Assessment and Rehabilitation of Social Cognition Impairment after Brain Injury: Surveying Practices of Clinicians

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Objectives: This study examined the current assessment practices of clinicians working with people with social cognition impairment following traumatic brain injury.

Method: Two hundred and sixty clinicians completed an on-line survey that was disseminated through professional brain injury organisations. Of respondents around 90% were allied health clinicians, with the remainder comprising medical, nursing and academia.

Main outcomes: The four areas of social cognition that were routinely assessed across the disciplines were *insight, disinhibition, anger* and *social adjustment*. The least routinely assessed areas were *theory of mind* and *alexithymia*. The test suggested most likely to identify social cognition impairments was The Awareness of Social Inference Test, although only 8% of clinicians responded to this question. Clinicians preferred *informal assessment* methods over *standardised assessment* methods for identifying social cognition rehabilitation goals. Higher levels of education were associated with greater use of standardised assessment modalities. Whilst there was paucity of responses overall, TBI Express was most commonly used for social cognition rehabilitation.

Conclusions: Considering the high prevalence of social cognition impairments in this population, formal assessment is extremely limited. The under-utilisation of assessment tools is problematic for the assessment and rehabilitation initiatives offered to people with TBI. These results have implications for the training of clinicians working in brain injury rehabilitation.

Keywords: Traumatic brain injury, survey, clinician, staff, social cognition, social function, assessment, assessment practices, evidence-based practice

Introduction

Moderate to severe traumatic brain injuries (TBI) cause multi-focal and diffuse neuropathology throughout the cerebrum with volume loss concentrated in the frontal and ventral cortices, with attendant white matter shearing (Bigler, 2001). Damage to these regions often leads to impairments in social cognitive functioning. Social cognition is a relatively new construct which refers to the ability to identify and interpret social cues (such as facial expressions) in order to make sense of the behaviour of others and to respond appropriately

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(McDonald, 2013). The first empirical reports of impaired social cognition after TBI were published in the 1980s (e.g., Jackson & Moffat, 1987) and did not gain much traction until after the year 2000. However, there is now substantial evidence to suggest that people with severe TBI have a range of social cognitive difficulties including reduced empathy (de Sousa, McDonald, & Rushby, 2012), alexithymia (Williams et al., 2001), changes in the ability to detect emotions from others' faces (Milders, Ietswaart, Crawford, & Currie, 2008) and tone of voice (Schmidt, Hanten, Li, Orsten, & Levin, 2010); and reductions in the ability to infer the thoughts and intentions of others (theory of mind) (Milders et al., 2008). Problems with apathy (Starkstein & Pahissa, 2014), disinhibition (Osborne-Crowley, McDonald, & Rushby, 2016) and emotion regulation are also directly related to social cognition (McDonald, 2013).

Impairments such as these have a profound impact upon the ability of the person with TBI to successfully reintegrate into their community. Even 5 years post injury, social changes are seen to be the most debilitating for the person and their family (Brooks, Campsie, Symington, Beattie, & McKinlay, 1986; Brooks & McKinlay, 1983; McKinlay, Brooks, Bond, Martinage, & Marshall, 1981; Tate & Broe, 1999). Indeed, these changes in social functioning likely lead to subsequent social withdrawal and social isolation for the person with brain injury (e.g., see Corrigan et al., 2014; Tate, Lulham, Broe, Strettles, & Pfaff, 1989; Temkin, Corrigan, Dikmen, & Machamer, 2009). Social cognitive impairments are, consequently, a critical target for remediation.

Reflecting the complex mix of impairments experienced as a result of severe TBI, hospitalisation and rehabilitation involves multiple assessments of injury sequelae by medical and allied health staff with the aim of identifying impairments and developing an effective rehabilitation plan (Jackson & Davies, 1995). Clinicians comprising the rehabilitation team include rehabilitation doctors, nurses, occupational therapists, speech and language therapists, psychologists, physiotherapists, social workers, return to work specialists and dieticians (Embling, 1995; Jackson & Davies, 1995; National Institute of Health, 1999). All of these clinicians engage in a specific role for meeting the person's rehabilitation goals, however, this can vary from team to team and is unique to the individual patient and their stage of recovery (New Zealand Guidelines Group, 2006). While many rehabilitation goals (e.g., return to work, independent living) are likely to be multidisciplinary, assessments of the individual's strengths and weaknesses are typically undertaken by one or more clinicians

using the tools with which they are trained and familiar with. These tools vary from discipline to discipline and as such, assess skills and abilities that can be specific to the practice of that discipline, but that may also overlap with that of other disciplines. This raises questions as to who takes responsibility for assessing social cognition following TBI and how this is achieved.

An international survey of approximately 420 clinicians was conducted to determine their view of the incidence of social cognition impairments following TBI and who was responsible for its assessment (Kelly, McDonald, & Frith, 2016). The vast majority of clinicians reported a high incidence (50% or more) of social cognitive problems in their clients as reported by the client him/herself, or their family. Despite this, routine assessment of social cognition was not the norm. While insight, anger and disinhibition were routinely assessed by 31–42% of respondents, other facets such as recognition of face identity and expression, prosody and theory of mind were assessed by 12% or less. Clinicians from the various disciplines also commented on who they felt were responsible for such assessments. While clinical psychologists, neuropsychologists, speech and language pathologists and occupational therapists were identified as the relevant clinicians, these same professions referred to each other rather than themselves as the person most responsible. Thus, there is a clear lack of consensus with respect to who should conduct social cognitive assessments. Partly, this may reflect the possibility that social cognition is not seen as a unitary construct with various strands being relevant to different disciplines, yet with no clear demarcation. Thus, certain professions may claim facets of social cognition but not others as falling within their domain of expertise. Determining this was one of the aims of the current study.

In addition, it is unclear how social cognition assessments are being undertaken. Tools used for the assessment of social cognition impairment are many and varied, and often are borrowed from work done in other clinical populations such as those with Autism Spectrum Disorder (ASD: e.g., Autism Diagnostic Interview-Revised: Lord, Rutter, & Le Couteur, 1994) or Schizophrenia (e.g., Assessment of Interpersonal Problem Solving Skills: Donahoe et al., 1990). Tools for assessing social cognition also vary in objectivity from skills-based assessments of function, to observation schedules, and self- and informant-reports. In a literature search, 60 different tools were identified that assessed various aspects of social function. Of these, 19 were behavioural assessments (e.g., 'name the emotion the person is displaying'), six were observational (clinician observes

behaviour and rates) and 35 were self-/informant-report surveys or questionnaires. The evidence for the reliability and validity of these tools varied greatly as did their origin and purpose. Many were predominately used in research rather than clinical settings, and many were for the assessment of developmental disorders such as ASD rather than acquired impairments. What we do not know, is the pattern of use for such assessments in examining social cognition clinically in the TBI population and whether there is an evidence-base for this practice. By examining a cohort of clinicians from Australia, this study aimed to elucidate the pattern of usage of social cognition assessments and remediation practices by clinicians within a single country.

The scarcity of suitable assessment tools of social cognition also presents a major challenge for the remediation of social cognition impairments as this relies on demonstration of pre–post intervention changes in function. Remediation programs that target multiple facets of social cognition are scant. There are a few published programs targeting emotion perception from facial expressions (Guercio, Podolska-Schroeder, & Rehfeldt, 2004; McDonald, Bornhofen, & Hunt, 2009; Neumann, Babbage, Zupan, & Willer, 2014; Radice-Neumann, Zupan, Tomita, & Willer, 2009) and tone of voice (McDonald et al., 2013). Additionally, there are conference proceedings reporting on targeting theory of mind in combination with emotion perception, emotion regulation and attribution bias (Spikman, 2016; Winegardner, Prince, & Keohane, 2015). A recent review of this literature highlighted the need for comprehensive, evidence-based social cognition remediation programs (Cassel, McDonald, Kelly, & Togher, 2016). This paucity of evidence-based programs leaves clinicians ill equipped for managing social problems, and no doubt lack of consensus on what service provision should look like for people with TBI and social cognition impairment.

In order to provide insight into how social cognition is typically being assessed in TBI rehabilitation and by whom, the following study reported on the findings of a survey of clinicians working in brain injury rehabilitation in Australia. These clinicians represented a subset of the international survey reported elsewhere (Kelly et al., 2016). While the international study provided information about the domains of social cognition being assessed and the barriers to this type of assessment, the aim of the current study was to provide an in-depth examination of clinicians within Australia, in order to identify the frequency that various domains of social cognition were assessed by the various disciplines working in brain injury assessment and rehabilitation, the tools and procedures that are commonly used to assess and rehabilitate social cognition and the factors that may influence this.

Methods

Survey Development

Survey items were developed using the following strategies: (1) A review of the literature pertaining to the assessment and rehabilitation of social and emotional behaviour following TBI in both clinical and research settings, (2) Identification of tools available for purchase through commercial publishing companies, (3) Compilation of list of tools identified from (1) and (2), (4) Consultation with a multidisciplinary brain-injury rehabilitation team to identify any other discipline specific tools that had been missed, (5) Consultation with a research group with expertise in social cognition impairment following TBI. Table 1 presents social cognition assessment tools identified during this process.

The survey was then constructed, together with the addition of questions targeting demographic data, with input from the co-investigators (MF: Speech and language pathologist, SM: Clinical Neuropsychologist) and piloted with clinicians to ensure item clarity and appropriateness of survey length. The majority of survey questions were designed as fixed-responses with an 'other' response option to allow for a text response. This style of question was chosen to decrease time demands on survey respondents. Demographic information collected included location of practice, role employed, level of qualification, employment setting (private/public/inpatient/community), years of experience in TBI rehabilitation, hours per week spent working in TBI rehabilitation and via what source they received the survey. Other descriptive information included the population (child/adult/older adult) that the clinician predominately worked with and the severity level of the population (multiple response option available).

Questions thereafter focused on assessment and rehabilitation practises. The majority of these questions were also fixed-anchor points, for example, clinicians were asked to indicate the frequency with which they utilised a number of different clinical tools for the assessment of social cognition impairment on a scale; infrequently (1–15% of clients), somewhat frequently (16–25% of clients), frequently (26–50% of clients), very frequently (51–75% of clients) and routinely (>75% of clients). Other questions covered opinions regarding the most useful method of assessment and targets of assessment for goal setting for social

TABLE 1

List of Measures Identified in the Literature as used to Measure Social Cognition

Behavioural test with normative data

Name	Abbreviation	Source	Description
Assessment of social context test	ASCT	Hynes, Stone and Kelso (2011)	A video-based task assesses comprehension of social non-verbal context, including identification of emotions, intentions and attitudes.
Awareness of interoception test	AIT	Hynes et al. (2011)	Animation-based task that measures ones' ability to apply a social interpretation to stimuli.
Behavioural assessment of the dysexecutive syndrome	BADS	Wilson, Alderman, Burgess, Emslie and Evans (1996)	Battery of six tests requiring planning initiation, monitoring and regulation of behaviour. Included is the DEX, a self-/informant-questionnaire with 20 items sampling emotional, motivational, behavioural and cognitive domains in everyday life.
Child and adolescent social perception measure	CASPM	Magill-Evans, Koning, Cameron-Sadava and Manyk (1995)	Ten videotaped scenes, each of which lasts 19–40 seconds. Children are shown the scenes and then questioned about the emotions portrayed.
Context test of emotion	CTE	Braun, Baribeau, Ethier, Daigneault and Proulx (1989)	Task consisted of correctly identifying the appropriate emotion for each of 36 brief verbal narratives representing contexts.
Developmental NEuroPSYchological assessment (subtest – theory of mind)	NEPSY – theory of mind	Korkman, Kirk and Kemp (2007)	Two tasks (1) verbal (2) contextual involving images and text.
Developmental NEuroPSYchological assessment (subtest affect recognition)	NEPSY – affect recognition	Korkman et al. (2007)	Four tasks matching emotional expressions from photos.
Diagnostic assessment of verbal accuracy	DANVA	Nowicki and Duke (1994)	Recognition of emotions displayed by children and adults in the domains of (1) faces, (2) voices and (3) posture.
Emotion recognition scales	ERS	Dyck, Ferguson and Shochet (2001)	Measures ability to understand emotion in pictures and text. Subtests include facial cues, unexpected outcomes, comprehension, emotion and vocabulary.
Emotions and conversations task	ECT	Turkstra, McDonald and DePompei (2001)	A social cognitive task that measures theory of mind, video vignettes of conversation and emotions.
Facial expression of emotional stimuli: stimuli and tests	FEEST	Young, Perret, Calder, Sprengelmeyer and Ekman (2002)	Two tests of emotion identification (1) The Ekman 60 Faces Test and (2) The Emotion Hexagon Test. Uses morphed images (blends from one emotion to another).Total scores in each test are assessed.

TABLE 1

Continued

Behavioural test with normative data Name	Abbreviation	Source	Description
Faux pas reasoning test	FPRT	Stone, Baron-Cohen, Calder, Keane and Young (2003)	Series of 10 texts describing a situation encompassing a faux pas. Comprehension of the faux pas is tested with five questions.
Florida affect battery	FAB	Bowers, Blonder and Heilman (1991)	Ten modality-specific subtests including, identity discrimination, facial affect discrimination, naming, selection and matching and prosody discrimination.
Hinting task	HintT	Corcoran, Mercer and Frith (1995)	Series of text vignettes probing the ability to understand hints.
Independent living scales (social adjustment subscale)	ILS	Loeb (1996)	Measures cognitive skills for independent living.
Japanese and caucasian faces expressions of emotion	JACFEE	Matsumoto and Ekman (1988); Matsumoto et al. (2000)	Fifty-six photos of facial expressions using Caucasian and Japanese actors. Response is to select one of the following labels contempt, happiness, surprise, anger, sadness, disgust, anger.
Social cognitive assessment profile	SCAP	Hughes, Cavell and Meehan (2004)	Semi-structured interview where a child is shown eight vignettes and line drawings of hypothetical situations of children being provoked.
Social interpretations test	SIT	Hynes et al. (2011)	A heartbeat detection assessment that measures sensitivity to one's cardiac function.
The assessment of interpersonal problem solving skills	AIPSS	Donahoe et al. (1990)	Twelve video vignettes with responses rated.
The awareness of social inference test	TASIT	McDonald, Flanagan and Rollins (2011)	Video vignettes in three parts (1) emotion, (2) social inference (sincere vs. sarcastic) and (3) social inference (lies vs. sarcastic) with questions to answer.

TABLE 1

Continued

Observation scales

Name	Abbreviation	Source	Description
Autism diagnostic observation schedule	ADOS	Lord et al. (2012)	Semi-structured assessment of communication, social interaction and play (or imaginative use of materials) for individuals suspected of having autism.
Bayley scales of infant and toddler development (subtest- social emotional)	BSITD	Bayley (2005)	Developmental play tasks. The Social Emotional subtest asks care-givers questions about ease of calming, social responsiveness and imitation play.
Behavioral referenced rating system of intermediate social skills	BRISS-R	Farrell, Rabinowitz, Wallander and Curran (1985)	Six scales used to rate social behaviour focusing on language, speech delivery, conversational structure, conversational content, personal conversational style and partner-directed behavior.
Profile of pragmatic impairments in communication	PPIC	Linscott, Knight and Godfrey (2003)	Ten summary scales clinicians to rate frequency of communication impairments including logical content, participation, quantity, quality, relation, clarity, social style, subject matter and aesthetics.
Social information processing interview	SIPI	Dodge (1980); Dodge, Laird, Lochman and Zelli (2002)	Eighteen videotaped vignettes of problematic social situations, and asked to imagine that they are the focal character.

Questionnaire/survey

Name	Abbreviation	Source	Description
Adaptive behaviour assessment system – II	ABAS (social subtest)	Rust and Wallace (2004)	Multiple respondents can rate items as to whether a (social) activity can be performed and how frequently.
Autism diagnostic interview	ADI	Rutter, Le Couteur and Lord (2003)	Standardised semi-structured interview for care givers to complete which provides an overall score.
Autism spectrum rating scales	ASRS	Goldstein and Nalglieri (2009)	Parent, teacher-rated, norm-referenced assessment of symptoms, behaviours and associated features of the full range of Autism Spectrum Disorders. Ages 2–18 years.
Balanced emotional empathy scale	BEES	Mehrabian (2000)	Thirty item self-report scale tapping emotional empathy.
Behavioural and emotional screening system	BESS	Kamphaus and Reynolds (2008)	Teacher, parent and student form. Assesses behavioural problems and strengths, internalising, externalising and school problems, and adaptive skills.
Behavioural assessment of the dysexecutive syndrome	BADS	Wilson et al. (1996)	Battery of six tests requiring planning initiation, monitoring and regulation of behaviour. Included is the DEX, a self-/informant-questionnaire with 20 items sampling emotional, motivational, behavioural and cognitive domains in everyday life.

TABLE 1

Continued

Questionnaire/survey Name	Abbreviation	Source	Description
Behavioural test of interpersonal competence for children	BTICC	Hughes et al. (1989)	Role play situations provided and children asked to provide a verbal response.
Bermond–vorst alexithymia questionnaire	BVAQ	Vorst and Bermond (2001)	Forty item self-report scale measuring five aspects of alexithymia: emotion to arousing events, fantasising, identifying, analysing and verbalising about one's own emotional state.
Childhood Autism rating scales	CARS	Schopler and Van Bourgondien (2010)	Fifteen items rated on a 4-point scale which provides a total score between 15 and 60.
Children's communication checklist	CCC	Bishop (1998)	Seventy item questionnaire completed by carer to screen for children who are likely to have language impairment and pragmatic impairments.
Communication checklist – adults	CC-A	Whitehouse and Bishop (2009)	Care-giver questionnaire that generates z scores providing an overall measure of language abilities, including pragmatic competence.
Developmental profile	DP	Alpern (2007)	Standardized tool to evaluate communication and symbolic abilities of children between birth and 12 years.
Empathy quotient	EQ	Baron-Cohen and Wheelwright (2004)	Sixty item self-report empathy questionnaire (20 items are filler items).
Friendship quality questionnaire	FQQ	Parker and Asher (1993)	Five-point scale which asks questions about loneliness and friendships.
Frontal systems behaviour scale	FrSBe	Grace and Malloy (2001)	Forty-two item rating scale for self or informant. Three subscales (1) Apathy, (2) Disinhibition and (3) Executive Function.
Functional assessment and intervention system	FAIS	Stoiber and Kratochwill (2004)	A number of components which look at positive and challenging behaviours in children preschool to year 1.
Gilliam autism rating scale	GARS	Gilliam (2013)	Fifty-six items divided into four scales, stereotyped behaviours, communication, social interaction and developmental disturbances.
Greenspan social emotional growth chart	GSEGC	Greenspan (2004)	Screening questionnaire for infants and young children. Used in children with suspected autism.
Infant toddler social emotional assessment	ITSEA	Carter and Briggs-Gowan (2006)	Seventeen subscales address four domains, 166-item Parent Form and Child Care Provider Form. Assessment focuses on strengths and weaknesses.

TABLE 1

Continued

Questionnaire/survey Name	Abbreviation	Source	Description
Interpersonal reactivity index	IRI	Davis (1983)	Twenty-eight item self-report scale with four subscales (1) perspective taking, (2) fantasy scale, (3) empathic concern and (4) personal distress.
Katz adjustment scale R1	KASR	Katz and Lyerly (1963)	The first of five scales of the KAS a 127 item scale rating frequency of psychiatric symptoms and social behaviour (e.g., 'thinks only of himself').
Latrobe communication questionnaire	LCQ	Douglas, Bracy and Snow (2007)	Self- or informant-rating scale with 30 items. covering conversational tone, flow, engagement, partner sensitivity and conversational attention
Neuropsychology behaviour and affect profile	NBAP	Nelson, Drebing, Satz and Uchiyama (1998)	Sixty-six items. Scales include (a) indifference, (b) inappropriateness, (c) prognosia: impaired pragmatics, (d) depression and (e) mania.
Social adjustment scale	SAS	Weissman and Bothwell (1976)	Two forms, semi-structured interview and a self-report questionnaire. 52 items, which measure interpersonal and instrumental performance.
Social communication questionnaire	SCQ	Rutter, Bailey and Lord (2003)	Used in children with suspected autism. 40 yes no questions completed by care giver.
Social communication skills questionnaire	SCSQ	McGann, Werven and Douglas (1997)	Tool which measures social communication skills which can be completed by subject, caregiver or significant other. Used in TBI.
Social dysfunction index	SDI	Munroe-Blum, Collins, McCleary and Nuttall (1996)	Used in s schizophrenia and other severe mental illnesses. Semi structured interview. 27 items with nine components. Used by care giver, health care provider or self.

TABLE 1

Continued

Questionnaire/survey Name	Abbreviation	Source	Description
Social performance survey schedule	SPSS	Lowe (1985)	Fifty-seven-item self-report measure which assesses strengths and weaknesses in higher order social skills.
Social problem solving inventory	SPSI	D'Zurilla and Nezu (2007)	Long and short form which assesses a number of domains in problem solving in interpersonal and work-related relationships. Used for 13 years and older.
Social responsiveness scale	SRS	Constantino (2005)	Sixty-five-item tool that is a screener and diagnostic tool. Can be used across the age span and is used in Autism Spectrum Disorders.
Social skills improvement system rating scales	SSISRS	Gresham and Elliott (2008)	Assessment of individuals and small groups to help evaluate social skills, problem behaviours and academic competence. Includes, teacher, carer and student forms.
Social skills rating system	SSRS	Gresham and Elliott (1990)	Parent teacher rating scale.
Sydney psychosocial reintegration scale	SPRS	Tate (2011); Tate, Hodgkinson, Veerabangsa and Maggiotto (1999)	Clinician, self- or informant-report scale with 12 items in three domains (1) occupational activity, (2) interpersonal relations and (3) independent living skills.
Toronto alexithymia scale	TAS	Bagby, Parker and Taylor (1994)	Twenty-item self-report questionnaire tapping alexithymia with three subscales: externally oriented thinking, difficulty identifying and describing feelings.
Vinelands adaptive behaviour scales	VABS	Sparrow, Cicchetti and Balla (2005a)	Measures the personal and social skills of individuals from birth through adulthood.
Vinelands social emotional early childhood scales	VSEECS	Sparrow et al. (2005b)	Standardized, norm-referenced evaluation tool for children from birth to age six. Assesses social and emotional function, the child's world of feelings and relationships and how they interact in the home and external environment.

TABLE 2
Source of Clinicians

Source	Number of responses	% of sample
Australasian society for the study of brain impairment	84	36.1
Occupational therapy Australia Ltd.	3	1.3
Queensland physiotherapy network	7	3
Colleague	118	50.6
Speech pathology Australia brain injury research group	4	1.7
Synapse – brain injury network	5	2.1
Special interest group in neuropsychological rehabilitation	3	1.3
Victorian brain injury recovery association	1	0.4
Other	8	3.4
Total	233	**100**

*90% of participants responded to this question.

cognition rehabilitation. To reduce the requirement of the clinician to respond against every tool listed ($n = 60$), they were instructed to leave the option blank if they *never* used that tool. Participants were also afforded the option of listing any other tools or resources they used for assessment and rehabilitation. The survey can be accessed in the supplementary materials of (Kelly et al., 2016).

Survey Dissemination

A number of professional networks as well as brain-injury services were contacted directly to disseminate the survey through their networks (see Table 2 for source of clinicians).

Identified clinicians were requested to complete an on-line survey via the Survey Monkey (www.surveymonkey.com) platform. An e-mail included the invitation as well as a link to the survey. This link was not specific to any one participant resulting in the survey being further disseminated. Following the initial mail out, the survey remained available for 1 month, during which time one reminder e-mail was sent to all original recipients via the same avenues. Given the survey link was

not personalised, it was not possible to deduce response rate.

Sample

The inclusion criteria were as follows: 'Clinicians who are currently working, or have worked in the past 12 months in a clinical role providing assessment or rehabilitation to people with a traumatic brain injury'. To ensure there were no duplications, IP addresses were tracked. Where duplications were detected, data was examined to determine if it were the same user or if a number of clinicians had responded on a shared computer. Any surveys that had been abandoned without responses were also removed. Additionally, those respondents who had not continued with the survey following completion of the demographic information (i.e., stopped at question 12) were removed from the final sample.

The Information Statement was included at the beginning of the survey and consent was implied through completion and submission of the survey. This study was approved by the Hunter New England Local Health District Human Research Ethics Committee (LNR/13/HNE/497; LNRSSA/13/HNE/498).

Definitions

Participating clinicians were provided with a definition of social cognition to ensure validity of responses with regards to this construct. This definition was adapted by the researchers to try to encapsulate the full gamut of domains of function that fall under social cognition. The definition was provided immediately before the questions pertaining to social cognition.

'Social cognition is defined as: the capacity to understand and interact with others in contextually appropriate ways, that is, the storage and processing of social information, along with the ability to produce appropriate responses with social partners'.

Analyses

Survey Monkey responses were imported into IBM Statistical Package for the Social Sciences Version 24 (SPSS-24). Descriptive statistics are presented. Pearson's Chi-squared analyses were conducted on categorical and ordinal data (Howell, 2007) to determine which responses were driving group differences (Agresti, 2013). Standardised adjusted residuals of $>=2.5/-2.5$ were chosen due to the larger number of cells in each comparison (Sharpe, 2015). In order to examine clinician characteristics in regards to tool use, 'frequency

of use' ordinal variables were treated as continuous variables and means were compared using *t*-tests according to years of experience and level of education/qualification. Level of qualification was divided into two categories: under-graduate (Honours, Diploma or still completing) and postgraduate (Masters level and higher). Years of experience were divided into those with 10 years or less, and those with greater than 10 years. For some analyses, discipline groups who are arguably more likely to be responsible for the assessment of social and emotional behaviour and communication in brain-injury services in Australia were targeted. It is indicated within the results section where this has occurred.

Results

Participants

Table 3 presents demographic information provided by respondents. There were a total of 535 respondents internationally before removal of 92 duplicates/incompletes. Of the 443 valid responses, 260 clinicians were from Australia and were included in the current data. The majority of these 260 respondents were from New South Wales followed by Victoria. Psychologists, followed by occupational therapists and speech and language pathologists formed the majority of the respondents. Clinicians with various levels of experience in brain-injury rehabilitation were included, with the majority having greater than 4-years' experience, and most having completed a Bachelor degree at minimum. On average, clinicians were working 25.71 hours ($SD = 12.59$) per week in brain-injury rehabilitation, with approximately one-third working full-time equivalent.

Characteristics Client Population and Service Setting

The client population descriptors and setting that respondents worked in are presented in Table 4. Almost half (49%) of clinicians reported working in outpatient or community settings. Just over half (53%) work in the public sector with 37% reporting that they split their time between public and private work. Most respondents (80%) reported that they worked mostly with adult TBI clients and the majority worked across groups with all levels of severity.

Assessment of Social Cognition Domains by Discipline

Clinicians were asked to report the frequency with which they assessed various aspects of social cognition. Table 5 highlights the percentage of the various discipline groups who *routinely* assessed each domain of social cognition. Only those disciplines who were likely to be involved in social cognition assessment were included, that is, medical doctors, nurses, physiotherapists and dieticians were removed from these analyses. Collapsed across discipline, *insight* (45%) and *disinhibition* (41%) were the two most frequently assessed domains. The two areas that were assessed with highest frequency for each discipline are highlighted. Data for all disciplines combined is also presented within Table 5.

To examine differences between the various disciplines with regards to the assessment of social cognition, Pearson's Chi-Square analyses were conducted. To meet conditions required to conduct Pearson's Chi-Square on frequency data, responses were combined for *never and infrequently,* and *very frequently and routinely*. This reduced groupings to three, and reduced the likelihood that more than 20% of the expected cell counts were less than 5, and that all individual expected counts were greater than 1 (Yates, Moore, & McCabe, 1999). This meant that the final classifications were *infrequently* (<25% of clinical time), *frequently* (25–50% of clinical time) and *routinely* (>50% of clinical time). Due to small cell sizes in some discipline areas, analyses targeted clinical/psychologists, clinical neuropsychologists, speech and language pathologists and occupational therapists only. The clinical/psychologist cell size was only 21 but it was felt that their contribution was distinct to others and should be represented separately. An adjusted standardised residual of $> = 2.5/–2.5$ (conservative) was regarded statistically significant (Sharpe, 2015) due to the large number of cells.

Chi-Square revealed that the frequency that clinicians examined '*theory of mind*' were dependent on discipline [χ (6) $= 14.63$, $p = .023$]. An adjusted standardized residual (asd) of 2.9 indicated that clinical/psychologists were significantly more likely to *frequently* assess '*theory of mind*' than were other disciplines. Clinical/psychologists were also more likely to *routinely assess alexithymia* [adjusted standardised residual (asd) $= 3.8$] compared with other disciplines [χ (6) $= 22.2$, $p = .001$].

Speech and language pathologists were more likely to: *routinely* (asd $= 6.5$) assess *prosody* when compared with other disciplines [χ (6) $= 53.28$, $p < .001$]; *routinely* (asd $= 3.1$) assess *knowledge of social norms* [χ (6) $= 20.49$, $p = .002$]; *routinely* (asd $= 4$) assess *sarcasm* [χ (6) $= 31.74$, $p < .001$]; *routinely* (asd $= 8.2$) assess *pragmatic*

TABLE 3

Clinician Demographic Characteristics

	Sample characteristics		
		N = 260	
		N	(%)
Location	ACT	4	1.5
	NSW	82	31.5
	NT	2	0.8
	QLD	32	12.3
	SA	28	10.8
	TAS	8	3.1
	VIC	60	23.1
	WA	44	16.9
Role	Psychology	70	27.6
	Clinical psychology/general	*23*	*8.8*
	Clinical neuropsychology	*47*	*18.8*
	Occupational therapy	55	21.2
	Speech and language pathology	53	20.4
	Physiotherapy	17	6.5
	Social work	10	3.8
	Medical doctor	16	6.2
	Nursing	17	6.5
	Case manager/rehabilitation co-ordinator	27	10.4
	Academia	4	1.5
	Dietician	1	0.4
Highest qualification attained	PhD	24	9.2
	Doctorate	36	13.8
	Masters	55	21.2
	Honours	31	11.9
	Bachelor	107	41.2
	Diploma	6	2.3
	None completed/still studying	1	0.4
Length of time working in TBI rehabilitation	<12 months	26	10
	1–3 years	51	19.6
	4–10 years	84	32.3
	>10 years	99	38.1

language [χ (6) = 75.95, $p < .001$]; *routinely* (asd = 3.9) assess *body language* [χ (6) = 21.37, $p = .002$] and, *routinely* (asd = 3.1) assess *social problem solving,* than other disciplines [χ (6) = 36.97, $p < .001$].

Clinical neuropsychologists were more likely than other disciplines to report that they *never or infrequently* assessed *knowledge of social norms* [asd = 3.2, χ (6) = 20.49, $p = .002$], *sarcasm* [asd = 3.3, χ (6) = 31.74, $p < .001$], *social problem solving* [asd = 5.3, χ (6) = 36.97, $p < .001$], *social faux pas* [asd = 2.7, χ (6) = 14.62, $p =$ .023] or *body language* [asd = 2.9, χ (6) = 21.37, $p = .002$].

Speech and language pathologists were significantly less likely to routinely assess *anger* (asd = –3.3) than other disciplines while clinical/psychologists (asd = 3) were more likely to [χ (6) = 20.37, $p = .002$]. Clinical/psychologists (asd = 2.8) and occupational therapists (asd = 3.8) were less likely than other disciplines to assess *pragmatic language* [χ (6) = 75.95, $p < .001$]. No other significant differences between disciplines were observed for all other social cognition domains.

TABLE 4

Characteristics of Service Setting and TBI Clientele

		Total sample (N = 260)	
		N	(%)
Setting	Inpatient	96	36.9
	Outpatient/community	127	48.8
	Private practice	32	12.3
	University/research centres	5	1.9
Sector	Private sector	15	5.8
	Public sector	139	53.5
	Both private and public	96	36.9
	NGO	10	3.8
Clientele	Pediatric (0–17 years)	35	13.5
	Adult (18–65 years)	208	80
	Older Adult (>65 years)	17	6.5
Injury severity*	Mild	161	61.9
	Moderate	219	84.2
	Severe	219	84.2
	Very severe	174	66.9

*Note. Respondents were asked to mark all that apply.

Social Cognition Assessment Tools used in Clinical Practice

Clinicians were provided with a list of 60 different behavioural assessments, observation scales and questionnaires that may be used to assess various aspects of social cognition in children and adults. A list of the tools has been provided in Table 6. Between 9% and 36% of clinicians reported using at least some of the 60 tools listed. On average, 85% of the tools listed were *never* used by clinicians working in brain-injury rehabilitation. The top five tools that were used by clinicians (at any frequency) are highlighted in Table 6 and included the Behavioural Assessment of the Dysexecutive Syndrome (BADS: Wilson, Alderman, Burgess, Emslie, & Evans, 1996), The Awareness of Social Inference Test (TASIT-R: McDonald, Flanagan, & Rollins, 2011), Vineland Adaptive Behaviour Scale (VABS: Sparrow, Cicchetti, & Balla, 2005b), La Trobe Communication Questionnaire (LCQ: Douglas, Bracy, & Snow, 2000) and the Social Skills Rating System (SSRS: Elliott & Gresham, 2008). Of these five, only two specifically assessed social cognition. In terms of a behavioural assessment focused purely on social cognition, TASIT is utilised to some extent by 29% of clinicians. The SSRS, a questionnaire, was also used by 23.5% of clinicians. Table 7 presents the percentage of each of the four disciplines who use each of these tools.

Other Assessment Tools Identified by Clinicians

A further 34 open-ended responses (13%) indicated that clinicians utilised a number of other tools that were not listed in Table 6. The most obvious oversight was the Advanced Clinical Solutions (ACS: Wechsler, 2009) social perception subtests. Ten respondents (5%) reported using the ACS (nine *infrequently*, one *frequently*), eight of which were clinical neuropsychologists and two were clinical psychologists. Four respondents (2%) reported using the Awareness Questionnaire (Sherer, 2004). The Overt Behaviour Scale (Kelly, 2010) (n = 3), Behaviour Rating Inventory of Executive Function (BRIEF: Gioa, Isquith, Guy, & Kenworthy, 2000) (n = 2), Mind in the Eyes Test (Baron-Cohen, Baldwin, & Crowson, 1997) (n = 2) and Spence Social Skills Questionnaire (Spence, 1995) (n = 2) were also used. The remaining 10 responses were suggested by one respondent only.

Tool Most Likely to Identify Social Cognition Impairment

Only 21 of the 260 clinicians provided a response when asked their opinion of test most likely to identify social cognition deficits in children and adults with TBI. The Awareness of Social Inference Test (TASIT: McDonald et al., 2011) was most cited

TABLE 5

Percentage of Each Discipline who *Routinely* Assess each Area of Social Cognition

Area of social cognition	Selected Sample* n = 215					
	Speech and Language Pathologists n = 49–53	Clinical/ Psychologists n = 21–23	Clinical Neuropsychologists n = 45–47	Occupational Therapists n = 51–55	Social Workers n = 8–10	Case Managers n = 24–27
Identity recognition	5.7	8.7	0.0	14.5	10.0	7.4
Facial affect recognition	9.8	13.0	2.1	11.1	10.0	7.4
Theory of Mind	2.0	4.8	0.0	1.9	0.0	0.0
Alexithymia	2.0	9.5	6.5	0.0	0.0	0.0
Prosody	30.8	4.3	4.3	0.0	10.0	7.4
Knowledge of social norms	23.1	17.4	4.3	11.1	30.0	14.8
Interoceptive awareness	10.2	9.1	0.0	1.9	0.0	4.0
Sarcasm	13.5	4.3	4.3	3.6	10.0	4.0
Social problem solving	30.2	30.4	6.7	25.5	30.0	11.1
Social adjustment	19.2	**47.8**	19.1	29.1	66.7	18.5
Empathy	13.5	21.7	6.7	7.4	22.2	11.1
Pragmatic language	**52.8**	4.3	8.9	1.9	0.0	11.5
Apathy	13.5	22.7	19.6	11.1	20.0	11.5
Social faux pas	13.5	4.3	6.7	3.6	0.0	7.7
Body language recognition	25.0	4.3	4.3	11.1	10.0	3.8
Insight	**51.9**	43.5	**42.6**	**54.5**	**70.0**	18.5
Anger	13.7	43.5	29.8	31.5	**70.0**	**22.2**
Disinhibition	39.6	**59.1**	**42.2**	**39.6**	60.0	**23.1**

Note. Not all respondents responded to each of these questions. At least 95% responded to all questions.
* who might reasonably be expected to partake in this type of assessment.

($n = 10$), followed by the La Trobe Communication Questionnaire ($n = 4$) (LCQ: Douglas et al., 2000). All other tests were identified by only one respondent.

Opinions Regarding Types of Assessment

Ninety percent (235/260) of clinicians responded to questions regarding the most appropriate assessment method and target. As can be seen in Figure 1, clinicians favoured *informal assessment* methods such as interview with the client/family over *standardised assessment* for identifying social cognition rehabilitation goals.

When clinicians were asked about the importance of assessing basic cognition (e.g., memory, attention) in favour of social cognition for developing goals for rehabilitation, 45% of the whole sample *disagreed* that assessment of basic cognition was more important. However, Pearson's Chi-Square analyses revealed that clinical neuropsychologists were significantly more likely than other disciplines to report that cognitive assessment were *more* important (asd = 3.4) than social cognition assessment for developing goals for TBI rehabilitation [χ (8) = 17.87, p = .022]. It was worth noting, however, that clinical neuropsychologists were almost evenly split across the response options. Data for each discipline are presented in Figure 2.

Effects of Qualification Level and Years of Experience

Overall, those with post-graduate level qualifications assessed social cognition using one of the tools listed (Table 1) significantly more frequently than those with under-graduate training only, t (202.88) = 2.36, p = .019, d = 0.33. There were no significant differences between groups based on years of experience, t (258) = 0.72, p > .05, d = 0.08. Level of qualification was also found to affect attitudes regarding the most useful types of assessment. Those with post-graduate level training were more likely to agree to the statement 'standardised assessments provide the most useful information

TABLE 6
Report of use of Various Tests that may Assess Domains of Social Function – Disciplines Combined

	% total respondents who used tool at any frequency	Infrequently (1–15% of clients)	Somewhat frequently/ frequently (16–50% of clients)	Very frequently (51–75% of clients)	Routinely (>75% of clients)
Behavioural test with normative data					
AIPSS	17.3	13.5	2.4	1.2	0.4
AIT	11.2	10.8	0.0	0.4	0.0
ASCT	11.5	11.2	0.0	0.4	0.0
BADS	**35.8**	15	13.9	4.2	2.7
CASPM	15.8	15.4	0.4	0.0	0.0
CTE	11.2	10.8	0.0	0.4	0.0
DANVA	10.8	10.4	0.0	0.4	0.0
ECT	16.5	14.6	1.2	0.8	0.0
ERS	18.8	13.8	2.7	1.9	0.4
FAB	16.5	14.6	1.6	0.4	0.0
FEEST	12.7	10	1.9	0.4	0.4
FPRT	12.3	10.8	1.2	0.4	0.0
HintT	10.8	10	0.8	0.0	0.0
ILS	15.8	8.5	5.0	0.8	1.5
JACFEE	10.4	10.4	0.0	0.0	0.0
NEPSY – affect recognition	22.3	16.5	5.7	0.0	0.0
NEPSY – theory of mind	21.5	16.5	5.0	0.0	0.0
SCAP	17.3	15	1.9	0.4	0.0
SIT	11.2	10.8	0.0	0.4	0.0
TASIT	**29.0**	18.8	6.9	2.3	0.8
Observation scales					
ADOS	11.2	10	0.8	0.4	0.0
BRISS-R	16.5	15	1.2	0.4	0.0
BSITD	15.8	12.3	2.3	0.8	0.4
PPIC	17.7	11.5	4.6	1.2	0.4
SIPI	17.3	15.4	1.2	0.4	0.4
Questionnaire/survey					
ABAS (social subtest)	21.9	14.6	4.6	2.7	0.0
ADI	10.0	8.5	0.8	0.8	0.0
ASRS	11.9	9.6	2.0	0.4	0.0
BADS	**35.8**	15	13.9	4.2	2.7
BEES	11.2	10.4	0.4	0.4	0.0
BESS	16.9	15.8	0.0	1.2	0.0
BTICC	15.8	15.8	0.0	0.0	0.0
BVAQ	10.8	10.4	0.4	0.0	0.0
CARS	11.9	10	1.5	0.4	0.0
CC-A	16.9	10	3.1	1.9	1.9
CCC	13.1	10.8	1.9	0.0	0.4
DP	9.2	8.1	0.0	0.4	0.8
EQ	11.5	9.6	1.6	0.4	0.0
FAIS	9.2	8.5	0.8	0.0	0.0
FQQ	17.3	14.6	1.2	0.8	0.8
FrSBe	20.8	14.2	3.5	1.9	1.2

TABLE 6
Continued

	% total respondents who used tool at any frequency	Infrequently (1–15% of clients)	Somewhat frequently/ frequently (16–50% of clients)	Very frequently (51–75% of clients)	Routinely (>75% of clients)
GARS	8.8	8.8	0.0	0.0	0.0
GSEGC	8.8	8.8	0.0	0.0	0.0
IRI	11.2	10.4	0.8	0.0	0.0
ITSEA	9.6	8.8	0.4	0.0	0.4
KASR	17.7	15.8	1.2	0.8	0.0
LCQ	**26.2**	11.9	7.6	2.3	4.2
NBAP	16.2	15	0.8	0.4	0.0
SAS	13.1	9.2	3.0	0.4	0.4
SCQ	15.4	10	3.0	1.2	1.2
SCSQ	17.3	10.8	4.2	1.5	0.8
SDI	11.2	10.8	0.4	0.0	0.0
SPRS	22.3	17.7	2.7	1.2	0.8
SPSI	16.5	13.5	2.4	0.8	0.0
SPSS	15.8	15	0.4	0.4	0.0
SRS	10.0	8.1	1.6	0.4	0.0
SSISRS	16.9	14.6	1.6	0.8	0.0
SSRS	**23.5**	16.5	5.0	1.5	0.4
TAS	11.5	10.4	0.8	0.0	0.4
VABS	**28.1**	15.8	10.3	1.5	0.4
VSEECS	18.5	14.6	3.4	0.4	0.0

Note. Please see Table 1 for complete details of each assessment tool.

TABLE 7
Percentage of each Discipline who Report using each of the Top Five Tools

	Discipline			
Social Cognition Tool	Speech and Language Pathologists	Clinical/ Psychologists	Clinical Neuropsychologists	Occupational Therapists
BADS	10.8	13.5	**44.6**	31.1
TASIT	**38.6**	14.0	35.1	12.3
VABS	15.7	23.5	**49.0**	11.8
LCQ	**68.4**	7.0	15.8	8.8
SSRS	**34.1**	15.9	**34.1**	15.9

Note. BADS = Behavioural Assessment of the Dysexecutive Syndrome; TASIT = The Awareness of Social Inference Test; VABS = Vineyard Adaptive Behaviour Scale; LCQ = La Trobe Communication Questionnaire; SSRS = Social Skills Rating System.

for goal setting around social cognition rehabilitation needs', $t(233) = 2.47$, $p = .014$, $d = 0.32$, whereas those with under-graduate level training were more likely to agree that 'informal assessment (e.g., interview with family/client) provided the most useful information for goal setting around social cognition rehabilitation needs', $t(233) = 2.02$, $p = .04$, $d = 0.26$.

TBI Rehabilitation Programs

Only 29 of the 260 clinicians provided a response when asked what training or social cognition rehabilitation program they used for clients with TBI. The programs that were identified were TBI Express (Togher, Power, McDonald, Tate, & Rietdijk, 2010) ($n = 8$); Improving First Impressions (McDonald et al., 2008) ($n = 4$); Communicate
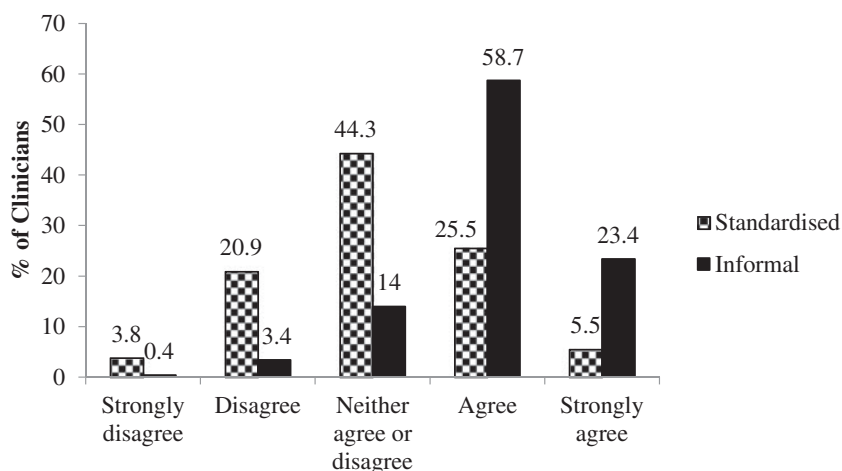
FIGURE 1

Clinicians reports regarding the most useful method of assessment for goal setting around social cognition rehabilitation needs. Ninety percent (235/260) of participants responded to this question. Percentage of respondents is indicated adjacent to each column.
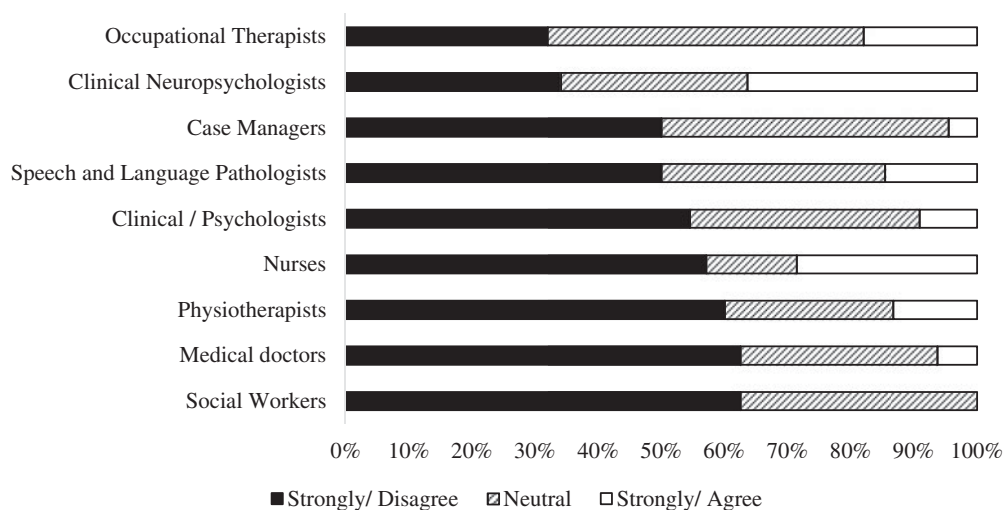
FIGURE 2

Response to the statement 'assessing basic cognition (e.g., memory, attention) is more important than social cognition in developing goals for TBI rehabilitation by discipline'. Ninety percent (235/260) of participants responded to this question.

with Confidence (Sloane, Mackey, & Chamberlain, 2002) (*n* = 3); TalkAbout Series (Kelly, 2016) (*n* = 2); Reading a Smile (Bornhofen & McDonald, 2009) (*n* = 2); and, other individual responses included the Spence Social Skills program (Spence, 1995); Mind Reading DVDs (Golan & Baron-Cohen, 2006); Communication Activities of Daily Living-2 (CADL-2) (Holland, Frattali, & Fromm, 1999); and the, Perceive, Recall, Plan, and Perform system (Nott & Chapparo, 2008). A further

four clinicians reported that they used an 'individualised' approach, whereas another two reported that the service provider had developed their 'own processes'.

Discussion

The aim of the current study was to examine the current state of play in regards to how relevant clinical professions assessed disorders of social cognition. This study followed up a prior international survey by focusing on the largest pool of respondents, Australian clinicians, in order to provide a snapshot of how social cognition was assessed and treated within a single country. It also aimed to identify which tools and procedures were most commonly used, and by who. Overall, the results revealed a diversity of approaches across professions, with particular professions (e.g., clinical psychologists vs. speech pathologists) claiming different facets of social cognitive assessment and remediation and with the nature of assessment (e.g., formal measures vs. informal observation) varying likewise.

As with the international sample (Kelly et al., 2016), the four areas that were most routinely assessed across the disciplines were *insight, disinhibition, anger* and *social adjustment.* Those four domains are arguably considered more psychological domains than social cognition *per se.* On the other hand, the two domains that clinician's routinely assessed the least were *theory of mind* and *alexithymia*. This was a significant concern given the frequency in which these two impairments are seen in the TBI population (Martin-Rodriguez & Leon-Carrion, 2010). Whilst the estimates of prevalence are unknown for *theory of mind*, up to 60% of those with TBI are thought to be *alexithymic* (Wood & Williams, 2007). Of interest, there were differences between disciplines with regards to the domains of social cognition reported by that discipline to be routinely assessed. Speech and language pathologists were more likely than other disciplines to report that they routinely assessed *prosody, sarcasm* and *pragmatic language*, all arguably related to communication, however, they also reported more routine assessment of *knowledge of social norms*, *body language* and *social problem solving*. Although frequency was relatively low, clinical psychologists were more likely than other disciplines to assess *theory of mind* and *alexithymia* routinely. The other noteworthy difference observed were for clinical neuropsychologists, who reported significantly less assessment of *sarcasm, faux pas, body language* and *knowledge of social norms* when compared with other disciplines.

It is possible that the differences observed between disciplines with regards to domains of social cognition assessed could be accounted for by the collective opinion of that discipline regarding what an 'assessment' entails. For example, it is possible that when answering these questions clinical neuropsychologists were considering only those domains that they formally assessed using a standardised assessment instrument, whilst for other disciplines simply asking the person with TBI about their ability in this area could constitute an assessment. It is also possible that clinical neuropsychologists who use a hypothesis-driven approach to assessment were considering all clients they see rather than only those they hypothesize may need social cognition assessment. Future examinations of clinical practice should include items that would allow the respondent to specify which domains they use a standardised versus non-standardised assessment modality.

An additional consideration regarding disciplines and the domains of assessment, is the likelihood of the roles and responsibilities of the various disciplines overlapping in rehabilitation settings (Pagan et al., 2015; Sander, Raymer, Wertheimer, & Paul, 2009; Wertheimer et al., 2008). Overlap has benefits in that it leads to a more cohesive and comprehensive intervention. It does, however, raise the question as to how information from multiple perspectives becomes integrated into a collaborative rehabilitation plan. Such overlap also runs the risk that clinicians may assume that if they do not cover a particular area of assessment and rehabilitation, that a colleague will. Clearly in the area of social cognition there is evidence (albeit little), that this could lead to gaps in service delivery (Kelly et al., 2016) rather than collaborative intervention.

Assessment tools designed to examine areas of social cognition were generally under-utilised. At best, 35% of clinicians reported using the Behavioural Assessment of Dysexecutive Syndrome (BADS) at least *infrequently*, however, on average, only 16% of clinicians reported that the tools were used at all. Of the top five tools that are used by clinicians (at any frequency), one predominately assessed executive functions (BADS), one focused on adaptive functioning which included one domain of socialization (VABS), one focused more on general communication skills (LCQ), whereas only two focused specifically on social cognition (TASIT, SRSS). Of the two tools that did focus on social cognition, only one of these was a behavioural assessment (TASIT), while the other was a questionnaire (SRSS). The ACS, a behavioural assessment of social perception was posited by only 5%, i.e., 10 clinicians as a useful assessment measure.

The list of assessment tools provided in the study highlighted the plethora of potential assessment tools available to the clinician. However, when clinicians were given the opportunity to state their opinion regarding the most useful tool for assessment and remediation of social cognition impairment there was a generally low response rate. The TASIT and the LCQ were both posited as useful assessment tools, though only 8% of the group responded. The finding that the LCQ was popular amongst speech and languages pathologists was consistent with a discipline specific survey of this group (Frith, Togher, Ferguson, Levick, & Docking, 2014). The finding that clinicians were under-utilising tools for the assessment of social cognition along with the underwhelming response rate when clinicians were given the opportunity to list additional tools or resources suggested that there are barriers to the provision of rehabilitation services in this domain. This was supported by data from the international survey that highlighted the importance of the need for availability of well-validated standardised tools and training in the use of such (Kelly et al., 2016). How we might go about the provision of training is in need of further examination, however, a recent survey highlighted that clinicians preferred workshop style education that focused on new interventions and therapies (Pagan et al., 2015). Now that the research into social cognition assessment and remediation in the TBI population is mounting (Cassel et al., in press; McDonald, Honan, Kelly, Byom, & Rushby, 2013), it is also time to determine how much this domain is being addressed in tertiary education settings, especially given the differences observed between disciplines and qualification levels.

Differences were noted between clinician assessment practices as a result of level of qualification. Those with higher levels of training (postgraduate qualifications) were more likely to use more of the tools listed. Furthermore, clinicians with higher qualifications were more likely to state that standardised assessments provided the most useful information for goal setting around social cognition rehabilitation needs. This potentially reflected the focus on evidence-based training within the tertiary setting. It may also depict a bias in the data whereby psychologists are arguably more likely to have post-graduate level training, as alternate pathways to becoming a psychologist have dwindled, and it is clinical neuropsychologists who specifically reported a preference for standardised assessments. Whilst all disciplines taught within university contexts are seen to teach only evidence-based interventions, there are definitely different levels of uptake and scientific rigor applied across the various disciplines and the uptake of evidence-

based practice (EBP) is viewed differently as a result (see Coelho, Ylvisaker, & Turkstra, 2005; Ratner, 2006; Ylvisaker, Turkstra, & Coelho, 2005 for discussion). The argument for the need for standardised tools is not a new one. Given many clinicians still prefer using informal means of assessment, as a large professional group, we need to determine how to move forward in reliable assessment of social cognition, especially with the problems associated with the reliability of self- and informant-report (Green, Rohling, Lees-Haley, & Allen, 2001; McKinlay et al., 1981; Newman, Garmoe, Beatty, & Ziccardi, 2000). Across many of the discipline groups in Australia there are governing professional bodies (e.g., Psychology Board of Australia, Occupational Therapy Board of Australia) that mandate the requirement of clinicians to EBP, which include both assessment and intervention. Despite this, it is not unusual to find deviation from these principles. This has been evident particularly for those clinicians working in mental illness (United States Surgeon General, 1999). Clearly, there are some obstacles to EBP in this field, however, understanding how to best disseminate EBP is paramount to reducing the gap between research and practice (for example, see Addis, 2002; Beidas & Kendall, 2010).

For rehabilitation, the tools which received the greatest support were TBI Express: Social Communication Training for People with TBI, their families and friends (http://www.assbi.com.au/tbi%20express.html), and, Improving First Impressions: A Step-By-Step Social Skills Program (http://www.assbi.com.au/improving%20first%20impressions.html). Encouragingly, these tools do have an evidence-base with promising outcomes for improving the conversational skills of communication partners of people with TBI, and to provide conversational skills training for people with TBI (Sim, Power, & Togher, 2013; Togher, McDonald, Tate, Power, & Rietdijk, 2013); and for addressing basic areas of social skills, respectively (McDonald et al., 2008). Again given the very small percentage of clinicians who responded to this open-ended question, it must be assumed that informal approaches rather than structured standardised resources are used. As a profession we may not be meeting the needs of the population with regards to interventions targeting social cognition impairments.

Some limitations of the study highlighted that disciplines were not equally or proportionally represented. There were greater numbers of psychologists, occupational therapists and speech and language pathologists than those from other disciplines, and that these did not reflect the staff ratios in rehabilitation (Australasian Faculty of Rehabili-

ation Medicine, 2011). Another limitation was that there were a few notable social cognition assessment tools missing from the list provided. These were the Mind in the Eyes Test (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) and the ACS subset of social perception tests. The data for these has been presented based on the open-response items, however, it was possible that this led to clinicians failing to be prompted or reminded that they utilised these tools. An additional concern was the conceptual overlap between the various social cognition domains. For example, assessment of sarcasm could fall within the assessment of 'theory of mind' as a higher order category (Martin-Rodriguez & Leon-Carrion, 2010). This could lead to over-inclusiveness or under-inclusiveness of reporting when thinking about these areas of social functioning. On the flip-side, one unforeseen benefit of circulating this survey was that it introduced many clinicians to tools that they reported they had not previously been aware of. This alone may have prompted clinicians to think more about this aspect of assessment when working with clients in the future.

The focus of this investigation was to examine the practices of clinicians in TBI rehabilitation with regards to social cognition. More specifically, it aimed to examine the various disciplines and their perceived role in assessment and rehabilitation of social cognition. This examination has highlighted a distinct difference between estimated prevalence of social cognition impairment in this population and the frequency in which it was assessed and treated. Additionally, it has highlighted under-utilisation of the tools designed for the assessment of social behaviour and a preference for informal modes of assessment in those with lower levels of qualification. This has highlighted the need for the field to examine the curriculum of tertiary professional programs that train the future TBI clinicians. Overcoming these issues cannot be solely the responsibility of the clinicians but, rather strong collaboration between educators, clinicians, researchers and professional bodies. Clinicians desire further training through participation in professional development activities (Pagan et al., 2015). The research community needs to rise to the challenge of providing them with valid and reliable tools along with opportunities to learn how to administer these tools to undertake this form of assessment.

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Conflict of Interest

None.

Ethical Standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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