Using the La Trobe Communication Questionnaire to Measure Perceived Social Communication Ability in Adolescents With Traumatic Brain Injury

Jacinta M. Douglas

School of Human Communication Sciences, La Trobe University, Australia

Introduction: The La Trobe Communication Questionnaire (LCQ) was developed to measure perceived social communication ability from various sources including the self-perceptions of individuals as well as those of others with whom they converse regularly (e.g., family members, friends and clinicians). It has been psychometrically evaluated with healthy young adults and adults with traumatic brain injury (TBI) and found to have acceptable reliability and validity. The present study was conducted to gauge the ability of the LCQ to distinguish between a group of adolescents who had sustained TBI and a control group of neurologically normal adolescents matched on the variables of socio-economic status (SES), age, gender and level of education completed. *Method:* Participants were 19 TBI dyads (TBI adolescents and close relatives) and 19 control dyads. All TBI adolescents had sustained severe injury (mean posttraumatic amnesia duration 33.76 days, *SD* 18.13) due to moving vehicle-related trauma. Mean age at the time of injury was 16.33 years (SD 1.67) and at the time of assessment 17.11years (*SD* 1.90). The LCQ was administered to all participants at home. *Results:* Perceptions of TBI adolescents and their relatives were significantly different from those of control dyads and consistent with a higher frequency of social communication difficulties in the TBI group. Difficulties reflected reduced conversational fluency and problems with managing the multiple demands of social discourse. *Conclusions:* The LCQ is a clinical tool that has sound potential to contribute to the multifaceted assessment of social communication in adolescents with TBI.

Keywords: social communication, adolescents, brain injury, assessment

Adolescence can be defined from various perspectives. The word itself derives from the Latin *adolescere,* to grow up. Medically, adolescence is defined typically from the physical perspective as the period between the onset of puberty, beginning with the appearance of secondary sex characteristics between 11 and 13 years of age, and ending with the completion of the development of the adult form at 18 to 20 years of age (*Mosby's Medical Dictionary*, 2009). Dahl (2004) broadened the conceptualisation of the term by including a social perspective and defining adolescence as 'that awkward period between sexual maturation and the attainment of adult roles and responsibilities' (Dahl, 2004, p. 9). In this definition, while the beginning of adolescence is characterised by the physical changes associated with puberty, the end is defined in the social domain of adulthood, when the individual has acquired the skills and knowledge to support independent living and self-regulation. From a clinical perspective, the inclusion of the social domain in the definition is important as it conceptualises adolescence as a period of transition from childhood to adulthood. This period of

Address for correspondence: Dr Jacinta Douglas, School of Human Communication Sciences, La Trobe University, Bundoora, Victoria, 3086, Australia. E-mail: J.Douglas@latrobe.edu.au

transition involves not only immense biological changes but also extensive cognitive, emotional and behavioural changes necessary to support adult roles and responsibilities.

It is now clear that maturational brain processes continue through adolescence and beyond (Blakemore & Choudhury, 2006; Dahl, 2004; Paus, 2005; Steinberg, 2005). Much of the evidence suggests there is a concentration of changes in the prefrontal cortex and enhanced connectivity between the prefrontal cortex and other brain regions (Blakemore & Choudhury, 2006; Steinberg, 2005). As a result, adolescent cognitive development is characterised by improvements in various aspects of executive function including selective attention, efficiency of information processing, working memory, deductive reasoning and decision making, long-term planning, metacognition, self-evaluation, inhibitory control and the coordination of affect and cognition (Blakemore & Choudhury, 2006; Keating, 2004; Steinberg, 2005). Consistent with these findings are the results of studies of social cognition showing that during adolescence, individuals begin to think about others in more abstract and multidimensional ways (Eisenberg & Morris, 2004).

Given general and social cognitive development during adolescence, it is not surprising that communication ability also changes during this transition period. Indeed, many of the changes in language use associated with adolescence can be seen to reflect developing cognitive abilities in the domains of executive functions and social cognition. During adolescence, individuals learn to interpret the communicative behaviours of others and regulate their own communicative behaviour across a range of social contexts (Ciccia, Muelenbroek, & Turkstra, 2009; Turkstra, 2000; Turkstra, Ciccia, & Seaton, 2003). They develop proficiency using their language skills to accomplish complex goals and to negotiate outcomes with flexibility in various interactive situations (Turkstra, McDonald, & Kaufmann, 1995). Thus, much of the communication development of adolescence rests on the maturational processes evident in the prefrontal cortex during this transition period.

This developmental stage brings with it a situation of double jeopardy for the communication outcome of the adolescent who sustains traumatic brain injury. The individual has not yet fully developed the social communication skills necessary to support independent living, and the development of these skills relies heavily on maturation processes associated with the prefrontal cortex. However, as a result of the neuropathology of TBI, it is the prefrontal cortex that is particularly vulnerable to damage (Adams, Graham, Scott, Parker, & Doyle, 1980; Blumbergs, Jones, & North, 1989; Levin & Kraus, 1994). In fact, impaired executive function and its behavioural manifestations are widely considered to be among the hallmark deficits encountered by those who sustain TBI (Anderson, Northam, Wrennall, & Hendy, 2001; Gioia & Isquith, 2004; Kim et al., 2005; Mattson & Levin, 1990; Millis et al., 2001; Taylor et al., 2002; Ylvisaker et al., 2007). In the domain of communication, pragmatics (use of language in social contexts) and specifically conversational interactions are highly susceptible to the consequences of impaired executive and social cognitive functions (Body, Perkins & McDonald, 1999; Channon & Watts, 2003; Douglas, 2010; Ewing-Cobbs & Barnes, 2002; Martin & McDonald, 2003; McDonald & Pearce, 1998; Snow, Douglas & Ponsford, 1998; Turkstra et al., 1995; Ylvisaker, 1993).

The specific manifestations of TBI-related pragmatic impairment include difficulties in meeting the informational needs of the listener (McDonald, 1993; Snow et al., 1997; 1998), lack of logical structure and coherence in discourse (Chapman et al., 1992; Ewing-Cobbs, Fletcher, Levin, Iovino, & Miner, 1998; Liles, Coelho, Duffy, & Zalagens, 1989; O'Flaherty & Douglas, 1997), difficulty with implied meaning (Barnes & Dennis, 2001; Dennis & Barnes, 1990; O'Flaherty & Douglas, 1997; McDonald, 1992) inappropriate choice of conversational content/topic (Fyrberg, Marchioni, & Emanuelson, 2007; Togher, Hand & Code, 1997; Snow et al. 1997), inappropriate interaction style (McDonald & van Sommers, 1993; O'Flaherty & Douglas, 1997), inappropriate change in topic/tangentiality (Bracy & Douglas, 2005; Fyrberg et al., 2007), and impoverished content (Brookshire, Chapman, Song, & Levin, 2000; Snow et al., 1997; 1998; Stout, Yorkston, & Pimentel, 2000). The consequence of such deficits is that conversations with individuals with TBI frequently require the communication partner to maintain the flow of conversation (Bracy & Douglas, 2005; Coelho, Youse & Le, 2002; Togher et al., 1997; Turkstra, 2000).

These social communication impairments can have significant implications, particularly in the context of adolescent development towards independence (Turkstra, 2000). Indeed in the 21st century, greater diversity and complexity of adult social worlds have increased the developmental demands placed on today's adolescents (Larson, Wilson, & Mortimer, 2002). Further, such diversity in social, cultural and institutional

contexts requires that adolescents develop more versatile interpersonal skills to support the development of relationships to carry into adulthood (Larson, Wilson, Brown, Furstenberg, & Verma, 2002). Clearly, it is essential to have reliable and valid tools to assess the social communication consequences of TBI during adolescence. In addition, it is important to be able to measure communication competence from a variety of interpersonal perspectives.

The assessment of social communication following TBI is a multifaceted process that brings with it significant challenges including the choice of measurement tools and discourse sampling methods (Snow & Douglas, 2000; Turkstra et al., 1995). Further, discourse sampling, transcription and analysis demand substantial clinician time, and normative data for comparison are frequently not available (Snow & Douglas, 2000; Turkstra et al., 1995). In reality, no single test, tool or procedure is likely to provide clinicians with an ecologically valid representation of an individual's social communication competence. Self and close other reports of functioning can provide useful information about an individual's competence. In addition, such tools have been used effectively over a relatively long period with adults as measures of cognitive, neurobehavioural, social and communication function after TBI (e.g., Bracy & Douglas, 2005; Douglas, Bracy & Snow, 2007a; Godfrey, Partridge, Knight, & Bishara, 1993; Kreutzer, Seel & Marwitz, 1999). Such an approach allows for behavioural description and measurement of the problems perceived by individuals with TBI as they negotiate day-to-day interactions across a variety of situations. Family members and close friends have knowledge of the individual's premorbid functioning. Consequently, they are well placed to evaluate post-injury change in communication ability and do so from within the same socio-demographic context. In contrast, traditional assessments of conversational discourse are completed on samples typically elicited in structured, often artificial settings with conversational partners who are relatively unfamiliar and frequently socio-demographically different. As a result, the deficits identified may not reflect the type and frequency of deficits noted by persons with TBI and those with whom they converse (Snow & Douglas, 2000).

In the TBI population however, the use of self-report does not come without its own constraints. Important among these challenges from a measurement perspective is the impact of impaired self-awareness on self-report. Significant underestimation of problems or denial of deficits on self-report has been reported frequently in the TBI literature describing adult outcome (Cavallo, Kay, & Ezrachi, 1992; Ehrlich & Barry, 1989; Fordyce & Roueche, 1986; McNeill-Brown & Douglas, 1997; Prigatano, 1991; 2005). However, underreporting of problems consistent with reduced self-awareness is not always evident and several authors have reported findings consistent with over-reporting of problems (Bracy & Douglas, 2005; Chelune, Heaton, & Lehman, 1986; Pagulayan, Temkin, Machamer, & Dikman, 2007; Prigatano & Altman, 1990). Further in adults with TBI, there is evidence to suggest that greater awareness of deficits may develop with the passage of time and repeated experience of difficulty in daily living situations (Douglas, 2010; Douglas et al., 2007a; Godfrey et al., 1993; Pagulayan et al., 2007; Prigatano, 1999; 2005). Regardless of a person's level of awareness, self report data provide firsthand information about the changes perceived from the injured individual's own perspective, knowledge of which is essential for effective intervention (Douglas, O'Flaherty, & Snow, 2000).

The La Trobe Communication Questionnaire (LCQ; Douglas et al., 2000) was developed specifically to measure perceived social communication ability from various sources including the self-perceptions of individuals as well as those of others with whom they converse regularly (e.g. family members, friends and clinicians). The LCQ is based on Damico's clinical discourse analysis (CDA) (Damico, 1985) which itself was derived from Grice's Co-operative Principle (Grice, 1975). Grice's Cooperative Principle describes four maxims governing normal conversational discourse, irrespective of context and subject matter. These four maxims refer to the *quantity*, *quality, relation* and *manner* of a person's contributions to conversational discourse. The *quantity* maxim relates to the amount of information provided in an interaction, and violations of the *quantity* maxim can reflect provision of too little information (e.g., leaving out important details) or too much (talking about something for too long) in a conversation. *Quality* refers to the accuracy of the conversational contribution with violations occurring when a speaker conveys an inaccurate message or allows the conversational partner to misinterpret what was said. The *relation* maxim involves the relevance of the contribution. Thus, tangential comments or situationally inappropriate interactive behaviours reflect violations of this maxim. The final maxim, *manner*, relates to how

the contribution is presented and non-fluent or delayed responses, lack of logical structure in content, and poor turn taking in conversation are examples of behaviours that violate it. Additional content included in the LCQ was drawn from the literature describing cognitive-communicative breakdown following TBI (e.g., Coelho, Liles & Duffy, 1991; Hagen, 1984; Hartley & Jensen, 1991; Hartley & Levin, 1990).

The reliability and validity of the LCQ have been determined with young healthy adults (Douglas et al., 2000) and found to be acceptable. Participants for the original normative study were selected to reflect the age and education characteristics of the TBI population in an effort to provide comparative data for clinical use. More recently, acceptable reliability and validity of the LCQ have been demonstrated with adults following TBI (Douglas et al., 2007a, Douglas, Bracy & Snow, 2007b).

In an effort to evaluate the LCQ's potential for clinical use with adolescents, the present study was conducted to gauge the ability of the LCQ to distinguish between a group of adolescents who had sustained TBI and a control group of neurologically normal adolescents matched on the variables of socio-economic status (SES), age, gender and level of education completed. In the process of meeting this objective, two associated aims were conceptualised. The first was to describe the behavioural nature of social (pragmatic) communication deficits as perceived by adolescents with TBI and close others who knew them before their injury and continued to interact with them on a daily basis. To meet this first aim, social communication difficulties reported by adolescents with TBI and their close others were compared with those of the control group. With respect to this first aim, it was hypothesised that adolescents with TBI and their close others would report significantly more frequent problems than control participants and their close others.

The second associated aim was to measure concordance between self and close other reports across the two groups in order to identify potential differences that might reflect compromised self-awareness in the adolescents with TBI. Based on previous findings consistent with impaired self-awareness following TBI (e.g., Ehrlich & Barry, 1989; Fordyce & Roueche, 1986; McNeill-Brown & Douglas, 1997; Prigatano, 1991), it was hypothesised that the close others of the TBI adolescents would report significantly more communication difficulties than the adolescents themselves and that this pattern of response would not be evident in the control group.

Method

Participants

Participants were recruited for two groups: a TBI group, comprising 19 adolescents with TBI and an adult family member, and a control group, comprising 19 SES, age, gender and education matched adolescents and an adult family member. The adolescent participants were required to have received all their education in the Australian primary and secondary school system, and adolescents with a past history of hearing, learning, neurological or psychological disability were excluded from the study. Participants with TBI were volunteers sourced through rehabilitation centres or community rehabilitation practitioners in Victoria, Australia. These participants were required to have sustained a single severe, nonpenetrating brain injury, resulting in loss of consciousness, between the age range of 13 and 20 years and to be less than 20 years of age at the time of assessment. Demographic and injury related characteristics of the adolescents with TBI are provided in Table 1.

The majority of TBI participants were male (15 males, 4 females). All had sustained severe injuries as a result of moving vehicle-related trauma. Duration of posttraumatic amnesia (PTA) was available for 17 of the participants (range 14–76 days) and Glasgow Coma Scale (GCS) scores of 7 and 8 on admission to hospital were available for the remaining two participants. Mean age at the time of injury was 16.33 years (range 13.42–18.97 years) and at the time of assessment was 17.11 years (range 13.92–19.92 years). All the adolescents with TBI had been discharged from inpatient rehabilitation and were living at home with family at the time of assessment. On average they had completed 10.16 years of education (range 7–12 years). Father's occupation was classified using the occupational classification of the Australian and New Zealand Standard Classification of Occupations (Trewin & Pink, 2006) to gain a broad index of socio-economic status (SES). Paternal occupations fell into the major classification groups as shown in Table 1.

An equal number of dyads were recruited from the community to a normative control group. Participants for the control group were matched with TBI participants for SES, gender, age and years of education completed by the adolescent. The following guidelines were used for matching participants: individuals were directly matched for gender; individuals were matched within ± 1 year for age; and individuals were matched within ± 1 year for years of education completed. SES as indexed by father's occupation was monitored during recruitment of control participants to

TABLE 1
Descriptive Data for Adolescents with TBI and Control Participants

	TBI (*n* = 19)	Control (*n* = 19)
Age at assessment (years): Mean (*SD*)	17.11 (1.90)	17.12 (1.71)
Education (years completed at assessment): Mean (*SD*)	10.16 (1.74)	10.42 (1.64)
SES: Father's Occupation Mean (*SD*)	3.95 (2.30)	3.74 (2.21)
Group 1 Managers (*n*)	2	2
Group 2 Professionals (*n*)	4	6
Group 3 Technicians & Trades (*n*)	6	4
Group 6 Sales workers (n)	3	4
Group 7 Machine Operators & Drivers (*n*)	3	3
Group 8 Labourers (*n*)	1	0
Injury Severity (duration of PTA in days)	33.76 (18.13)	
Age at injury (years)	16.33 (1.67)	
Time since injury (weeks)	37.90 (32.13)	

insure that the major occupation groups sampled were similar to that of the TBI participants (see Table 1). Average age for control adolescents at the time of assessment was 17.12 years (range 14.00–19.83) and they had completed a mean of 10.42 years of education (range 7–12 years). The TBI and control groups were exactly matched on gender composition (15 males and 4 females). They were not significantly different in age (F = .000; p = .994), years of education (F = .230; p = .635) or SES as indexed by father's occupation (F = .082; p = .774) (see Table 1).

For each adolescent participant, an adult relative (21 years of age) with whom he/she resided was invited to participate in the study. In most cases the family member who participated was a parent (TBI group: 12 mothers, 3 fathers, 1 sister, 3 brothers; Control group: 14 mothers, 1 father, 3 sisters, 1 brother).

Materials

The La Trobe Communication Questionnaire (LCQ) (Douglas et al., 2000) was administered independently to individual participants within the TBI and control dyads. The LCQ consists of two forms: Form S, self-report form, and Form O, close other/relative form. The forms are identical in content with the exception that Form O uses the third person when describing communication behaviours. There are 30 items on the LCQ. Item content reflects the four domains of Grice's (1975) Cooperative Principle of conversation (Quantity, Quality, Relation and Manner) supplemented by items reflecting cognitive-communicative deficits associated with TBI. A detailed description of item content can be found in previous articles outlining the development and evaluation of the LCQ (Douglas et al., 2000; Douglas, Bracy, & Snow, 2007a & 2007b). No changes were made to the content of the LCQ for use with adolescents in this study. This decision was taken for several reasons. First, Grice's (1975) Cooperative Principle of conversation is applicable to adolescents as well as adults; second, Damico's (1985) clinical discourse analysis procedure was initially developed and used with school-aged and adolescent students (Damico, 1991); and third, the additional items included in the original development of the LCQ capture conversational behaviours characteristically seen in adults and adolescents with TBI.

There are four possible levels of response for each of the 30 items: (1) *Never or rarely*, (2) *Sometimes*, (3) *Often*, and (4) *Usually or always*. The frequency response format yields individual item scores ranging from 1–4 and a total score ranging from 30–120. High scores are consistent with a perception of frequent difficulties and low scores indicate less frequent difficulties. The LCQ has a second response format, *change*, available for clinical use. This response format can be used to elicit premorbid versus postmorbid, pre-intervention versus post-intervention judgements of change or judgements of change over specified periods of time. The frequency response format was used in the present study.

The LCQ has been psychometrically evaluated on young healthy adults (Douglas et al., 2000) and adults with TBI (Douglas et al., 2007a). It has high internal consistency (Cronbach's Alpha: Self-report = .85, Close others = .86), and acceptable stability over time for self-report (test–retest reliability — 8 weeks: r = .76), in the healthy adult population. Total LCQ scores for

self and close other report in the normative group were normally distributed around a total score mean of 52.47 (*SD* 9.62) for self report ratings and a mean of 47.17 (*SD* 9.93) for close other ratings (Douglas et al., 2000).

The LCQ has also been shown to have high internal consistency with TBI participants (Cronbach's Alpha = 0.91) and their close others (Cronbach's Alpha = 0.92). Test-retest coefficients across a 2-week interval for TBI participants ($r = .81$) and their close others ($r = .87$) were also acceptable (Douglas et al., 2007a). Principal component factor analysis supports the construct validity of the LCQ and indicates that it can also be used to measure dimensions within TBI-related cognitive-communicative breakdown (Douglas et al., 2007b; Struchen et al., 2008). The clinical utility of the LCQ within the TBI adult population has been supported by the results of several published studies (Bracy & Douglas, 2005; Douglas, 2010; McNeill-Brown & Douglas, 1997; O'Flaherty & Douglas, 1997; Struchen, Clark et al., 2008; Watts & Douglas, 2006). To date, no published studies have reported on the use of the LCQ in the TBI adolescent population.

Procedure

Ethics approval to conduct the study was obtained from university and health institution ethics committees. All participants were seen in their homes for data collection and the visit began with completion of informed consent procedures, which included parental consent. All adolescent participants completed the LCQ in an interview format with the researcher, while relatives were given the option of completing it in either an interview or a written questionnaire form. In interview format the questionnaire requires approximately 30 minutes to complete. Completion of the written questionnaire requires 15 minutes.

Data Analysis

Group comparisons on LCQ total scores were analysed using mixed 2 × 2 ANOVA. The ANOVA was used to conduct between-subjects analysis (comparison of total scores of the two independent groups: TBI vs control) and within-subjects analysis (comparison of total scores with respect to source of perception: self vs close other). *T* tests (paired and independent) were performed to evaluate planned comparisons reflecting the a priori hypotheses. Nonparametric analyses (Mann Whitney *U*-test) were used for analyses comparing individual item responses because the item response format yields ordinal not ratio data. An alpha level of .05 was applied to all group comparison tests on total scores and a Bonferroni adjusted alpha level of .0017 (.05/30) was used for comparisons of individual items.

Results

Descriptive statistics for LCQ total scores of TBI and control dyads are shown in Table 2. Analysis of LCQ total scores using mixed 2 × 2 ANOVA revealed a significant group main effect ($F = 56.38$, $p < .001$) with LCQ scores being significantly higher in the TBI group than those reported by control participants. There was no main effect for source of perception ($F = .86$, $p = .36$) but there was a significant interaction between the two factors ($F = 28.88$, $p < .001$; see Figure 1). *T* tests conducted to explore the a priori between-group hypotheses revealed that adolescents with TBI reported themselves to have significantly more frequent communication difficulties than control adolescents ($t = 2.27$; $p = .015$, one-tailed test; $d = 1.07$). This result was also the case for relatives' perceptions ($t = 10.01$; $p < .001$, one-tailed test; $d = 4.70$). However, the effect size was four times greater in the relatives' data. Paired *t* tests conducted to evaluate within group comparisons revealed that adolescents with TBI perceived themselves to have significantly less frequent communication difficulties than their relatives perceived them to have ($t = –3.75$; $p = .002$, two-tailed test; $d = .92$). Consistent with the significant interaction, the pattern of results was reversed in the control group with control adoles-

TABLE 2
Descriptive statistics on LCQ total scores of TBI and Control Groups

LCQ Total	TBI		Control	
	Self (*n* = 19)	Relative (*n* = 19)	Self (*n* = 19)	Relative (*n* = 19)
Mean	54	65.79	46.79	38.47
Standard deviation	12.12	12.78	6.74	5.84
Range	34–73	45–87	37–60	30–48

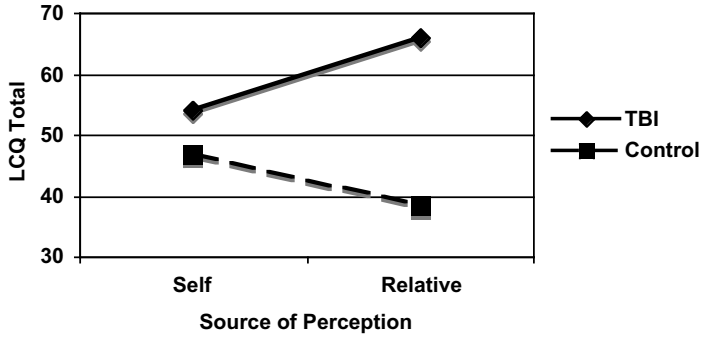

FIGURE 1

Self and relative LCQ total scores of the TBI and control groups.

Note: Possible range of total scores on the LCQ is 30–120, where 30 = difficulties never or rarely and 120 = difficulties usually or always.

cents reporting themselves to have significantly more frequent communication difficulties than their relatives perceived them to have (t = 4.23; p = .001, two-tailed test; d = 1.42).

In keeping with the directional hypotheses that adolescents with TBI and their close others would report significantly more frequent problems than control participants and their relatives, one-tailed Mann Whitney *U*-tests were then applied to individual items. A Bonferroni adjusted alpha level of .0017 (.05/30) was applied to the individual item comparisons between the TBI and control groups. Results are shown in Table 3.

TBI participants' themselves reported significantly more frequent difficulties than did the control participants on only 1 of the 30 items, while relatives of the TBI participants reported significantly more frequent difficulties than did the relatives of the control participants on 20 of the 30 items. The single item on which self-perceptions yielded a significant difference measured word-finding difficulties and reflected the Conversational Fluency factor of the LCQ. The 20 items that showed significant differences between the relatives' perceptions reflected frequent difficulties in all four of Grice's domains (Quantity, Quality, Relation and Manner) and the Conversational Fluency, Inhibitory Control, Task Management and Attentional Control factors of the LCQ. Five items in the dataset from the relatives of TBI adolescents showed particularly high elevations (> 2.5 mean frequency) and large differences (> 1.00) compared to the relatives of the control adolescents. One of these was included in the LCQ as a measure of word-finding difficulties (*thinking of a particular word*), two measured behaviours in the Manner domain (turn-taking: *knowing when to talk and when to listen,* discourse structure: *putting ideas together in a logical way*) and two measured behaviours in the Relation domain (tangentiality: *getting sidetracked by irrelevant parts of the conversation,* appropriate selection of speech style: *changing speech style according to the situation*).

Discussion

Results of the present investigation support the clinical utility of the LCQ with adolescents who have sustained TBI. As hypothesised the LCQ was able to distinguish between a group of adolescents who had sustained TBI and a control group of neurologically normal adolescents matched on the variables of SES, age, gender and level of education completed. Further, significant differences between the two groups emerged from both the perspectives of the adolescents themselves and the perspectives of their relatives who interacted with them frequently. However, the magnitude of the difficulties reported by the TBI adolescents and their relatives was significantly different. Relatives of TBI adolescents reported not only significantly more frequent conversational difficulties overall, but also a larger number of individual items/conversational behaviours were identified as producing difficulties. Thus, although the TBI adolescents reported significantly more difficulties than the matched control adolescents, they perceived less difficulty with their communication than their relatives. This pattern of response, where there were significantly elevated frequency scores from relatives of people with TBI, was opposite to that found in the control adolescent group and indeed in the original normative group (Douglas et al., 2000) and the control groups of previous studies using

TABLE 3
Mean ratings on items that yielded significant differences ($p < .0017$) between TBI and Control groups (self and close other perceptions).

Item	Gricean Domain	LCQ factor	Self-report		Relatives' report	
			TBI mean frequency	Control mean frequency	TBI mean frequency	Control mean frequency
1. Leave out important details	Quantity	Conversational fluency	1.74	1.89	2.16*	1.32
2. Use a lot of vague/ empty words	Quantity	Conversational fluency	1.95	1.58	2.58*	1.68
3. Go over & over the same ground	Quantity	Inhibitory control	2.00	1.32	2.21*	1.26
7. Thinking of the particular word	Cog-Comm	Conversational fluency	2.26*	1.47	2.58*	1.32
9. Say/do things others consider rude/embarrassing	Relation	Inhibitory control	2.05	1.95	2.26*	1.53
10. Hesitate, pause or repeat	Manner	Conversational fluency	1.74	1.53	2.21*	1.16
11. Know when to talk and when to listen	Manner	Task management	2.05	1.74	2.68*	1.26
12. Get sidetracked by irrelevant parts of conversation	Relation	Attentional control	2.11	1.79	2.53*	1.47
13. Hard to follow group conversations	Cog-comm	Attentional control	1.58	1.16	2.37*	1.11
14. Need other person to repeat before answering	Quantity	Attentional control	1.63	1.21	1.84*	1.10
15. Give people information that is not correct	Quality	Task management	1.58	1.26	2.37*	1.21
16. Make a few false starts	Manner	Conversational fluency	1.79	1.68	2.16*	1.16
19. Keeping track of main details	Cog-Comm	Task management	1.58	1.47	2.47*	1.00
20. Give answers not connected to the question	Relation	Inhibitory control	1.47	1.37	1.95*	1.11
21. Change speech style according to the situation	Relation	Task management	1.89	1.58	2.58*	1.47
23. Put ideas together in a logical way	Manner	Task management	1.84	1.68	2.84*	1.11
25. Carry on talking about things too long	Quantity	Inhibitory control	2.11	1.95	2.37*	1.53
27. Answer without taking time to think	Cog-comm	Inhibitory control	1.84	1.58	2.42*	1.26
28. Give information that is completely accurate	Quality	Task management	1.68	1.47	2.37*	1.16
29. Lose track of conversations in noisy places	Cog-Comm	Attentional control	1.90	1.84	2.32*	1.32

Note: * Mann Whitney U TBI vs Control $p < .0017$ (one tailed).

the LCQ (Bracy & Douglas, 2005; Douglas, 2010). In normative groups the pattern of response generally reflects a high degree of self-awareness with self-reports of frequency of communication difficulty being significantly higher than relative or close other reports.

Significant elevations of deficit frequency scores from relatives in comparison to scores from people with TBI themselves have been associated previously with impaired self-awareness of conversational deficits (Douglas et al., 2007a; McNeill-Brown & Douglas, 1997). However, significant

differences between relative/close other report and self-report have not always emerged (Bracy & Douglas, 2005; Douglas, 2010). Awareness of deficit may be shaped not only by severity and patterns of injury, but also by the passage of time, emotional adjustment and experience of failure in social communication contexts. Time elapsed since injury may well have exerted an effect on the current results. On average, participants were 9.5 months postinjury and 14/19 participants were less than 1 year postinjury. This relatively short time postinjury interval was also the case in McNeill-Brown and Douglas' (1997) study, in which similar results were reported. These authors found that a group of 17 participants, all less than 1 year postinjury, reported that they experienced significantly less frequent communication difficulties than were perceived by either their close others or their rehabilitation workers. In contrast, findings characterised by high concordance and no significant difference between self and close other reports (Bracy & Douglas, 2005; Douglas, 2010) tend to emerge from studies in which the time postinjury intervals are substantially longer. Participants in the Bracy and Douglas' (2005) study had sustained severe brain injuries a mean of 7.3 years earlier, while a minimum of 2 years and an average of 5.3 years had elapsed since injury for participants in the Douglas (2010) study. The results of these studies considered together with the current results provide some support for the contention that self-awareness of social communication difficulty increases with increasing time postinjury. This increased awareness may result from the combined effects of neurological recovery, treatment, and accumulation of negative experiences in day-to-day conversational settings. Longitudinal studies will be required to shed additional light on this issue, particularly in the case of the developing adolescent who sustains TBI.

While TBI adolescents perceived themselves to be experiencing significantly more frequent overall communication difficulties than the control adolescents, item analysis revealed that there was only one individual behaviour, word-finding difficulty, that yielded a significant difference in its own right. In contrast, two-thirds of the individual items produced statistically significant results in the relatives' data. Behaviours associated with violations of the conversational principles of Relation, Manner and Quantity and to a lesser extent Quality were clearly identified by relatives of the TBI adolescents as creating frequent problems. A tendency for persistent disruption to occur in these aspects of conversational discourse after TBI has also been reported in adults using clinical discourse analysis of transcribed conversational samples (Snow et al., 1997, 1998) and the LCQ (Douglas, 2010). Given that the conversational domains of Relation, Manner and Quantity present significant challenges for adolescents and adults with TBI, behavioural violations in these domains clearly require systematic treatment attention.

Limitations of the Study

This study was undertaken to make a preliminary evaluation of the clinical utility of the LCQ in the adolescent TBI population. Although these initial results are promising, they need to be considered within the limitations of the study. The sample size was relatively small and predominantly male. In addition, the sample was constrained by the injury-related parameters of severity (severe) and time postinjury (< 2.5 years) and the geographic range of recruitment (Victoria, Australia). All of these factors place substantial constraints on the extent to which these findings can be generalised. Further, there is no doubt that assessment of social communication skills after TBI requires a multifaceted approach of which only one aspect is targeting self and close other perspectives. Thus, additional research comparing LCQ self and other profiles with the results of a variety of other measures (e.g., standardised tests and discourse analysis protocols applied to conversational samples collected across a variety of contexts) is necessary.

Conclusions

Despite the limitations of the study, the present findings provide promising support for the use of the LCQ as a measure of social communication ability in adolescents with TBI. Comparison of self and close other report on the LCQ also provides a means of evaluating self-awareness specific to the domain of communication. Regardless of the level of awareness shown by a client, obtaining first hand information about the difficulties and changes perceived by an injured adolescent is an essential component of goal setting and therapy planning. Even when self-awareness is compromised, comparison of perceptions from various sources (self, parents, siblings, teachers, friends and clinicians) allows for identification of behaviours characterised by differential degrees of agreement. Areas of strong agreement can represent excellent starting points for therapy. In addition, comparison of perception across respondents can provide much needed material for working towards increased awareness. Further, family members have knowledge of the adolescent's preinjury functioning and personal communication style and are thus well placed to

identify areas of function that show substantial postinjury change.

Finally, difficulties in the domain of interpersonal communication have been found to contribute to the enduring disability associated with severe TBI across the age range from childhood (Ewing-Cobbs & Barnes, 2002; Ylvisaker, 1993), through adolescence (Ciccia, Muelenbroek, & Turkstra, 2009; Turkstra, 2000; Turkstra et al., 1995) and adulthood (Galski, Tompkins, & Johnston, 1998; Snow et al., 1998; Struchen, Clark et al., 2008). Measurement of interpersonal communication is a difficult process that continues to challenge clinicians working across the rehabilitation continuum. The LCQ is a clinical tool that has sound potential to contribute to the multifaceted measurement of this complex area of human behaviour in adolescents as well as adults.

Acknowledgments

Many thanks to those who so generously participated in this study.

Author Note

The La Trobe Communication Questionnaire is available for clinical and research use from the author.

References

Adams, J., Graham, D., Scott, G., Parker, L., & Doyle, D. (1980). Brain damage in fatal non-missile head injury. *Journal of Clinical Pathology, 33,* 1132–1145.

Anderson, V., Northam, E., Wrennall, J., & Hendy, J. (2001). *Developmental Neuropsychology: A Clinical Approach.* Sussex, England: Psychology Press.

Barnes, M. A. & Dennis, M. (2001). Knowledge based inferencing after childhood head injury. *Brain and Language, 76,* 253–265.

Blakemore, S. & Choudhury, S. (2006). Development of the adolescent brain: Implications for executive function and social cognition. *Journal of Child Psychology and Psychiatry, 47,* 296–312.

Blumbergs, P., Jones, N., & North, J. (1989). Diffuse axonal injury in head trauma. *Journal of Neurology, Neurosurgery and Psychiatry, 52,* 838–841.

Body, R., Perkins, M., & McDonald, S. (1999). Pragmatics, cognition and communication in traumatic brain injury. In S. McDonald, C. Code & L. Togher (Eds.), *Communication Disorders following Traumatic Brain Injury* (pp. 81–112). Hove, UK: Psychology Press.

Bracy, C., & Douglas, J. (2005). Marital dyad perceptions of injured partners' communication following severe traumatic brain injury. *Brain Impairment, 6,* 1–12.

Brookshire, B., Chapman, S., Song, J. & Levin, H. (2000). Cognitive and linguistic correlates of children's discourse after closed head injury: A three-year follow-up. *Journal of the International Neuropsychological Society, 6,* 741–751.

Cavallo, M., Kay, T., & Ezrachi, O. (1992). Problems and changes after traumatic brain injury: Differing perceptions within and between families. *Brain Injury, 6,* 327–335.

Chapman, S., Culhane, K., Levin, H., Harward, H., Mendelsohn, D., Ewing-Cobbs, L., et al. (1992). Narrative discourse after closed head injury in children and adolescents. *Brain and Language, 43,* 42–65.

Channon, S., & Watts, M. (2003). Pragmatic language interpretation after closed head injury: Relationship to executive functioning. *Cognitive Neuropsychiatry, 8,* 243–260.

Chelune, G., Heaton, R., & Lehman, R. (1986). Relation of neuropsychological and personality test results to patients complaints of disability. In G. Goldstein & R. Tarter (Eds.), *Advances in clinical neuropsychology* (Vol. 3, pp. 95–126). New York: Plenum Press

Ciccia, A., Muelenbroek, P., & Turkstra, L. (2009). Adolescent brain and cognitive developments: Implications for clinical assessment in traumatic brain injury. *Topics in Language Disorders, 29,* 249–265.

Coelho, C. A., Liles, B.Z., & Duffy, R.J. (1991). Analysis of conversational discourse in head injured adults. *Journal of Head Trauma Rehabilitation*, *6*, 92–99.

Coelho, C., Youse, K., & Le, K. (2002). Conversational discourse in closed head-injured and non-brain-injured adults. *Aphasiology, 16,* 659–672.

Dahl, R. (2004). Adolescent brain development: A period of vulnerabilities and opportunities. *Annals of the New York Academy of Science, 1021,* 1–22.

Damico, J.S. (1985). Clinical discourse analysis: A functional approach to language assessment. In C.S. Simon (Ed.), *Communication skills and classroom success* (pp. 165–203). London: Taylor & Francis.

Damico, J.S. (1991). Clinical discourse analysis: A functional approach to language assessment. *Assessment and therapy methodologies for language and learning disabled students* (pp.125–150). Eau Claire, WI: Thinking Publications.

Dennis, M., & Barnes, M. (1990). Knowing the meaning, getting the point, bridging the gap and carrying the message: Aspects of discourse following closed head injury in childhood and adolescence. *Brain and Language, 39,* 428–446.

Douglas, J. (2010). Relation of executive functioning to pragmatic outcome following severe traumatic brain injury. *Journal of Speech, Language, and Hearing Research, 53(2),* 365–382.

Douglas, J., Bracy, C. & Snow, P. (2007a). Measuring perceived communicative ability after traumatic brain injury: Reliability and validity of the La Trobe Communication Questionnaire. *Journal of Head Trauma Rehabilitation, 22,* 31–38.

Douglas, J., Bracy, C., & Snow, P. (2007b). Exploring the factor structure of the La Trobe Communication Questionnaire: Insights into the nature of communication deficits following traumatic brain injury. *Aphasiology, 21,* 1181–1194.

Douglas, J., O'Flaherty, C., & Snow, P. (2000). Measuring perception of communicative ability: The development and evaluation of the La Trobe Communication Questionnaire. *Aphasiology, 14,* 251–268.

Ehrlich, J., & Barry, P. (1989). Rating communication behaviours in the head-injured adult. *Brain Injury, 3,* 193–198.

Eisenberg, N., & Morris, A. (2004). Moral cognitions and prosocial responding in adolescence. In R. Lerner & L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp. 155–188). New York: Wiley & Sons.

Ewing-Cobbs, L., & Barnes, M. (2002). Linguistic outcomes following traumatic brain injury in children. *Seminars in Pediatric Neurology, 9,* 209–217.

Ewing-Cobbs, L., Fletcher, J., Levin, H., Iovino, I., & Miner, M. (1998). Academic achievement and academic placement following traumatic brain injury in children and adolescents: A two-year longitudinal study. *Journal of Clinical and Experimental Neuropsychology*, *20*, 769–781.

Fordyce, D., & Roueche, J. (1986). Changes in perspectives of disability among patients, staff and relatives during rehabilitation of brain injury. *Rehabilitation Psychology, 31,* 217–229.

Fyrberg, A., Marchioni, M., & Emanuelson, I. (2007). Severe acquired brain injury: Rehabilitation of communicative skills in children and adolescents. *International Journal of Rehabilitation Research, 30,* 153–157.

Galski, T., Tompkins, C., & Johnston, M. (1998) Competence in discourse as a measure of social integration and quality of life in persons with traumatic brain injury. *Brain Injury*, *12*, 769–782.

Gioia, G.A., & Isquith, P.K. (2004). Ecological assessment of executive function in traumatic brain injury, *Developmental Neuropsychology*, *25*, 135–158.

Godfrey, H.P.D., Partridge, F.M., Knight, R.G., & Bishara, S.N. (1993). Course of insight disorder and emotional dysfunction following closed head injury: A controlled cross-sectional follow-up study. *Journal of Clinical and Experimental Neurosychology, 15*, 530–515.

Grice, P. (1975). Logic in conversation. In P. Cole and P. Morgan (Eds.), *Studies in syntax and semantics* (Vol. 3, pp. 41–58). New York: Academic Press.

Hagen, C. (1984). Language disorder in head trauma. In A. Holland (Ed.), *Language disorders in adults* (pp. 245–281). San Diego, California: College Hill Press.

Hartley, L., & Jensen, P. (1991). Narrative and procedural discourse after closed head injury. *Brain Injury, 5,* 267–285.

Hartley, L.L. & Levin, H.S. (1990) Linguistic deficits after closed head injury: A current appraisal. *Aphasiology*, *4,* 353–370.

Keating, D.P. (2004). Cognitive and brain development. In R. Lerner and L. Steinberg (Eds.), *Handbook of adolescent psychology* (pp. 45–84). New York: Wiley & Sons.

Kim, J., Whyte, J., Hart, T., Vaccaro, M., Polansky, M., & Coslett, H. (2005). Executive function as a predictor of inattentive behavior after traumatic brain injury. *Journal of the International Neuropsychological Society, 11,* 434–445.

Kreutzer, J., Seel, R., & Marwitz, J. (1999). *The Neurobehavioral Functioning Inventory*. San Antonio: The Psychological Corporation.

Larson, R., Wilson, S., Brown, B., Furstenberg, F., & Verma, S. (2002). Changes in adolescents' interpersonal experiences: Are they being prepared for adult relationships in the twenty-first century. *Journal of Research on Adolescence, 12,* 31–68.

Larson, R., Wilson, S., & Mortimer, J. (2002). Conclusions: Adolescents' preparation for the future. *Journal of Research on Adolescence, 12,* 159–166.

Levin, H., & Kraus, M. (1994). The frontal lobes and traumatic brain injury. *Journal of Neuropsychiatry and Clinical Neurosciences, 6,* 443–454.

Liles, B., Coelho, C., Duffy, R., & Zalagens, M. (1989). Effects of elicitation procedures on the narratives of normal and closed head-injured adults. *Journal of Speech and Hearing Disorders, 54*, 356–366.

Martin, I., & McDonald, S. (2003). Weak coherence, no theory of mind, or executive dysfunction? Solving the puzzle of pragmatic language disorders. *Brain and Language, 85,* 451–466.

Mattson, A., & Levin, H. (1990). Frontal lobe dysfunction following closed head injury. A review of the literature. *Journal of Nervous and mental Disease, 178,* 282–291.

McDonald, S. (1992). Differential pragmatic language loss following closed head injury: Ability to comprehend conversational implicature. *Applied Psycholinguistics, 13,* 295–312.

McDonald, S. (1993). Pragmatic language skills after closed head injury: Ability to meet the informational needs of the listener. *Brain and Language, 44,* 28–46.

McDonald, S., & Pearce, S. (1998). Requests that overcome listener reluctance: Impairment associated with executive dysfunction in brain injury. *Brain and Language, 61,* 88–104.

McDonald, S., & van Sommers, P. (1993). Pragmatic language skills alter closed head injury: Ability to negotiate requests. *Cognitive Neuropsychology, 10*, 297–315.

McNeill-Brown, D., & Douglas, J. (1997). Perceptions of communication skills in severely brain-injured adults. In J. Ponsford, V. Anderson and P. Snow (Eds.), *International perspectives on traumatic brain injury. Proceedings of the Fifth International*

Association for the Study of Traumatic Brain Injury Conference (pp. 247–250). Brisbane, Australia: Australian Academic Press.

Millis, S., Rosenthal, M., Novack, T., Sherer, M., Nick, T., Kreutzer, J. et al. (2001). Long term neuropsychological outcome after traumatic brain injury. *Journal of Head Trauma Rehabilitation, 16,* 343–355.

Mosby's Medical Dictionary, (8th ed.). (2009). St. Louis, Mo.: Mosby/Elsevier.

O'Flaherty, C., & Douglas, J. (1997). Living with cognitive-communicative difficulties following traumatic brain injury: Using a model of interpersonal communication to characterise the subjective experience. *Aphasiology. 11,*889–911.

Pagulayan, K., Temkin, N., Machamer, J., & Dikman, S. (2007). The measurement and magnitude of awareness difficulties after traumatic brain injury: A longitudinal study. *Journal of the International Neuropsychological Society, 13,*561–570.

Paus, T. (2005). Mapping brain maturation and cognitive development during adolescence. *Trends in Cognitive Sciences, 9,* 60–68.

Prigatano, G. (1991). Disturbances of self-awareness of deficit after traumatic brain injury. In G. Prigatano & D. Schacter (Eds.), *Awareness of deficit after brain injury* (pp. 111–126). New York: Oxford University Press.

Prigatano, G. (1999). *Principles of neuropsychological rehabilitation.* New York: Oxford University Press.

Prigatano, G. (2005). Disturbances of self-awareness and rehabilitation of patients with brain injury: A 20 year perspective. *Journal of Head Trauma Rehabilitation, 20,* 19–29.

Prigatano, G.P., & Altman, I.M. (1990). Impaired awareness of behavioural limitations after brain injury. *Archives of Physical Medicine and Rehabilitation, 71,* 1058–1064.

Snow, P.C., & Douglas, J.M. (2000). Conceptual and methodological challenges in discourse assessment with TBI speakers: Towards an understanding. *Brain Injury, 14,* 397–415.

Snow, P., Douglas, J., & Ponsford, J. (1997). Conversational assessment following traumatic brain injury: A comparison across two control groups. *Brain Injury. 11,* 409–430.

Snow, P., Douglas, J., & Ponsford, J. (1998). Conversational discourse abilities following severe traumatic brain injury: A longitudinal follow-up. *Brain Injury, 11,* 911–935.

Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Science, 9,* 69–74.

Stout, C., Yorkston, K., & Pimentel, J. (2000). Discourse production following mild, moderate and severe traumatic brain injury: A comparison of two tasks. *Journal of Medical Speech Language Pathology, 8,* 15–25.

Struchen, M., Clark, A., Sander, A., Mills, M., Evans, G., & Kurtz, D. (2008). Relation of executive functioning and social communication measures to functional outcomes following traumatic brain injury. *NeuroRehabilitation, 23*,185–198.

Struchen, M., Pappadis, M., Mazzei, D., Clark, A., Davis, L., & Sander, A. (2008). Perceptions of communication abilities for persons with traumatic brain injury: Validity of the La Trobe Communication Questionnaire. *Brain Injury, 22*, 940–951.

Taylor, H., Yeates, K., Wade, S., Drotar, D., Stancin, T., & Minich, N. (2002). A prospective study of long- and short-term outcomes after traumatic brain injury in children: Behavior and achievement. *Neuropsychology, 16,* 15–27.

Togher, L., Hand, L., & Code, C. (1997). Analysing discourse in the traumatic brain injury population: Telephone interactions with different communication partners. *Brain Injury, 11*, 169–189.

Trewin, D., & Pink, B. (2006). *Australian and New Zealand Standard Classification of Occupations (1st Ed.).* Canberra: Australian Bureau of Statistics.

Turkstra, L. (2000). Should my shirt be tucked in or left out? The communication context of adolescence. *Aphasiology, 14,* 349–364.

Turkstra, L., Ciccia, A., & Seaton, C. (2003). Interactive behaviours in adolescent conversation dyads. *Language, Speech and Hearing Services in Schools, 34,* 117–127.

Turkstra, L., Mc Donald, S., & Kaufmann, P. (1995). Assessment of pragmatic communication skills in adolescents after traumatic brain injury. *Brain Injury, 10,* 319–345.

Watts, A., & Douglas, J. (2006). Interpreting facial expression and communication competence following severe traumatic brain injury. *Aphasiology, 20,* 707–722.

Ylvisaker, M. (1993). Communication outcome in children and adolescents with traumatic brain injury. *Neuropsychological Rehabilitation, 3,* 367–387.

Ylvisaker, M., Turkstra, L., Coehlo, C., Yorkston, K., Kennedy, M., Sohlberg, M., & Avery, J. (2007). Behavioural interventions for children and adults with behaviour disorders after TBI: A systematic review of the evidence. *Brain Injury, 21,* 769–805.