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6 The Relationship Between Inhibitory Control Impairment in Social Disinhibition Following Severe Traumatic Brain Injury

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Objective: Inhibitory control impairment is highly prevalent following traumatic brain injury (TBI). There have not been any empirical investigations into whether this could explain social disinhibition following severe TBI, i.e. socially inappropriate behaviour of verbal, physical or sexual nature. Further, social context has proven to be important in studying social disinhibition and using a social version of an established task for the assessment of inhibitory control may provide a new perspective. Therefore, the objectives of this research study were to investigate the role of inhibitory control impairment in social disinhibition following severe TBI, using a social and a non-social task. We hypothesized that people with TBI and clinical levels of social disinhibition would perform worse on both task versions, when compared to those with low disinhibition levels. Further, we hypothesized that participants high on social disinhibition would perform worse on the social, when compared to the non-social version.
Participants and Methods: We conducted a between-group comparative study. Twenty-six adult participants with severe TBI were matched with 27 adult, healthy controls based on gender, age and education. Frontal Systems Behavior Scale and Social Disinhibition Interview were used to assess social disinhibition. A computerized task based on the cued go/no-go paradigm was used to assess inhibitory control. We included two versions of this task – a coloured (non-social) Go/No-Go with different colored rectangles, and an emotional (social) Go/No-Go with emotional faces serving as ‘go‘ and ‘no-go‘ cues. Two-way mixed ANCOVAs were used to test between-group differences in errors of commission and response speed.
Results: Unexpectedly, the TBI and the control group did not significantly differ on their levels of depression, anxiety, stress, or their level of social disinhibition. Overall, participants were slower ($F(1,47) = 15.212$, $p<.001$, $\eta p2 = .245$) and made more errors of commission on no-go trials ($F(1,44) = 11.560$, $p = .001$, $\eta p2 = .208$) on the social Go/No-Go task. There was no main effect of participants‘ brain injury status on errors of commission on no-go trials or mean reaction times. When categorized based on disinhibition level (high vs low), participants in the high-disinhibition group made more errors on the social task ($F(1,41) = 4.095$, $p = .050$, $\eta p2 = .091$) than those in the low-disinhibition group, and more errors on the social, compared to the non-social task (task-group interaction ($F(1,41) = 7.233$, $p = .010$, $\eta p2 = .150$)).
Conclusions: Based on these initial results, social disinhibition is associated with inhibitory control impairment, although this is only evident when a social inhibitory control task is used for assessment. We did not find any relationship between social disinhibition and the speed with which people react to stimuli. The results of this study add to the conceptualization of social disinhibition that is commonly present after severe TBI.

Categories: Social Cognition
Keyword 1: disinhibition
Keyword 2: inhibitory control
Keyword 3: traumatic brain injury
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Paper Session 06: Epilepsy related topics

2:15 - 3:45pm
Thursday, 2nd February, 2023
Town & Country Ballroom D

Moderated by: Natasha Ludwig

1 Network Efficiency as Structural Reserve: Pre- And Post-Operative Associations Between Network

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Organization and Memory in Temporal Lobe Epilepsy

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Objective: Memory impairment is a common comorbidity in individuals with temporal lobe epilepsy (TLE). Further, in medication-resistant epilepsy the frontline option, neurosurgical epileptogenic zone destruction, places memory at significant risk. Research has highlighted that TLE causes whole-brain network efficiency disruption, but it is not established how this may explain pre- and post-surgical cognition. Here we examine whether white matter structural network organization predicts pre-operative memory function and/or risk for post-operative memory decline.
Participants and Methods: Patients with drug-resistant TLE were recruited from two epilepsy centers in a prospective longitudinal study. The pre-operative sample included 51 individuals with left TLE (L-TLE), 52 with right TLE (R-TLE), and 57 healthy controls who underwent T1- and diffusion-weighted MRI (dMRI), and neuropsychological tests of verbal and visual memory. Forty-four patients (n=21 L-TLE) subsequently underwent temporal lobe surgery (36 anterior temporal lobectomy; 7 stereotactic laser amygdalohippocampectomy; 1 amygdalohippocampectomy) and completed post-operative memory testing. Whole-brain connectomes were generated via diffusion tractography and analyzed using graph theory, focusing on network integration (*path length*) and specialization (*transitivity*). In the pre-operative dataset, first we compared TLE versus controls with analysis of covariance (ANCOVAs) controlling for age. Next, linear regressions examined the association between memory scores and network efficiency between L-TLE, R-TLE and controls. In the post-operative sample, bivariate correlations examined the association between pre- to post-operative memory change and 1) global network efficiency and 2) asymmetry of mesial temporal efficiency (i.e., local efficiency of the hippocampal, parahippocampal, and entorhinal nodes). Finally, efficiency metrics were entered into stepwise regressions along with established predictors of memory decline.
Results: Compared to controls, TLE showed longer path length ($p < .05$; $\eta_p^2 = .03$) and lower transitivity ($p = .01$; $\eta_p^2 = .04$). Pre-operatively, better verbal learning and memory were associated with both shorter path length (β = -0.23 to -0.32; $ps_{adjusted} < .05$) and increased transitivity (β = 0.20 to 0.31; $ps_{adjusted} < .05$). These associations were greater in L-TLE than R-TLE (i.e., a significant interaction; β = -0.29 to 0.25; $ps_{adjusted} <.05$). Post-operatively, global metrics predicted decline on list learning for L-TLEs (rs = -.57 to .58; ps < .01), and were marginal on list recall (rs = -.42 to .40; ps < .10). Leftward asymmetry of mesial temporal local efficiency predicted greater decline across most verbal memory measures for L-TLE (rs -.47 to -59; $ps_{adjusted} <.05$), but not R-TLE. Asymmetry of mesial network efficiency uniquely explained at least 20 to 43% of the variance in list learning, recall, and story learning for L-TLE, outperforming hippocampal asymmetry and pre-operative score ($ps_{adjusted} <.05$).
Conclusions: Our findings suggest that global white matter network abnormalities contribute to verbal memory impairment pre-operatively and vulnerability to decline post-operatively in L-TLE. Asymmetry of a predefined mesial temporal sub-network may help predict post-operative memory function following left temporal lobe surgery, such that greater efficiency in the to-be-resected mesial temporal network may be an important risk factor for decline. Our findings extend the importance of network approaches in TLE to include the relationships between neurobiological networks and memory function.

Categories: Epilepsy/Seizures
Keyword 1: epilepsy / seizure disorders
Keyword 2: neuroimaging: structural connectivity
Keyword 3: memory disorders
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2 Cross Cultural Application of the International Classification of Cognitive Disorders in Epilepsy (IC CoDE)*Cognitive Phenotypes in People with Temporal Lobe Epilepsy in India*

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