results from manual motor tests and the AMPS Motor scale were consistent. Correspondence between the AMPS Process scale and neuropsychological test results was more variable. Neuropsychological testing showed moderate to severe impairment in memory and abstract learning (CVLT-2, Category Test), but the AMPS Process scale suggested that only minimal assistance in ADLs was required. Mildly impaired visuoconstructional skills were in keeping with the AMPS Process scale, but test results in other cognitive domains varied.

Conclusions: Neuropsychological and performance-based ADL assessments produced complementary, but differing, results in this case study of ACoA rupture. The two types of assessments can be used in conjunction to effectively strengthen rehabilitation recommendations.

Correspondence: *Sherri L. Carter, PhD, Psychology, QEII Health Sciences Centre, N.S. Rehabilitation Centre, 1341 Summer Street, Halifax, NS B3H 4K4, Canada. E-mail: sherri.carter@cdha.nshealth.ca*

V.G. DEFREITAS, S.L. CARTER, A. AL-MOSAWIE & B. JOYCE. A Case Study of the Effects of Methylphenidate on Attention Following Left PComm Aneurysm Clipping: A Pre-Post Comparison.

Objective: While there are documented cognitive benefits of methylphenidate in Attention-Deficit Hyperactivity Disorder, research in acquired brain injury is limited and yields mixed results. Despite frequent use clinically, methylphenidate is not without vascular risk in older individuals. We investigated the clinical benefit of methylphenidate in improving attention in an older individual following left PComm aneurysm clipping and bilateral frontal white matter hyperintensities.

Participants and Methods: A 50-year-old African-Canadian woman 3.5 years status/post clipping completed a battery of attention and working memory tests, control tests of verbal comprehension, and self-ratings pre and 6-weeks post methylphenidate (5 mg) treatment. Reliable change indices (RCIs) accounting for practice effects (Chelune et al., 1993) were computed to assess meaningful change.

Results: At baseline, attention test scores were below average and the WAIS-IV Verbal Comprehension Index (VCI) was average. Using RCIs, performance on most attention measures remained unchanged post-treatment, but there was significant improvement on the Numbers and Letters Part A Errors and Efficiency subtests of the NAB Attention Module. Improved objective performance coincided with fewer complaints on the Cognitive Failures Questionnaire and an attention-specific rating scale, as well as self-reported improvements in quality of life and emotional control. As expected, WAIS-IV VCI did not change from pre to post treatment.

Conclusions: Results support the contention that methylphenidate improves some aspects of attention in brain injured patients with chronic attention difficulties. Self-reported improvement in quality of life and emotional control may have also contributed to improved attention or lessened the subjective experience of attention failures post-treatment.

Correspondence: *Vanessa G. DeFreitas, MA, Psychology, Simon Fraser University, 8888 University Drive, Burnaby, BC V5A 1S6, Canada. E-mail: vgb@sfu.ca*

M.G. FERREIRA, C.H. MORO & S.C. FRANCO. Depression after Stroke: Association with Vascular Risk Factors in a Brazilian Sample.

Objective: There is a large discussion about factors associated with post-stroke depression (PSD) due to its multifactorial origin. The purpose of this study was to determine the association among depression symptoms (DS) and clinical-demographic variables, vascular risk factors and cognitive and functional status, 6 to 10 months after stroke.

Participants and Methods: Forty-five ischemic stroke survivors in outpatient follow-up, from July 2009 to August 2010, in Southern Brazil,

underwent an extensive neuropsychological assessment and were administered Beck Depression Inventory (BDI) and Pfeffer Functional Activities Questionnaire (PFAQ). The cut-off score used to demonstrate DS presence was ≥ 10 points in BDI. Five or more points in PFAQ demonstrated functional impairment. Control group had 54 community subjects. Continuous variables were analyzed by Student's *t* test. Categorical variables were analyzed by binary logistic regression. Variables with $p < 0.10$ were included in the regression model, in order to establish Odds Ratio (95%CI).

Results: The mean age was 60 years old (SD=13.17), 71% were male sex, with 5 years of education (SD=3.56). Ten patients (22%) presented DS. In the final model of logistic regression, statistically significant difference was found between DS and Diabetes Mellitus [Odds ratio (OR) 0.055, 95% confidence interval (CI) 0.003 - 0.890] ($p=0.041$) and alcohol intake [Odds ratio (OR) 0.029, 95% confidence interval (CI) 0.001 - 0.645] ($p=0.025$).

Conclusions: Findings suggest that Diabetes Mellitus and pre-stroke alcohol intake were associated with DS after stroke. Previous studies found these vascular risk factors associated with PSD.

Correspondence: *Maria G. Ferreira, MsC, Psychology, University of The Region of Joinville - UNIVILLE, Rua Conselheiro Mafra, 295 apto. 502 Centro, Joinville S9.201-480, Brazil. E-mail: mariagabrielarf@gmail.com*

M.G. FERREIRA, C.H. MORO, K.G. WOLKE & S.C. FRANCO. Cognition and functional capacity after thrombolysis: preliminary results in a Brazilian sample.

Objective: Thrombolysis is associated to a better functional outcome but did not spare cognition after subacute stroke. The purpose of this study is to compare cognition and functional capacity, 6 to 10 months after stroke, in patients treated with thrombolysis with rt-PA and those who were not.

Participants and Methods: From October 2008 to March 2010, 15 patients treated with thrombolysis and 30 patients who did not, were administered an extensive neuropsychological assessment and a functional activities questionnaire. Control group had 54 community-dwellers. Continuous variables were analyzed by Student's *t* test and categorical ones by Chi-Square.

Results: Most patients had suffered supratentorial (88.9%); atherothrombotic strokes (64.4%). Groups did not differ in age ($p=0.964$), sex ($p=0.646$), educational level ($p=0.560$), stroke severity ($p=0.080$), BAMFORD criteria ($p=0.766$), TOAST classification ($p=0.097$) and side of lesion ($p=0.190$). Cognitive performance ($p=0.624$) and functional capacity ($p=0.664$) showed no difference between groups. The mean age in group T was 56.8 years (SD=14.5). The mean educational level was 5.5 years (SD=4.6). 46.7% had left hemisphere lesions. 46.7% had language impairment and 33.3% had visuospatial impairment. Group NT had a mean age of 61.6 years (SD= 12.4). The mean educational level was 4.8 years (SD=3.0). 60% had right hemisphere lesions. 40% presented neglect; language, visuospatial, verbal memory and visual impairments were present, each, in 33.3% of the subjects. There was a statistically significant difference between groups concerning neglect ($p=0.004$).

Conclusions: Findings suggest that patients who received thrombolysis presented less neglect but did not show better cognitive functioning or functional capacity.

Correspondence: *Maria G. Ferreira, MsC, Psychology, University of The Region of Joinville - UNIVILLE, Rua Conselheiro Mafra, 295 apto. 502 Centro, Joinville S9.201-480, Brazil. E-mail: mariagabrielarf@gmail.com*

C.A. HAJEK, K.O. YEATES, V. ANDERSON, M. MACKAY, M. GREENHAM, A. GOMES & W. L.O. Cognitive Outcomes Following Arterial Ischemic Stroke in Children.

Objective: To investigate cognitive outcomes following pediatric arterial ischemic stroke (AIS) and explore factors that may explain individual variability in outcomes.

Participants and Methods: Participants included 36 children with perinatal or childhood AIS at least 1 year prior to assessment, and a

comparison group of 15 children with asthma, all from 6-15 years old at the time of the study. Children completed measures of general cognitive ability, attention, executive functions, and processing speed. The Pediatric Stroke Outcome Measure (PSOM) assessed neurological function. Children with AIS also completed MRIs to determine lesion location and volume.

Results: Mean cognitive scores were average for both groups. Compared to children with asthma, children with AIS performed significantly worse on a measure of inhibitory control. Group differences for the remaining measures were in the same direction but not statistically significant. Children with AIS performed significantly below normative populations on several measures. The PSOM severity score was significantly negatively correlated with general cognitive ability and processing speed. Stroke volume was significantly negatively correlated with verbal skills and general cognitive ability. Socioeconomic status (SES) was also related to scores on several measures. Lesion location, laterality, age at stroke, and sex were not significantly related to outcome. Regression analyses indicated that after controlling for SES, greater stroke severity accounted for significant variance on several cognitive measures.

Conclusions: Results suggest that following AIS, children performed in the low end of the average range on measures of cognitive functioning. Cognitive outcome following AIS depends on a combination of factors, including stroke severity and lesion volume.

Correspondence: *Christine A. Hajek, M.A., The Ohio State University, 2312 Essex St., Baltimore, MD 21224. E-mail: hajek.11@osu.edu*

J. KEMP, M. BERTHEL, A. HENRY, I.J. NAMER, M. MUSACCHIO, A. DUFOUR, O. DESPRÉS & F. SELLAL. Social Cognition Impairment Following Left Caudate Damage: A Case and SPECT Study.

Objective: Most studies in social cognition have focused on developmental diseases or analyzed the consequences of acquired frontal lesions on the integrity of Theory of Mind (ToM), but, to our knowledge, none to date has addressed the eventual consequences of damage to the basal ganglia on ToM.

Participants and Methods: To investigate the possible consequences of such lesions on social cognition, we tested a selected patient, MVG, a 44-year-old man with a focal caudate nucleus (CN) lesion following stroke. In the aftermath of this stroke, MVG shows loss of empathy and difficulties recognizing emotions in others. The dual aims of this study were first, to evaluate the implications of CN on ToM and recognition of emotion, and second, to discuss these results as a consequence of a disconnection of the subcortical orbito-frontal (OF) loop due to caudate damage. We performed a complete neuropsychological assessment of MVG, as well as different tasks evaluating social cognition, such as the Faux-Pas Test and the Reading the Eyes in the Mind Test. MVG's performances on social cognition tasks were compared to those of twelve healthy volunteers, matched in age and socio-cultural-level.

Results: No cognitive deficits were found. However, on tasks assessing social cognition, MVG showed impairments in the "warm" or "affective" part of ToM as well as in the ability to recognize negative emotions (i.e. sadness and fear).

Conclusions: These results indicate that damage to the head of the left CN can lead to impairment of ToM and emotion recognition. Furthermore, the data shows that, in MVG, such impairment appears to be due to a disconnection of the subcortical OF circuit resulting from damage to the CN. Neuro-imaging data tends to confirm this hypothesis by bringing out a hypoperfusion in both, the territory of his left CN and prefrontal (i.e. ventromedial) brain areas.

Correspondence: *Jennifer Kemp, Laboratoire d'Imagerie & Neurosciences Cognitives, 21 rue Becquerel, Strasbourg 67087, France. E-mail: jennifer.kemp@etu.unistra.fr*

D.T. PULSIPHER, N. STRICKER, J. SADEK & K.Y. HAALAND. Validity of the Neuropsychological Assessment Battery (NAB) after Unilateral Stroke.

Objective: The NAB is a comprehensive neuropsychological battery assessing 5 cognitive domains (Attention, Language, Memory, Spatial,

Executive Functions). Despite the advantage of standardized scores from the same normative sample across domains, its validity is not well established because few studies with clinical populations have reported full-battery findings. The aim of this study was to compare individuals after left (LHD) or right (RHD) hemisphere damage due to stroke on the NAB and several comparable non-NAB neuropsychological measures. We hypothesized well documented hemispheric differences on the NAB (Language impairment in LHD and Spatial impairment in RHD).

Participants and Methods: 31 RHD and 36 LHD patients were administered the full NAB, parts of the Western Aphasia Battery (WAB), and spatial tasks (composite index of Judgment of Line Orientation, Facial Recognition, and Block Design tests). Performance was compared between groups.

Results: RHD and LHD were associated with comparable Attention, Executive, and Spatial Functions, but worse Language and Memory performance after LHD. Both groups performed similarly on visual memory and LHD performed worse on verbal memory. RHD was associated with worse performance on the non-NAB spatial index and better performance on the WAB.

Conclusions: Some, but not all, hypothesized hemispheric differences were observed using the NAB. The LHD impairment on Memory is attributable to its composition of primarily language-based memory measures. Spatial differences seen on non-NAB tasks (but not on the NAB) suggest visuospatial impairment is better detected using traditional measures. The patterns of Memory and Spatial performances imply these modules are confounded by abilities from other domains.

Correspondence: *Dalin T. Pulsipher, Ph.D., New Mexico Veteran's Affairs Health Care System, 1501 San Pedro Dr. SE (116), Behavioral Health Care Line (116), Albuquerque, NM 87108, NM 87108. E-mail: dalin.pulsipher@my.rfums.org*

B.A. SPRINGATE, G. TREMONT, D. BISHOP & I. MILLER. Contributions of Stroke Patients' Cognitive and Functional Status to Family Functioning.

Objective: The relationship between stroke and family functioning (FF) is complex. To date no studies have examined the contributions of stroke patients' cognitive and functional status to FF. This study examined the relationship between cognition, ADLs, and FF in a sample of stroke patients.

Participants and Methods: 108 patients were assessed with the NIH Stroke Scale and 3MS within 2 weeks of their stroke. Patients and caregivers completed the Family Assessment Device, a questionnaire assessing FF along 6 dimensions and general FF, which has been used in several other stroke studies. Caregivers also completed measures assessing patients' ADLs. FF and ADLs were reassessed after 12 months.

Results: At baseline, 57% of caregivers reported general FF within the healthy range according to normative data, and no significant change in mean FF was observed over time. Patient and caregiver perceptions of FF were not correlated at either time point. Although total 3MS scores were not predictive of overall FF, higher patient executive function at baseline was correlated with improved family communication and behavioral control at follow-up ($r=0.28$ and 0.25 , respectively). Total 3MS scores were positively correlated with patients' basic ADLs at follow-up ($r=0.41$), but not with instrumental ADLs. Surprisingly, stroke severity and signs (e.g., presence of aphasia) were not predictive of FF at baseline or follow-up.

Conclusions: Although global cognition and stroke severity were unrelated to overall FF, greater executive function deficits at baseline were associated with poorer family communication and behavioral control at 12 months. Findings suggest families and patients may benefit from early intervention and education about managing executive dysfunction after stroke.

Correspondence: *Beth A. Springate, PhD, Psychiatry, Rhode Island Hospital, 593 Eddy Street, Physician's Office Building, Suite 430, Providence, RI 02903. E-mail: bspringate@lifespan.org*

C. STERLING, T. RICKARDS, M.J. GRAHAM, J. TYRER, L. VAUGHN, A. BARGHI, V.W. MARK, G. USWATTE & E. TAUB. Lesions in the Centrum Semiovale Related to Poorer Retention of Motor Improvement after CI Therapy.

Objective: Our laboratory has shown that following Constraint-Induced Movement (CI) therapy, an efficacious rehabilitation for the behaviorally conditioned suppression of spontaneous limb movement after stroke, benefits can remain at least 2 years... Furthermore, neither lesion size nor location affect treatment benefits. This study evaluated whether retention rate were specifically affected by lesion location in the corticospinal tract (CST) as it descends through the centrum semiovale (CS), where it receives fibers from the ipsilateral cortex over the corpus callosum.

Participants and Methods: Twenty-seven chronic stroke patients (63.5 ± 9.8 years) were administered CI therapy. Motor functioning was measured using the Motor Activity Log before and after treatment as well as at 6-months and 1-year post-treatment. Patients received an MRI scan prior to treatment and percentage of the CS damaged by lesion was calculated.

Results: The magnitude of damage to the CS was significantly correlated with retention rates at 6 months ($r = -0.572$, $p = .004$), and 1 year ($r = -0.525$, $p = .018$) post-treatment. Lesions in the CST outside of the CS were not significantly related to retention.

Conclusions: These findings suggest that the greater the damage to the CS after stroke, the less the therapeutic motor benefits retained 1-year after CI therapy. The findings bear upon overcoming the behavioral suppression of arm use post-stroke. Patients with lesions in this area may need to repeat treatment occasionally to help retain the motor improvement made in therapy and need to be vigilant in continuing the motor techniques learned in treatment.

Correspondence: *Chelsey Sterling, B.A., Psychology, UAB, 1223 29th St S, Apt 28, Birmingham, AL 35205. E-mail: csterli1@uab.edu*

Visuospatial Functions/Neglect/Agnosia

P. CHEN & K.M. GOEDERT. Small Clock Drawings may Reflect Neglect Patients' Limited Ability to Enlarge the Attentional Aperture.

Objective: Previously we reported that right-brain-damaged (RBD) stroke survivors with spatial neglect produced smaller clock drawings than non-neglect RBD patients, suggesting that the subjectively available workspace is reduced with the presence of spatial neglect. The present study investigated the mechanism for this phenomenon by examining the relation between clock-drawing characteristics and performance on six subtests of the Behavioral Inattention Test (BIT).

Participants and Methods: Seventy-one RBD and 40 healthy participants drew clocks while taking the BIT, with 31 RBD participants scoring below cutoff for the presence of spatial neglect. We measured the size and the shape of clock drawings, and drawing placement in horizontal (left/right) and radial (upper/lower half of page) dimensions on the test sheet.

Results: Drawings of neglect participants (mean area index = 2988.4 ± 3834.2) were smaller than those of non-neglect RBD (7187.9 ± 6230.9 ; $p = .006$) and healthy participants (10044.5 ± 5981.9 ; $p < .001$), who did not differ from each other. The clock size was predicted uniquely by the figure and shape copying subtest of the BIT: the poorer the figure and shape copying, the smaller the clock perimeter. Clock size was not related to its horizontal placement on the paper. However, in both RBD and healthy participants, the clock perimeter decreased in size as the drawing was placed radially farther away.

Conclusions: These results suggest that neglect-dependent defects in enlarging the aperture of attention, rather than shifting attention, may reduce the subjectively available workspace for copying a figure as well as drawing a clock from memory.

Correspondence: *Pei Chen, Kessler Foundation Research Center, 1199 Pleasant Valley Way, West Orange, NJ 07052. E-mail: pchen@kesslerfoundation.org*

V.W. MARK & L.E. CHASAN. Aphasia vs. Neglect on Cancellation Tests after Stroke.

Objective: Aphasia and unilateral spatial neglect are the two most prominent cognitive consequences of stroke. Although neglect is routinely assessed on cancellation tests, aphasic patients are frequently excluded from non-verbal cognitive assessment because of marked comprehension impairment. However, it is possible to evaluate cancellation in even the most severely aphasic patients after demonstrating how to conduct the test. We therefore tested patients with marked comprehension impairment after left hemisphere stroke (LHD) and patients with substantial unilateral neglect after right hemisphere stroke (RHD) to compare cancellation outcomes on spatial attention and executive measures.

Participants and Methods: 7 LHD and 7 RHD patients were tested. The mean Western Aphasia Battery Comprehension test subscore in LHD was 4.9/10 (*SD* 2.2), range 2.3-8.8. All patients were video recorded as they took 4 parallel test versions of the 56-target Star Cancellation Test. Video recordings were subsequently analyzed for outcomes.

Results: All patients complied with test requirements after observing test demonstration. As expected, the RHD patients had significantly more target omissions (14 *vs.* 2; $p < 0.001$ 1-tailed). Groups did not differ on mean distance between marked targets or number of perseverated target markings (p 's > 0.1). However, RHD patients had significantly more pathway intersections/target (0.3 *vs.* 0.1, $p = 0.003$) and lower "best r " values (regression of either x - or y -coordinates of marked targets against their marking sequence: 0.7 *vs.* 0.9; $p < 0.001$).

Conclusions: During cancellation, neglect patients are significantly more disorganized than aphasic patients with impaired comprehension. More important, these findings show it is possible to assess spatial attention and self-organization during visual search in even severe aphasia. Relatively preserved non-verbal executive skills in aphasia may be relevant to functional recovery. The predictive value of cancellation for functional recovery in aphasia should be assessed.

Correspondence: *Victor W. Mark, M.D., Physical Medicine and Rehabilitation, University of Alabama at Birmingham, 619 19th Street South, SRC 190, Birmingham, AL 35249-7330. E-mail: vmark@uab.edu*

A. NIQUERITO, D. DE SOUZA COELHO, C. NUNES MORETTI, J. BROCO FERRARI, C. NARDI, M. A. DE BARROS GARROTE CURY & M. MERIGHI TABAQUIM. Analysis of Gnosis Functions in Children with Cleft Lip and Palate: Neuropsychological Assessment.

Objective: To investigate the Gnostic functions of individuals with cleft lip and palate.

Participants and Methods: In this study 107 subjects participated, of both sexes, aged 7 to 12 years with cleft lip and palate repaired at the Hospital for Rehabilitation of Craniofacial Anomalies -USP (Bauru). The following instrument was used: The Neuropsychological Examination - BANI-T that searches the neuropsychological skills related to Gnostic functions

Results: The results showed that 56.01% of the children had satisfactory performance on the Visual Retention and Recovery, 62.61% in the Retention and Recovery Auditory-visual perception; 74.76% of objects and drawings; 57% in Space Orientation; 58.87% in intellectual Space Operations; 76.63% and 61.68% in Functional Understanding the Understanding of Simple Prayers. The data showed that 74.76% had the expected results for chronological age related to the Acoustic Motor Organization of the Rhythmic Structures in the visual area.

Conclusions: According to the literature there is no evidence that individuals with cleft lip and palate had diagnosis. However, this previous study observed visual processing deficits, prosopagnosia and astereognosia featuring this sample on the studied population.

Correspondence: *Ana Vera Niquerito, Hospital for Rehabilitation of Craniofacial Anomalies (HRCA) and São Paulo University (USP), Rua: Pelegrino Constanzo 1-136, Bauru 17018-110, Brazil. E-mail: anavera.n@gmail.com*

R.D. WHITMAN & L.C. VOS. Asymmetric lateralization of vigilance for visual field change.

Objective: Research indicates that the right hemisphere (RH) is more vigilant for change, particularly for novel and/or threatening stimuli. Posner and colleagues (1984) found that RH injured subjects showed greater difficulties shifting attention in a vigilance task, and showed an "inhibition of return" to portions of the visual field (VF) where change did not occur. Neuroimaging studies confirm greater RH arousal during detection of change in the environment. The present study examined lateral differences in vigilance for change detection using a change blindness procedure. Change blindness is the failure to identify physical changes when a visual scene is obscured by a momentary disruption such as a flicker.

Participants and Methods: We presented 100 Ss pictures of real-life scenes in which change occurred in either the left or right VF by reversing the orientation of the photograph. Each picture was displayed for 240 ms followed by an 80 ms gray screen, causing a "flickering effect." The pictures were presented in a cyclical pattern until participants indicated change detection by finger press.

Results: Changes in the LVF were detected faster, supporting the argument that the RH serves a greater role in change detection. Time-to-detection showed that this advantage occurs early, suggesting pre-conscious processing. Examination of order effects revealed a tendency for prior trials to influence subsequent trials, consistent with the inhibition of return phenomena observed in studies of vigilance in brain damaged populations.

Conclusions: The RH is biased for detecting change; namely scenes presented to the LVF-RH were detected faster than those presented to the opposite VF. Future research needs to address the role of spatial cueing and inhibition of return during the change blindness procedure, the speed at which the lateralized differences occur, and the relationship of change blindness to neglect phenomena.

Correspondence: *Russell D. Whitman, Ph.D., Psychology, Wayne State Univ, 5057 Woodward Ave, 7th Floor, Detroit, MI 48202. E-mail: dwhitman@wayne.edu*

Psychopathology/Neuropsychiatry (Other)

S. DUBREUCQ, M. BILODEAU, M.E. LAVOIE, R. HORNE & V. TOURJMAN. Impact of cognitive difficulties on pharmacological adherence of patients with affective disorder or ADHD.

Objective: Adherence to medication is defined as the extent to which patients take medications as prescribed by their health care providers. Poor adherence has important consequences on clinical evolution and represents an economic burden. Previous research found a relationship between neuropsychological functioning and adherence but this dimension has, to date, been inadequately explored in ADHD or major depression. This study seeks to explore the relationship between self-report executive function and pharmacological adherence of subject suffering from affective disorder and/or Attention Deficit/Hyperactivity disorder (ADHD).

Participants and Methods: Forty-seven patients with ADHD and/or depression were recruited from a specialized psychiatric clinic in Montréal. They completed a battery of questionnaires including self-report scales for adherence such as the Medication Adherence Rating Scale, the Medication Adherence Scale. Neuropsychological functioning was assessed by the Behaviour Rating Inventory of Executive Function-Adult Version: Self Report (BRIEF-A) and the scale of cognitive auto-evaluation. Other scales assessing beliefs about medication, ADHD rating scale (ASRS) and depression symptoms (BDI-13), clinical alliance with medical team (4-PAS) and psychological distress (GHQ-12).

Results: Results revealed a significant relationship between adherence and cognitive difficulties. Patients with low adherence have a lower score on the inhibition and emotional regulation scales of the BRIEF-A.

Conclusions: Our finding showed that some cognitive dimensions are associated with reduced adherence. The current study will shed light on this issue and determine the conditions necessary to explore the impact of cognition on adherence in these disorders in future larger scale studies.

Correspondence: *Simon Dubreucq, Université de Montréal, 259 Perault, Varennes, QC J3X1M4, Canada. E-mail: sdubreucq@hotmail.com*

Symposium 13: Empirically-based Cognitive Rehabilitation from Healthy Aging to Alzheimer's

Chair: Benjamin Hampstead

10:45 a.m.–12:15 p.m.

B.M. HAMPSTEAD, R. KESSELS, B.M. HAMPSTEAD & S. BELLEVILLE. Empirically-based cognitive rehabilitation from healthy aging to Alzheimer's.

Symposium Description: Alzheimer's disease (AD) threatens to overwhelm healthcare resources at a global level. Although a number of disease modifying/arresting agents are currently under investigation, they are years away from being commercially available. Even if such agents are successful, many patients will experience persistent cognitive impairment. Cognitive rehabilitation of memory is a treatment standard for some patient populations but is relatively understudied and somewhat contentious in patients with AD and its clinical precursor, mild cognitive impairment (MCI). This symposium will integrate data from three separate, but complementary, international laboratories to examine several issues that are critical for developing effective cognitive rehabilitation programs across the spectrum from healthy to MCI and finally AD. Developing such programs first requires an understanding of the interaction between more basic and higher-order cognitive abilities that are involved in "normal" memory functioning. Therefore, Dr. Roy Kessels will examine preserved cognitive abilities (e.g. implicit memory) that may be useful in developing intervention programs, specifically focusing on the efficacy of errorless learning in AD. Next, it is important to know how factors like the presence/severity of cognitive impairment and methodological details in treatment delivery affect the efficacy of various rehabilitative techniques (e.g. mnemonic strategies); topics that will be examined by Dr. Benjamin Hampstead. Finally, Dr. Sylvie Belleville will provide evidence that comprehensive rehabilitation programs are effective in these populations and that training strategies can be generalized. Functional neuroimaging data will be integrated throughout with particular attention to whether training elicits restorative and/or compensatory processes.

Correspondence: *Benjamin M. Hampstead, PhD, Rehabilitation Medicine, Emory University, 1441 Clifton Rd NE, Room 150, Atlanta, GA 30322. E-mail: bhampst@emory.edu*

R. KESSELS. Implicit Memory Function, Errorless Learning and Their Application in Cognitive Rehabilitation in Alzheimer's Disease. Episodic-memory deficits are a hallmark of (early) Alzheimer's disease (AD), including the MCI stage. There is increasing evidence that implicit forms of learning and memory are relatively preserved, even in moderate to severe AD. These intact cognitive functions may be useful for cognitive rehabilitation purposes. However, intact implicit memory function may also hamper new learning, as errors that occur during the learning process may be implicitly consolidated, thus interfering with the correct memory response. Prevention of the occurrence of errors during learning – errorless learning – may, as a result, facilitate new learning, but controlled evidence is scarce in the field of AD, especially with respect to the acquisition or re-learning of everyday activities. First, I will present recent evidence for intact implicit memory function in AD and focus on implicit-memory assessment in clinical practice. Second, I will present recent studies in which we systematically compared different learning methods for acquiring everyday activities in AD. Specifically we examined an errorless-learning approach using elements of modelling and feed-forward cueing and an active learning approach in

which errors could occur during learning but were corrected (i.e., resembling trial and error learning). Results of two pilot studies showed that AD patients were able to acquire new skills and that an errorless approach was beneficial for learning compared to the active learning. In two large-scale ongoing studies, we now focus on the applicability of errorless learning in clinical practice, using a randomized-controlled trial design, also taking the severity of the dementia into account.

Correspondence: *Roy P.C. Kessels, Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Radboud University Nijmegen Medical Centre, Department of Medical Psychology & Alzheimer Centre Nijmegen, Nijmegen 00000, Netherlands. E-mail: r.kessels@mps.umcn.nl*

B.M. HAMPSTEAD. Toward a model of stage-appropriate cognitive rehabilitation in Alzheimer's disease.

Almost by definition, mild cognitive impairment (MCI) represents a heterogeneous group of patients whose cognitive abilities range from virtually "normal" to almost indistinguishable from those with Alzheimer's disease. Moreover, most of these patients will experience progressive cognitive decline that is not limited to memory impairment. This variability creates a number of challenges for those interested in rehabilitation, among which are the diagnostic criteria, ecological relevance of training, and selection of outcome measures. Similarly, the presence and severity of non-memory domain impairment may directly affect the type of intervention that is most effective. Our recent studies suggest that mnemonic strategies (MS) (semantic organization and elaboration) are related to executive functioning whereas purely rehearsal based approaches (e.g. mass exposure with repeated testing) are unaffected by cognitive impairment. These findings concur with fMRI data showing extensive increases in dorsolateral and ventrolateral prefrontal activity after MS training compared to more restrictive changes after repeated exposure. Consistent with models of prefrontal-hippocampal interactions during encoding, patients trained with MS also demonstrated increased hippocampal activity. These changes appear to represent both restorative and compensatory processes as responsible for the behavioral improvement. Our ongoing studies examine whether comparable networks are engaged during memory retrieval, whether patients can generalize MS training, and whether other rehearsal-based approaches (spaced retrieval; subtracting cues) are more effective than mere mass exposure. Ultimately, it may be reasonable to adopt a "stage appropriate" model wherein more "intact" MCI patients learn techniques that facilitate generalization whereas more advanced MCI patients use alternative techniques to learn specific content.

Correspondence: *Benjamin M. Hampstead, 1441 Clifton Rd NE, room 150, Atlanta, GA 30322. E-mail: bhampst@emory.edu*

S. BELLEVILLE. Cognitive training in aging and mild cognitive impairment: measuring efficacy and brain substrates.

An increasing number of studies indicate that training can improve episodic memory and working memory in persons with healthy aging and in persons with mild cognitive impairment. Those training programs represent promising tools to promote brain vitality and prevent cognitive decline in older adults. In this presentation, I will present studies investigating the short and long-term efficacy as well as neural substrates of training programs targeting episodic memory and working memory. I will first present two randomized controlled trials in persons with mild cognitive impairment showing that multifactorial memory training and working memory training improve target memory functions in these individuals. Both studies also indicate some generalization effect. A second set of studies will examine the biological substrates of training-related cognitive improvement in mild cognitive impairment and in healthy ageing. Those studies used fMRI to measure the brain activation of healthy older adults and persons with mild cognitive impairment (MCI) prior and after memory training. Results showed marked changes in task-related activation after training. In persons with MCI, training increased activation in both specialized brain regions, that is, regions recruited by the task prior to training, and in

new/alternative brain regions. Furthermore, a new activation within the right parietal lobe correlated with memory training efficacy. Training in healthy aging was associated with a combination of increased and decreased activation. These results will be discussed in relation to models of brain plasticity and compensation in aging and early Alzheimer's disease.

Correspondence: *Sylvie Belleville, Institut Universitaire de g eriatrie de Montr al, 4565 Queen Mary, Montreal, QC H3W-1W5, Canada. E-mail: sylvie.belleville@umontreal.ca*

Paper Session 9: Cognition in Low Birth Weight/Premature Birth

Moderator: Dalin Pulsipher

10:45 a.m.–12:15 p.m.

C. LUONG-TRAN, M.D. AHRONOVICH, F.R. LITMAN, R. BAKER & I. BARON. Small for Gestational Age v. Appropriate for Gestational Age Late Preterm Birth: Neuropsychological and Behavioral Outcomes at Age Three: The PETIT Study.

Objective: Neonates born late preterm (LPT; 34–36 gestational weeks) and NICU-admitted for clinical instability, observation of thermoregulation, and/or feeding issues are at increased risk of medical and neuropsychological impairments. Whether risk increases in LPT children also born small for gestational age (SGA) has not been reported although birth SGA is a known risk factor in other preterm subgroups. We sought to compare LPT SGA and appropriate for gestational age (AGA) preschoolers on neuropsychological and behavioral measures.

Participants and Methods: We studied 243 NICU-admitted late preterm participants (mean age=3.7 years), comparing those born SGA (n=34) and AGA (n=209) on measures of general conceptual ability (GCA), nonverbal/visuospatial/visual-motor skill, dexterity, attention, executive function, learning/memory, and behavioral questionnaires were completed by parents and teachers.

Results: LPT participants born SGA had lower birth weight and higher cesarean rate than those born AGA ($p<.05$). AGA's neonatal course included more respiratory distress ($p=.014$), respiratory support ($p=.019$), surfactant ($p=.025$), and antibiotics ($p=.002$) than SGA. Hypoglycemia incidence was 26.7% (AGA) v 39.4% (SGA). The two groups did not differ in GCA, nonverbal/visuospatial/visual-motor, dexterity, selective attention, executive function, learning/memory or parental/teacher reported behavioral variables, except that AGA was rated as having worse shifting ($p=.003$) and flexibility ($p=.007$) than SGA according to parent behavioral report.

Conclusions: Data support counseling parents that when significant neonatal medical complications are absent neuropsychological outcome is no worse for preschoolers born LPT and SGA compared with those born LPT and AGA. Longitudinal study of factors other than SGA may better clarify the etiology of behavioral, executive and other neuropsychological deficits associated with LPT birth.

Correspondence: *Ida Sue Baron, Inova Fairfax Hospital for Children, 3300 Gallows Road, Falls Church, VA 22042. E-mail: Ida@isbaron.com*

K. BERRY, F.R. LITMAN, M.D. AHRONOVICH, R. BAKER & I. BARON. Neuropsychological and Behavioral Outcomes at Age Three of In Vitro Fertilization and Late Preterm Birth: The PETIT Study.

Objective: Fewer behavior problems, higher academic achievement scores, and better verbal ability have been reported in term children conceived by in vitro fertilization (IVF). However, the literature is inconsistent about whether IVF has an effect on the psychological outcomes in preterm children. This study was conducted to examine the influence of IVF conception on neuropsychological and behavioral outcomes in a single-center cohort of three-year-old children born late preterm (LPT; 34–36 gestational weeks) between 2004–2007.

Participants and Methods: Participants were 273 LPT children (mean age=3.8 years) grouped by conception method: 1) IVF; n=77 (35 male/42 female) and, 2) non-IVF; n=196 (108 male/88 female). General conceptual ability (GCA), nonverbal reasoning, visual-spatial and visual-motor skill, manual dexterity, selective attention, executive function, and learning/memory were assessed, and parental behavioral and executive function questionnaires were completed.

Results: Differences were found for maternal age (IVF=37.6; non-IVF=33.2; $p<.001$) and birth weight (IVF=2316.7g; non-IVF=2539.0g; $p<.001$), but not general cognitive ability (IVF/GCA=105.4; non-IVF/GCA=107.3). ANOVAs indicated no group differences in any cognitive, neuropsychological, or behavioral variable except that parental ratings of children's anxiety favored IVF over non-IVF ($p=.048$), but were no longer significant after covarying for maternal age, birth weight, and gender.

Conclusions: IVF did not increase the risk of general cognitive, neuropsychological, or behavioral impairment in our LPT preschoolers. Future longitudinal study of these LPT children at elementary school age may detect subtle impairments not apparent at age three due to their advancing maturity and enhanced ability to perform finer neuropsychological discriminations, including of executive functions.

Correspondence: *Ida Sue Baron, Inova Fairfax Hospital for Children, 3300 Gallows Road, Falls Church, VA 22042. E-mail: Ida@isbaron.com*

S. HORNACK, M. SMITH, J. MCCANN, R. BAKER, F.R. LITMAN, M.D. AHRONOVICH & I. BARON. Occipitofrontal Circumference Predicts General Cognition While Medical Risk Predicts Executive Function in Extremely Low Birth Weight Children at Age Six: Evidence from the PETIT Study.

Objective: Extremely low birth weight (ELBW) infants are at-risk for poor postnatal brain development, small occipitofrontal circumference (OFC), and cognitive/neuropsychological deficits. Few have studied ELBW children with normal or subnormal-OFC using neuropsychological measures.

Participants and Methods: 61 ELBW participants (mean=6.4 years; born 2000–2004) with normal OFC (n=43) or subnormal OFC ($z \leq -1.5$; n=18) had comprehensive testing, including Differential Ability Scales and noun fluency.

Results: ELBW/subnormal-OFC while of average general conceptual ability (GCA; $\sim IQ$), had lower GCA, verbal, nonverbal, and spatial; visual-motor; dexterity; and digit span performances compared with ELBW/normal-OFC (all $p<.05$). No other group differences were found, including parent/teacher behavioral reports. Multiple regression analyses were performed to determine whether OFC predicted cognition (GCA) and executive function (noun fluency), controlling for gender, maternal education, and medical risks including Patent Ductus Arteriosus (PDA). The overall regression model on GCA was significant ($p<.05$), all variables accounting for 26.2% of variance in GCA. OFC predicted GCA even after controlling for gender, maternal education, and PDA ($p<.05$); other variables were no longer significant. The overall regression model controlling for these variables on noun fluency was significant ($p<.001$), all variables accounting for 28.2% of variance in noun fluency. However, OFC was no longer significant controlling for gender, maternal education and PDA, while PDA continued to predict noun fluency even after controlling for the other variables ($p<.05$).

Conclusions: Results indicate different trajectories for ELBW children with subnormal-OFC and increased medical risk, emphasizing the importance of closely monitoring OFC to preempt and address difficulties these children experience by school-age.

Correspondence: *Ida Sue Baron, Inova Fairfax Hospital for Children, 3300 Gallows Road, Falls Church, VA 22042. E-mail: Ida@isbaron.com*

J. BAPP NEWMAN, A.K. DEBASTOS, B.N. PETERS, D. BATTON & S. RAZ. The Relationships between Head Circumference and Neuropsychological Performance in Preschoolers Born Prematurely.

Objective: We wished to examine the relationships between head size - a proxy for brain size - and neuropsychological outcome in

children born prematurely. We hypothesized that head size, measured during the preschool years, will account for a unique portion of the variance in neuropsychological skill development, over and above the variance attributable to demographic factors and to perinatal risk.

Participants and Methods: We used a sample of 279 children born prematurely (< 36 gestational weeks). The children, evaluated at 3–5 years of age, had received neonatal intensive care in a suburban hospital. We excluded children with severe neonatal intracranial hemorrhage, and children who had developed cerebral palsy by the assessment time. Tests administered included the WPPSI-R, the Preschool Language Scale (PLS)III, and the Peabody Developmental Motor Scales (PDMS) II.

Results: Multiple regression analyses (using chronological age, sex, socioeconomic status, twin status, gestational age, intrauterine growth rate, and number of complications as covariates) revealed that head circumference accounted for a unique portion of the variance in verbal IQ ($p < .01$), but not Performance IQ ($F < 1$), and in expressive language skills ($p < .02$), with a trend for an association with receptive language skills ($p = .06$). Neither gross nor fine motor skills were associated with head circumference ($F < 1$). The positive association between head circumference and the VIQ, and between the former variable and expressive language, remained significant when current height was added as a covariate (both $p < .05$).

Conclusions: Following statistical adjustment for demographic variables, perinatal risk, intrauterine growth rate, and current height, head circumference was found to be associated with preschool verbal skills in a large sample of children born prematurely. These findings are consistent with neuroimaging based studies revealing decrease in both white and grey matter brain volume in preterm-birth children.

Correspondence: Sarah Raz, Ph.D., Merrill Palmer Institute, Wayne State Univ, Merrill Palmer Institute, 71 E. Ferry St., Detroit, MI 48202. E-mail: sarahraz@wayne.edu

S.W. DUVALL, P. MACLEAN, S. ERICKSON & J. LOWE. Perinatal Medical Variables Predict Executive Function Within a Sample of Preschoolers Born Very Low Birth Weight (VLBW).

Objective: Executive function is an important ability that appears to be negatively impacted by premature birth and very low birth weight (VLBW). The purpose of the current study was to identify perinatal predictors of early executive dysfunction in preschoolers born VLBW.

Participants and Methods: 58 VLBW preschoolers completed executive function tasks measuring working memory, flexibility and inhibition (Dimensional Change Card Sort-Separated, Bear Dragon and Gift Delay Open). Relationships between EF and perinatal medical severity factors (gestational age, early respiratory difficulties (days on ventilation and CPAP), size for gestational age, maternal steroids and number of surgeries), chronological age and Full Scale IQ (FSIQ) were investigated.

Results: The perinatal medical variables, FSIQ and chronological age were used to predict executive function through stepwise linear regression. FSIQ, gestational age, chronological age, maternal steroids and size for gestational age predicted performance on the Dimensional Change Card Sort-Separated task. Performance on the Bear Dragon task was predicted by chronological age, FSIQ and early respiratory difficulties. Using logistic regression, the likelihood of passing the Gift Delay Open task was related to gestational age, size for gestational age, FSIQ and number of surgeries.

Conclusions: In this VLBW sample, gestational age, early respiratory difficulties, size for gestational age, maternal steroids and number of surgeries were related to executive function. By understanding the relationship between perinatal medical severity and preschool executive function outcomes we hope to be able to identify the children at highest risk for future executive dysfunction; which may lead to targeted early intervention services for VLBW children.

Correspondence: Susanne W. Duvall, MS, Psychology, University of New Mexico, 1 University of New Mexico, Logan Hall, Albuquerque, NM 87131. E-mail: swduvall@unm.edu

Symposium 14: Korsakoff's Syndrome Revisited with Neuroimaging and Translational Investigations

Chair: Rosemary Fama

Discussant: Edith Sullivan

10:45 a.m.–12:15 p.m.

R. FAMA & E.V. SULLIVAN. Korsakoff's Syndrome Revisited with Neuroimaging and Translational Investigations.

Symposium Description: This symposium presents transdisciplinary investigations of Korsakoff's Syndrome (KS) that provide leads to neural, metabolic, and genetic mechanisms underlying its antecedent conditions, notably Wernicke's encephalopathy (WE), and characteristic neuropsychological and neurological profiles. In the latter half of the 19th century, S.S. Korsakoff described a 'psychic disturbance' associated with cases of multiple neuritis caused by various conditions, ranging from chronic alcoholism to hyperemesis gravidarum. Since then, the abnormalities of KS have transcended all levels of neuroscience analysis. A variety of competing theories regarding the specific brain regions and neural circuitry involved have been long debated and will be reviewed. Recent studies using in vivo imaging capabilities and behavioral assessment applied in the human condition and animal models are newly elucidating specific neural circuitry degradation defining the disorder and will be highlighted.

Our session on KS will span neuroimaging, translational animal models, neuropsychological investigation of brain-behavior relations, and affected neural systems. Anne-Lise Pitel will review neuroimaging studies guiding theories of neural impairment and its underpinnings. Lisa Savage will address translational animal research, which allows longitudinal tracking of the development and resolution of WE and KS. Neuropsychological controversies involving mnemonic (Michael Kopelman) and nonmnemonic (Marlene Oscar-Berman) processes and underlying metabolic and genetic mechanisms of KS will be addressed. Recognition of frontal lobe and medial temporal lobe circuitry interactions in KS will be a theme throughout the session. The Discussion will consider the scope and limits of treatment and rehabilitative efforts available to patients with apparently intractable KS. Support: AA005965, AA010723, AA017168, and AA017923

Correspondence: Rosemary Fama, PhD, Department of Psychiatry and Behavioral Sciences, Stanford University School of Medicine, 401 Quarry Road, Stanford, CA 94305. E-mail: rfama@stanford.edu

A. PITEL, A. LEBERRE, F. EUSTACHE & H. BEAUNIEUX. Macrostructural Brain Abnormalities in Alcoholic Korsakoff's Syndrome.

Alcoholic Korsakoff's syndrome (KS), which results from the combination of alcoholism and thiamine deficiency, is characterized by a disproportionate impairment of episodic memory compared with other aspects of cognitive function. Early neuropathological studies suggested that thalamic nuclei and mammillary bodies neuropathology play a key role in the physiopathology of KS. More recent in vivo neuroimaging investigations confirmed volume deficits in thalamic and mammillary bodies in KS and revealed widespread cerebral damage affecting the frontal lobes and especially the nodes and connections of the frontocerebellar and limbic circuits. These circuits are also damaged in non-Korsakoff alcoholics (ALC). A direct comparison of macrostructural brain abnormalities in KS and ALC was conducted in several brain regions and revealed a graded effect of volume deficits, from mild in ALC to moderate or severe in KS, notably in the mammillary bodies, thalamus, hippocampus, and cerebellum. Whether the whole brain is more severely damaged in KS than in ALC has recently been examined. Considerable similarities were found in the regional distribution and severity of gray and white matter damage in ALC and KS, suggesting that

brain abnormalities observed in KS notably in the frontal lobes and cerebellum result from the neurotoxic effect of chronic alcohol consumption. Even though volume deficits were found in Papez's circuit in both patient groups, this circuit was more severely damaged in KS than in ALC. This in vivo brain structural finding corroborates the neuropsychological assumption that the main feature that distinguishes ALC and KS is the severity of episodic memory impairments.

Support: ANR retour Post-Doctorant 2010, Inserm, PHRC Korsakoff, Mildt, Conseil Regional de Basse-Normandie

Correspondence: *Anne-Lise Pitel, INSERM, Caen U923, France. E-mail: pitel@cyceron.fr*

L. SAVAGE. Impairment and Recovery of Cortical Function in a Translational Model of Korsakoff's Syndrome.

Thiamine deficiency in rodents recapitulates the biobehavioral sequelae of Korsakoff's Syndrome (KS) in humans. Although the thalamus and mammillary bodies are the primary sites of KS neuropathology, functional deactivation of certain cortical regions also contributes to the chronic cognitive dysfunction. We have begun to investigate the extent of the cortical neuropathology and whether cortical function can be restored in the rodent pyridoxamine-induced thiamine deficiency (PTD) model of KS. Both the frontal and retrosplenial cortical regions display a loss of cholinergic innervation, decreases in behaviorally-activated acetylcholine release, and reductions in neurotrophins and proliferating cells. Behavioral recovery can occur in the PTD model when an acetylcholinesterase inhibitor is infused in the frontal cortex but not the retrosplenial cortex. Strategically planned exercise improves neurotrophin levels and proliferating cells in both cortical areas. Exercise can also serve to initiate recovery of impaired spatial behaviors in the PTD model. These data point to the frontal cortex as a critical target for neurochemical or neurobehavioral modulation enabling recovery of cognitive abilities in human KS.

Support: NINDS 054272 and ARRA NINDS 054272 S1

Correspondence: *Lisa Savage, State University of New York, Binghamton, NY 13902-6000. E-mail: lsavage@binghamton.edu*

M.D. KOPELMAN & R. KESSELS. Aspects of Context Memory in the Alcoholic Korsakoff's Syndrome.

The Korsakoff's Syndrome (KS) is a memory disorder that usually emerges (although not always) in the aftermath of an episode of Wernicke's encephalopathy and in the context of chronic alcohol misuse. It is likely that those predisposed to this disorder have a specific genotype, although the precise nature of this genotype has not yet been identified, despite active research. The characteristic neuropathology includes neuronal loss, micro-haemorrhages, and gliosis in memory circuitry, particularly in the thalamus and mammillary bodies and commonly associated with frontal cortical atrophy. This combination of pathologies gives rise to the characteristic amnesic syndrome and is as-

sociated with an extensive retrograde amnesia, usually going back 20 to 25 years before the onset of the Wernicke episode. Since the 1980s, a disproportionate context memory deficit has been identified in Korsakoff amnesia by Mayes and others. More recently, Kessels and colleagues have investigated implicit aspects of context memory in KS. Inappropriate context-free retrieval also occurs in so-called 'spontaneous' confabulation, which is commonly seen during the Wernicke episode, but seldom in the chronic Korsakoff phase. This sign is associated with concomitant pathology within the orbitofrontal and ventromedial frontal brain regions.

Support: Wellcome Trust and NOW (Netherlands Organization for Scientific Research)

Correspondence: *Michael D. Kopelman, Kings College London, London WC2R 2LS, United Kingdom. E-mail: michael.kopelman@kcl.ac.uk*

M. OSCAR-BERMAN. Nonmnemonic Deficits in Korsakoff's Syndrome.

One of the most tragic of the possible legacies of chronic alcoholism is the severe neuropsychological condition, alcohol-induced persisting amnesic disorder, more commonly referred to as Korsakoff's Syndrome (KS). Although other etiologies are known, the condition often is associated with concomitant malnutrition. Alcoholic KS usually is preceded by a more acute, transient stage of neurological symptoms, which include confusion, impairments of consciousness, difficulties moving eye muscles, and problems with gross muscle control (collectively referred to as Wernicke's encephalopathy); this stage generally disappears with alcohol abstinence and good nutrition. The signature symptom of KS is anterograde amnesia, or memory loss for recent events, and putative brain damage is in diencephalic and medial temporal lobe structures. Overall intelligence, as measured by standardized IQ tests, usually remains intact. Preservation of IQ occurs because memories formed before the onset of prolonged heavy drinking — the types of information and abilities tapped by measures of Verbal IQ — remain preserved compared with memories recently acquired. However, clinical and experimental evidence has shown that neuropsychological dysfunction in alcoholic patients with KS includes nonmnemonic abilities, and further brain damage involves neocortical networks and the cerebellum. Among the impairments are the following: retarded processing of incoming information; reduced arousal; poor attention; difficulty with abstraction, problem-solving, and learning new materials; emotional abnormalities and disinhibitions; diminished sensitivity to the consequences of rewarded responses; and impaired visuospatial abilities. Here, we discuss the relation between nonmnemonic neurobehavioral impairments in KS and alcoholism-related brain damage.

Support: US Department of Health and Human Services NIAAA R01-AA07112 and K05-AA00219; US Department of VA Medical Research Service

Correspondence: *Marlene Oscar-Berman, Boston University, Boston, MA 02215. E-mail: oscar@bu.edu*

SATURDAY AFTERNOON, FEBRUARY 18, 2012

Paper Session 10: Psychopathology

Moderator: Shawn McClintock

12:30–2:00 p.m.

J.G. KEILP, M. GORLYN, A.K. BURKE, M.A. OQUENDO & J. MANN. Decomposing the Nature of Memory Impairments in Depressed Suicide Attempters.

Objective: Deficits in verbal list learning have been a consistent finding in our samples of depressed, medication-free suicide attempters (Keilp, et al, 2001; Keilp et al, in press). We undertook a trial-by-trial analysis of the Buschke Selective Reminding Task (SRT) to determine if these deficits primarily reflect impairment in encoding, retrieval, or retention.

Participants and Methods: Medication-free past suicide attempters with major depressive disorder (n=79) were compared to depressed non-attempters (n=112) and healthy controls (n=107). Individual trial data for all subscores of the SRT were analyzed via univariate and repeated measures ANOVA, adjusting for age and gender. Savings scores were also computed comparing delayed recall to acquisition scores on the final learning trial.

Results: Suicide attempters had the poorest overall performance on the SRT. Trial-by-trial analyses revealed that attempters had consistently lower recall throughout the learning phase of the test, primarily due to poorer Long Term Storage ($F[2,293]=5.21, p=.006$), most pronounced in the latter half of the learning phase, and excess reliance on Short Term Retrieval ($F[2,293]=3.62, p=.028$). Though Long Term Retrieval scores differed, the number of items forgotten from items successfully encoded into Long Term Storage was equivalent among groups ($F[2,293]=2.29, p=.10$). Suicide attempters' delayed savings scores, in turn, were comparable to other groups' (all p 's > .35).

Conclusions: Suicide attempters' poorer SRT performance was due to shallower encoding throughout the learning phase of the task and not to impaired retrieval or retention. Suicide attempters' deficits reflect a moderately diminished learning capacity, implicating frontal lobe circuitry. Correspondence: *John G. Keilp, Ph.D., Psychiatry/Molecular Imaging, Columbia U./NY State Psychiatric Institute, Box 42, NYSPI, 1051 Riverside Drive, New York, NY 10032. E-mail: jgk13@columbia.edu*

M. CULANG-REINLIEB, A.D. PERSAUD, J. PAGNOTTA, E. COHEN, M. PIMONTEL, D. SINGH, E. GARCON, B.R. RUTHERFORD, G.H. PELTON, D.P. DEVANAND, S.P. ROOSE & J.R. SNEED. The Neuropsychological Profile of MRI-Defined Vascular Depression.

Objective: Vascular depression (VD) has been proposed as a unique diagnostic subtype in late-life. The VD hypothesis proposes that cerebrovascular disease may predispose some geriatric depressive syndromes. This hypothesis is supported by the frequent occurrence of MRI hyperintensities in late-life depression, which are thought to disrupt frontal-subcortical systems. The goal of the current study was to characterize the neuropsychological profile of MRI-defined VD.

Participants and Methods: Forty men and women 50 years or older meeting DSM-IV criteria for nonpsychotic unipolar depression participated in this eight-week, open-treatment study. Neuropsychological testing and a brain MRI were performed at baseline. We hypothesized that patients with VD would exhibit worse performance on tests of information processing speed and executive functioning compared to patients with non-VD.

Results: Thirty-five patients received MRIs (M age=61.34±9.65; M years education=14.46±2.85; 40% White; 51% AA). T2-weighted MRI scans were evaluated for the presence of hyperintensities in the deep white matter (DWM) using the Coffey modified Fazekas Rating Scale. Patients with DWM lesions >=2 were classified as vascular depressed (n=14) based on previously published diagnostic criteria (Sneed, et al., 2008). Consistent with our expectations, group comparisons revealed that VD was associated with worse performance on all executive function measures (Trail Making Test B, Stroop Color-Word Test and Initiation/Perseveration subtest of the DRS-2) and on a measure of complex reaction time (Choice Reaction Time test); VD was also significantly associated with race (79% of VD patients were African American). In multivariate regression models, complex reaction time and some aspects of executive function (inhibition and initiation/perseveration) remained worse among the VD group after controlling for age and education.

Conclusions: MRI-defined VD is associated with frontal systems dysfunction that may reflect the underlying cerebrovascular pathology.

Correspondence: *Michelle Culang-Reinlieb, Graduate Center, CUNY, 250 Mercer Street, B1402, New York, NY 10012. E-mail: reinliebmg@gmail.com*

S. WEISENBACH, D. MARSHALL, A. WELDON, T. MIAL, K. RYAN, A. VEDERMAN, M. KAMALI, S. LANGENECKER & M. MCINNIS. The Double Burden of Age and Disease on Cognitive Functioning in Bipolar Disorder.

Objective: Despite knowledge of cognitive deficits in Bipolar Disorder (BD), few studies have investigated cognitive functioning in older adults with BD. This study examined the "double burden" of age and BD on cognitive performance and explored the extent to which clinical variables predict performance in BD.

Participants and Methods: Thirty-five older adult euthymic BD patients (M age 56) were compared with 47 young euthymic BD patients (M age 24) and with older (n=30) and younger age-matched healthy controls (n=49). Samples were drawn from the Prechter Longitudinal Study on Bipolar Disorder baseline assessment.

Results: A 2 (age group) X 2 (disease status) MANCOVA was conducted for eight cognitive factors, with education entered as a covariate. Pearson correlation analyses were performed in young and older BD groups separately, assessing relationships of cognitive performance with a number of clinical variables (e.g., number of hospitalizations, medication load). Results demonstrated a significant interaction of age and disease

status on Emotion Processing, Verbal Fluency with Processing Speed, and Processing Speed with Interference Resolution ($ps < .05$). There were independent effects of age and diagnosis on Fine Motor Functioning, Visual Memory, and Inhibitory Control ($ps < .05$). Age, but not diagnosis, impacted performance on Auditory Memory, and Conceptual Reasoning and Set-Shifting ($ps < .01$). Clinical variables did not strongly predict cognitive performance in older or younger BD patients.

Conclusions: There is a double burden of age and BD on executive functioning and emotion processing among individuals in the euthymic state, suggesting the accumulation of scar effects of disease and disease associated conditions over time.

Correspondence: *Sara Weisenbach, Ph.D., University of Michigan, 2303 Commonwealth Blvd., Suite C., Ann Arbor, OH 48105. E-mail: sarawrig@med.umich.edu*

W.D. KILLGORE, J.C. BRITTON, I.M. ROSSO, Z.J. SCHWAB, M.R. WEINER & S.L. RAUCH. Shared and Unique Patterns of Cortico-Limbic Activation Across Anxiety Disorders.

Objective: Exaggerated responsiveness of the amygdala and associated threat-related systems has been reported in a number of anxiety disorders, but no study has directly compared the activation of this neurocircuitry across multiple anxiety disorders simultaneously. Using a masked affect perception task, we compared brain activation patterns across 3 anxiety disorder groups, including post-traumatic stress disorder (PTSD), panic disorder (PD), specific animal phobia (SP), and healthy controls (HC) during functional magnetic resonance imaging (fMRI).

Participants and Methods: Sixty-five adults (15 PTSD; 14 PD; 15 SP; 22 HC) completed a series of backward masked facial affect perception tasks (fear, happy, neutral) while undergoing fMRI. Conditions were contrasted with one another and compared across diagnostic groups. Cortical and limbic search territories were interrogated at $p < .001$.

Results: For the masked fear versus neutral condition, anxiety disorders as a group showed significantly greater activation within the left amygdala and reduced activation within the vmPFC relative to HCs, even after controlling for depression scores. Paired comparisons showed that increased activation of the amygdala was common to all disorders, but decreased vmPFC was only evident for SP and PD groups. Notably, compared to SP, PD was associated with elevated responsiveness of the hippocampus and dorsal anterior cingulate cortex (dACC), while PTSD was associated with increased dACC activation. PD and PTSD did not differ.

Conclusions: The anxiety disorders studied here all share a common pattern of altered cortico-limbic functioning, regardless of diagnostic category, but also show some evidence of uniquely differentiating patterns within specific components of the identified neurocircuitry.

Correspondence: *William D. Killgore, Ph.D., Psychiatry, Harvard Medical School, Brain Imaging Center, McLean Hospital, 115 Mill Street, Belmont, MA 02478. E-mail: killgore@mclean.harvard.edu*

X. SHENG, A.S. BUCHHOLZ & D.J. SCHRETLEN. Correlates of Work Stability over the Preceding Year in Outpatients with Severe Mental Illness and Healthy Adults.

Objective: Severe mental illness (SMI) is associated with work disability, but the causes of this are unclear. Here we aimed to identify the person, disease, cognitive, and everyday functional characteristics that predict how many months a person worked during the preceding year in patients with SMI and healthy adults.

Participants and Methods: We examined predictors of work outcome in 909 adults with and without severe mental illness. On average, the study participants were 45 years old (SD=17), and they completed 14 (SD=3) years of schooling. They included slightly more women (54%) than men and more white (62%) than black adults. We used stepwise multiple regression to evaluate whether demographic variables (age, sex, race, marital status, education), possession of a driver's license (never, past, present), psychiatric illness (presence/absence of schizophrenia or bipolar disorder), estimated premorbid IQ, and current cognitive performance would predict the number of months participants worked in the preceding year.

Results: Psychiatric diagnosis, $t(617) = -9.18$, age, $t(617) = -6.29$, years of education, $t(617) = 5.04$, having a driver's license, $t(617) = 3.61$, and processing speed, $t(617) = 2.06$ all explained significant incremental variability in the number of months a person worked over the preceding year. The final model explained 28% of the variance in work outcome.

Conclusions: In this study, the presence of severe mental illness was found to be the single most powerful predictor of work outcome. Of the remaining predictors, age, years of education, and whether someone holds a valid driver's license all explained more variance than cognitive functioning in work outcome. These findings challenge the view that cognitive dysfunction is a common pathway to work disability in SMI.

Correspondence: *David J. Schretlen, Ph.D., Department of Psychiatry, Johns Hopkins University School of Medicine, 600 N. Wolfe Street, Meyer 218, Baltimore, MD 21287-7218. E-mail: dschret@jhmi.edu*

Paper Session 11: Pediatric Structural Neuroimaging

Moderator: Michelle McKerral

12:30–2:00 p.m.

A. LLOYD-DAVIES, E.A. WILDE, R. YALLAMPALLI, X. LI, Z.D. CHU, J.V. HUNTER, M.C. MACLEOD, L. EWING-COBBS, M.E. AITKEN, S. MULLINS & H.S. LEVIN. **Diffusion Tensor Imaging of Limbic Pathways and their Relation to Memory after Early Moderate to Severe Pediatric Traumatic Brain Injury.**

Objective: Memory disturbances, common following traumatic brain injury (TBI), may result from injury to limbic pathways. Using diffusion tensor imaging (DTI), we examined the cingulum bundles (CB), uncinate fasciculi (UF), and inferior longitudinal fasciculi (ILF) in children with and without TBI and analyzed the relation of imaging to verbal recall.

Participants and Methods: Twenty-one children (15M, 6F) aged 10–18 years who sustained moderate-to-severe TBI 5–15 years earlier and 18 uninjured children (13M, 5F) of comparable age and demographic background underwent DTI (quantitative tractography) on a 3T Philips MRI scanner and were administered the California Verbal Learning Test-Children's Version (CVLT-C).

Results: T-tests revealed no differences in fractional anisotropy (FA). Group differences were noted for apparent diffusion coefficient (ADC) in the left UF ($p=0.015$; Cohen's $d=0.96$) and left CB ($p=0.035$; $d=0.68$), and marginal differences in right ILF ($p=0.054$; $d=0.62$), CB ($p=0.07$; $d=0.60$) and UF ($p=0.014$, $d=0.53$) with the TBI group exhibiting higher ADC. Groups differed on total ($p=0.001$; $d=1.11$), short ($p=0.020$; $d=0.75$) and long ($p=0.04$, $d=0.65$) delay free recall. Correlations between DTI and memory in TBI subjects were noted for ADC of left UF and CB with total recall, and right CB, left CB, and right ILF with short delay, and left UF, right and left CB, and right and left ILF with long delay free recall (all r 's between -0.44 and -0.62 , all p 's < 0.05). Better performance was associated with lower ADC, which reflects greater white matter integrity.

Conclusions: Few studies have examined late cognitive and imaging sequelae of early pediatric TBI. Both TBI-induced memory and white matter changes in limbic pathways appear persistent.

Correspondence: *Elisabeth A. Wilde, Ph.D., Physical Medicine and Rehabilitation, Neurology and Radiology, Baylor College of Medicine, 1709 Dryden Rd., Ste 1200, Houston, TX 77030. E-mail: ewilde@bcm.edu*

J. FABER, E.A. WILDE, K. HANTEN, G. HANTEN, X. LI, M.C. MACLEOD, L. EWING-COBBS, M.E. AITKEN, S. MULLINS, Z.D. CHU, J.V. HUNTER & H.S. LEVIN. **Diffusion Tensor Imaging of the Hippocampus and Its Relation to Memory in Moderate to Severe Pediatric Traumatic Brain Injury.**

Objective: Memory disturbances, which are common following traumatic brain injury (TBI), may result from changes in the hippocampus. Using diffusion tensor imaging (DTI), we examined apparent diffusion coefficient (ADC) of the right and left hippocampi in relation to verbal recall in children with and without TBI.

Participants and Methods: Twenty-one children (15M, 6F) aged 10–18 years that who had sustained moderate-to-severe TBI 5–15 years earlier and 18 uninjured children (13M, 5F) of comparable age and demographic background underwent DTI on a 3T scanner and were administered the California Verbal Learning Test-Children's version (CVLT-C). DTI imaging of the hippocampus was performed using a region of interest analysis. We examined total recall, short and long delay free recall, long delay cued recall, and semantic- and serial-cluster ratios.

Results: No group differences were noted on demographic variables. T-tests revealed no differences in apparent diffusion coefficient (ADC) for the right or left hippocampus. However, groups differed on total recall ($p=0.001$; Cohen's $d=1.11$), short ($p=0.020$; $d=0.75$) and long ($p=0.042$; $d=0.65$) delay free recall and semantic-cluster ratio ($p=0.026$; $d=0.74$). There was no group difference for serial-cluster ratio ($p=0.142$, $d=0.46$). Correlations between DTI and memory performance in TBI subjects were noted for ADC of left hippocampus with long delay free recall ($r=-0.481$, $p=0.027$), long delay cued recall ($r=-0.494$, $p=0.023$), and serial-cluster ratio ($r=-0.568$, $p=0.007$). However, there were no significant correlations with ADC in the right hippocampus. Better performance on the CVLT-C was associated with lower ADC, as expected.

Conclusions: Few studies have examined cognitive and imaging sequelae of early pediatric TBI at a 5–15 year post-injury interval. TBI-induced memory dysfunction appears persistent, and correlates with DTI-derived ADC of the hippocampus. Region of interest analysis of the hippocampus may have the potential to serve as a predictor of memory impairment.

Correspondence: *Elisabeth A. Wilde, Ph.D., Physical Medicine and Rehabilitation, Neurology and Radiology, Baylor College of Medicine, 1709 Dryden Rd., Ste 1200, Houston, TX 77030. E-mail: ewilde@bcm.edu*

K. HANTEN, E.A. WILDE, J. FABER, G. HANTEN, X. LI, M.C. MACLEOD, S. MULLINS, M.E. AITKEN, L. EWING-COBBS, J.V. HUNTER, Z.D. CHU & H.S. LEVIN. **Perforant Pathway Diffusion Tensor Tractography and Its Relation to Verbal Recall in Children with Traumatic Brain Injury.**

Objective: Traumatic brain injury (TBI) often results in persistent deficits, even years post-injury. Memory difficulties are common, and may result from changes in white matter contributing to the perforant pathway (PP) and memory-related structures. We examined the structural integrity of the PP in children with and without TBI using diffusion tensor imaging (DTI), and verbal recall using the California Verbal Learning Test-Children's Version (CVLT-C).

Participants and Methods: Twenty-one children (15M, 6F) aged 10–18 years who had sustained moderate-to-severe TBI 5–15 years earlier and 18 uninjured children (13M, 5F) of similar age and demographic background underwent DTI on 3T MRI. Quantitative tractography was performed for the PP, and fractional anisotropy (FA) and apparent diffusion coefficient (ADC) were derived. CVLT-C long delay free (LDFR) and cued recall (LDCR), and serial-cluster ratio (SerCR) metrics were examined.

Results: T-tests revealed no group differences in FA or ADC for the right or left PP, though right PP FA was marginally lower in the TBI group ($p=0.103$, $d=0.51$). However, groups differed on LDFR ($p=0.042$; $d=0.65$) and were marginally different for LDCR ($p=0.076$, $d=0.57$). There was no group difference for SerCR ($p=0.142$, $d=0.46$). Spearman correlations between DTI metrics and recall in TBI subjects were sig-

nificant for LDFR and right ($r=-0.463$, $p=0.034$) and left ($r=-0.562$, $p=0.008$) PP ADC, and left PP FA ($r=0.667$, $p=0.001$). LDCR also correlated with left PP FA ($r=0.519$, $p=0.016$) and marginally correlated with right ($r=-0.406$, $p=0.068$) and left ($r=-0.411$, $p=0.064$) PP ADC. Finally, SerCR correlated with left PP ADC ($r=-0.547$, $p=0.010$). Better recall was associated with lower ADC and higher FA, which presumably reflect increased structural integrity.

Conclusions: The PP appears vulnerable to TBI-related injury, and DTI of the PP correlates with recall of verbally-based information. DTI may be a useful tool in identifying post-traumatic changes in tract fidelity.

Correspondence: *Elisabeth A. Wilde, Ph.D., Physical Medicine and Rehabilitation, Neurology and Radiology, Baylor College of Medicine, 1709 Dryden Rd., Ste 1200, Houston, TX 77030. E-mail: ewilde@bcm.edu*

R. YALLAMPALLI, E.A. WILDE, G. HANTEN, E.D. BIGLER, X. LI, S. SHAH, A.C. VASQUEZ, J.V. HUNTER, Z. CHU & H.S. LEVIN. Relation Between Iowa Gambling Task and White Matter Changes of the Ventral Striatum in Moderate to Severe Pediatric Traumatic Brain Injury.

Objective: Disturbances to reward response, decision-making, and executive functioning are commonly reported following moderate to severe traumatic brain injury (TBI). Such changes may be related to structural changes in the ventral striatum (VS), which has been implicated in the emotional and motivational aspects of decision-making and behavior, as well as a role in reward and positive reinforcement. Using diffusion tensor imaging (DTI), we examined changes in the VS in children with and without TBI and their relation to decision making as measured by the Iowa Gambling Task (IGT), which is based on risk and reward behaviors.

Participants and Methods: Eighteen children (7F, 11M) aged 9-16 years with TBI (mean GCS=8.41) and seventeen children (5F, 12M) with orthopedic injury underwent magnetic resonance imaging with DTI at 3 months post-injury (± 24 days) on a 3T Philips scanner and were administered the IGT. The groups did not significantly differ in age, handedness, ethnicity, post-injury interval, or Socioeconomic Composite Index. Quantitative tractography of the VS was performed using Philips PRIDE v4.1 software.

Results: Two-tailed t-tests revealed a significant group difference in fractional anisotropy (FA) of the right ($p=0.011$; Cohen's $d=0.90$) and left VS ($p<0.001$; Cohen's $d=1.33$), with the TBI group having lower FA. Additionally, significant group differences were noted for apparent diffusion coefficient (ADC) of the right ($p=0.04$; Cohen's $d=0.70$) and left VS ($p=0.03$; Cohen's $d=0.77$) with the TBI group demonstrating higher diffusivity. Spearman correlation demonstrated moderate relations between overall performance on the IGT (and ADC of the right ($r=-0.516$, $p=0.058$) and left ($r=-0.503$, $p=0.066$) VS in the TBI group, such that poor performance on the IGT was associated with greater diffusivity.

Conclusions: The ventral striatum appears vulnerable in TBI, and DTI may be a useful tool in examining post-traumatic changes to white matter structures, and their relation to decision-making and risk taking behaviors.

Correspondence: *Ragini Yallampalli, M.A, PM&R, Baylor College of Medicine, 1709 Dryden, Suite 1200, Houston, TX 77025. E-mail: ragini.sanyal@gmail.com*

K.W. AYOUB, E.A. WILDE, E.D. BIGLER, J.V. HUNTER, Z.D. CHU & H.S. LEVIN. Novel Longitudinal Vertex Analysis and Diffusion Tensor Tract-Based Spatial Statistics Reveal Evolving Subcortical Structural Changes in Patients with Traumatic Brain Injury.

Objective: Traumatic brain injury (TBI) is the leading cause of disability in children, yet little is known about TBI-induced changes to the structural and functional integrity of the pediatric human connectome. This study examines structural alteration in the hippocampi and thalami with a vertex-based approach not previously applied in TBI. We also examine the relation of these alterations to diffusion tensor imaging (DTI) indices in the surrounding white matter.

Participants and Methods: Subjects with moderate-to-severe TBI ($n=20$) and orthopedic-injury (OI) controls ($n=21$) between the ages of 7-17 years underwent DTI and T1-weighted 3D MRI at 3 and 18 months post-injury. DTI was analyzed using tract-based spatial statistics (TBSS) and volumetric data were analyzed using a vertex-based analysis, which can quantitatively determine location and degree of change within a structure and alteration in size, shape, and orientation of that structure. Between- and within-group analyses were performed.

Results: Vertex-based analysis demonstrated areas of minor increase and decrease in volume within aspects of the hippocampi and thalami in the within-group analysis for the OI group. Notably, the TBI subjects did not exhibit the same pattern of change on within-group analyses. Between-group analyses at 18 months revealed widespread differences in the rotation, shape and volume of the hippocampi and thalami. Regions where the two structures exhibited rotational, translational, or volumetric changes were examined in connection with changes in the diffusion indices from the TBSS analysis.

Conclusions: This study employed a novel multi-modal approach to analyzing TBI-induced structural change in the developing brain. Moderate-to-severe TBI may induce significant microstructural alteration in subcortical gray and white matter as seen by vertex analysis and TBSS. These results encourage closer investigation of the structural and functional connectomes in patients with TBI to improve clinical management and intervention.

Correspondence: *Kareem W. Ayoub, B.S. Bioengineering, Rice University, 6100 Main Street, Houston, TX 77005. E-mail: kwa1@rice.edu*

**Paper Session 12:
Cognitive Functioning in Epilepsy**

Moderator: Shawn Gale

12:30–2:00 p.m.

C. BECK DUNN, G.Z. RECKESS, R.M. BAUER, C.M. LEONARD, J.E. JONES, K. DABBS, B.P. HERMANN & M. SEIDENBERG. Age of Onset of Temporal Lobe Epilepsy Partially Mediates the Relationship between Gross Sulcal Morphology and Item Visual Memory.

Objective: The anterior temporobasal surface of the brain prominently features the collateral (CS) and rhinal (RS) sulci. Previous research conducted by our group showed a relationship between a CS-RS connection in the right hemisphere and poorer performance on a measure of item memory (Reckess et al, 2010) and with early age of disease onset (Beck et al, 2010) in individuals with temporal lobe epilepsy (TLE). We therefore hypothesized that age of onset mediates the relationship between sulcal morphology and memory.

Participants and Methods: Participants included 79 (23 male) individuals diagnosed with complex partial seizures with definite or probable origin in the temporal lobe (mean age = 35.8 ± 10.6 years). Square-root transformation was used to improve normality of the age of onset variable. Mediation was tested using the Preacher and Hayes (2008) SPSS script for indirect effects.

Results: Age of onset partially mediated the relationship between the presence of a CS-RS connection in the right hemisphere and performance on the Faces Delayed subtest of the WMS-III, controlling for WAIS-III IQ (indirect effect of age of onset= $p<.05$).

Conclusions: A CS-RS connection in the right hemisphere of temporal lobe epilepsy patients is related to poorer visual item memory performance, and this relationship is partially mediated by age of onset. These results may lend support to the theory that presence of a CS-RS connection could be a neurodevelopmental risk factor for TLE and suggests that its effect on cognition may at least partially act through decreasing the age of onset of disease.

Correspondence: *Callie Beck Dunn, M.S., University of Florida, PO Box 100165 HSC, Gainesville, FL 32610. E-mail: cbeck@ufl.edu*

D. LADOWSKI, S.J. BANKS, M. JONES-GOTMAN & V. SZIKLAS. Lateralized hippocampal activations during fMRI verbal and non-verbal learning tasks correlate with performance on material-specific memory tasks performed in the clinic.

Objective: fMRI is increasingly being used to probe memory in patients with temporal lobe epilepsy (TLE). However, fMRI memory tasks are generally quite different in format and content from tests used in clinical assessment of memory. Furthermore, the stimuli used are often dually encodable, and do not probe material specific memory, which is of particular interest in unilateral TLE. We have developed parallel verbal and nonverbal list encoding and recognition tests that create isolated increases in activation (relative to baseline) in the left and right medial temporal lobes, respectively, during fMRI. We sought to examine whether signal change in regions of interest within the hippocampi in patients with TLE was related to performance on memory tests administered in the clinical setting.

Participants and Methods: The fMRI protocol assesses learning and retention. It has two encoding trials, each followed immediately by a recognition trial, and after a ten minute distraction, a delayed recognition trial. This fMRI protocol is highly similar to some tests used in our clinic. Stimuli are pseudowords and abstract designs aimed to accurately capture verbal and nonverbal memory, respectively.

Results: In patients with left TLE, we found that more activation in the left hippocampus during initial recognition of a pseudoword list was associated with higher scores on a story learning and a word list learning task completed in the clinic. For patients with right TLE, higher activations on the right during our fMRI design learning task correlated with an abstract design list task completed in the clinic.

Conclusions: These results suggest that our fMRI memory tasks are probing similar functions as the clinically used tasks, and that in both cases the tasks are a reflection of lateralized hippocampal exertion. This is encouraging in terms of future application of our protocol for assessment of hippocampal integrity.

Correspondence: *Sarah J. Banks, PhD, Montreal Neurological Institute, 3801 University, Montreal, QC H2W2B1, Canada. E-mail: sarahjlbanks@hotmail.com*

L. SEPETA, L. CROFT, L. ZIMMARO, W. GAILLARD & M. BERL. Hippocampal Connectivity in Typically Developing Children and Children with Focal Epilepsy.

Objective: In epilepsy patients, language functioning may be affected after surgical intervention targeting the hippocampus, suggesting that the hippocampus is functionally connected to the language network. We examined the functional connectivity (fcMRI) between the hippocampal formation (HF) and frontal and temporal language regions in a pediatric epilepsy population.

Participants and Methods: We examined children with focal epilepsy and normal MRI (n=45; mean age=8.4; SD=2.4) and healthy controls (n=65; mean age=8.7; SD=2.6). We used region of interest (ROI) based linear correlation coefficients to assess functional connectivity during an auditory description decision task. In addition to the HF ROI, five ROIs that are established as part of the language network were selected: anterior temporal lobe (aTL), middle temporal lobe (mTL), posterior temporal lobe (pTL), temporal pole (TP), and pars orbitalis (PO). Time series data for each subject were extracted for the left ROIs and their right homologues.

Results: There was a main effect of region ($p=0.000$), but no effect of group ($p=0.884$) or two-way interaction ($p=0.172$). Across both groups, the strongest functional connectivity was between left and right HF ($r=0.76$). Functional connectivity between the HF and frontal language areas was less strong (r range: 0.25 to 0.36) than connectivity between the temporal language areas and the ipsilateral HF, particularly with the aTL, pTL, and mTL (r range: 0.46 to 0.53).

Conclusions: We found that the HF is functionally connected to traditional language processing areas, with greater synchrony between temporal compared to frontal regions of the language network. Strength of connectivity was not diminished in epilepsy patients compared to their typically developing peers. The preservation of connectivity in spite of having a disease that impacts the network may explain why language difficulties ensue following a resection. An important future study would include patients with known mesial temporal sclerosis.

Correspondence: *Leigh Sepeta, Children's National Medical Center, 15245 Shady Grove Road, Suite 350, 15245 Shady Grove Road, Suite 350, Rockville, MD 20850. E-mail: lsepeta@cnmc.org*

G.P. LEE, S.H. LEE, K.M. VINER LESTER, M.J. COHEN & Y.D. PARK. Predictors of Nociferous Cortex in Children with Intractable Temporal Lobe Epilepsy.

Objective: Nociferous cortex is a region of dysfunctional brain causing abnormal cognition that is distant from the site of an epileptogenic lesion. Cognitive impairment is thought to be due to the repetitive propagation of abnormal electrical discharges from the epileptic focus to the distal site. Since little is known about factors that contribute to the development of distant nociferous cortex, we compared 43 children, with and without cognitive signs of frontal nociferous cortex, who underwent anterior temporal lobectomy for the relief of refractory epilepsy.

Participants and Methods: Nociferous children (mean age = 14.2 yrs) consisted of 23 youngsters (15 male, 8 female) who showed executive dysfunction on Wisconsin card sorting or associative word fluency. Non-nociferous children (mean age = 14.9 yrs) consisted of 20 children (10 males, 10 females) who performed normally on these tests of executive function. Seizure history variables (i.e., age of onset, duration of illness, seizure etiology), neuroimaging, post-surgical neuropathology, and seizure surgery outcome were compared to determine which variables were most important in predicting the presence of frontal nociferous cortex.

Results: Although nociferous children generally had an earlier age of onset (6.8 yrs vs. 8.5 yrs) and longer duration of seizures (7.8 yrs vs. 6.4 yrs), these differences were not significant. More nociferous (89%), than non-nociferous (11%), children had a history of febrile seizures ($p = .001$). Nociferous children also showed more frequent (79%) mesial temporal lobe sclerosis on postoperative pathology than non-nociferous youngsters (21%) ($p = .02$). There were no significant group differences on any of the other seizure history, MRI, pathology, or surgery outcome variables.

Conclusions: Results suggest early febrile seizures and mesial temporal lobe sclerosis may predispose intractable, childhood-onset epilepsy patients to develop frontal nociferous cortical abnormalities by the time of adolescence.

Correspondence: *Gregory P. Lee, PhD, Neurology, Medical College of Georgia, 1120 15th Street, Augusta, GA 30912. E-mail: glee@georgiahealth.edu*

C.C. STEWART. The Influence of Side of Seizure Focus, Age of Seizure Onset, and Handedness on fMRI Language Lateralization in Temporal Lobe Epilepsy Patients.

Objective: Atypical (rightward) language lateralization in epilepsy patients has been associated with left hemisphere seizures, earlier age of seizure onset, and weaker right-hand dominance. The influence of all of these factors, however, has not been examined simultaneously in a large sample using fMRI.

Participants and Methods: The TLE sample consisted of 52 right-handers and 23 non-right-handers. The fMRI language protocol consisted of a semantic decision (linguistic) task contrasted against a tone decision (control) task. A laterality index (LI) was calculated using suprathreshold voxel counts in each hemisphere. LIs were compared via independent t-tests. The percentage of atypical language lateralization ($LI < 20$) within subgroups is also included for descriptive purposes.

Results: Atypical language lateralization was more prevalent among patients with left-sided seizures (31%) than those with right-sided seizures (0%; $p < .001$). Among the left TLE group, atypical language lateralization was more prevalent in non-right-handers (50% vs. 25%; $p < .05$) and in patients with precipitating injuries or seizures starting before age 5 (46% vs. 21%; $p < .05$). Among 9 patients with left TLE, non-right-handedness, and precipitating injuries or seizures before age 5, 44% had atypical language dominance and another 33% showed a trend towards atypical lateralization (i.e., $LI < 30$).

Conclusions: Atypical language lateralization was most prevalent in non-right-handers with left TLE, presumably because these patients suffered early left hemisphere injuries or seizures resulting in “pathological” left-handedness and rightward language reorganization. Studies excluding left-handers likely underestimate the prevalence of atypical language in the overall epilepsy population.

Correspondence: *Christopher C. Stewart, Ph.D., Neurology, Medical College of Wisconsin, 9200 W. Wisconsin Ave., Milwaukee, WI 53226. E-mail: cstewart@mcw.edu*