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Research Article

# Psychosocial Outcomes of Severe Traumatic Brain Injury in Relation to Discourse Recovery: A Longitudinal Study up to 1 Year Post-Injury

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**Purpose:** The interrelationship between psychosocial outcomes and discourse after severe traumatic brain injury remains largely unknown. This study examines outcomes relating to work, relationships, and independence within the context of discourse recovery across the 1st year post-injury.
**Method:** An inception cohort comprising 57 participants with severe traumatic brain injury was assessed at 3, 6, 9, and 12 months post-injury. Outcomes were measured with the Sydney Psychosocial Reintegration Scale–2 (Tate et al., 2012; Tate, Simpson, Loo, & Lane-Brown, 2011), and discourse was evaluated with Main Concept Analysis of a narrative retell. Correlation and linear regression analyses were utilized.
**Results:** Significant correlations were found between psychosocial outcomes reported by relatives and discourse performance across the 1st year. The 6-month discourse scores significantly predicted the 12-month psychosocial outcomes reported by relatives. Initial discourse severity and recovery pattern also informed outcomes.
**Conclusions:** Discourse disorders have a strong relationship with everyday outcomes relating to work, relationships, and independence as reported by relatives. Six months post-injury is a beneficial time for assessment, education, and service planning. Age, years of education, and aphasia may mediate recovery and outcomes. A clinical decision tree is offered to support goal setting.
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Poor psychosocial outcomes, including social isolation, difficulty reintegrating into paid work roles, and lack of independence with daily activities, are commonly reported following severe traumatic brain injury (TBI; Corrigan et al., 2014; Olver, Ponsford, & Curran, 1996; Ponsford et al., 2014; Ponsford, Olver, & Curran, 1995; Tate, Lulham, Broe, Strettles, & Pfaff, 1989). Communication skills are an integral component of everyday activities relating to work, relationships, and daily interactions (Meulenbroek, Bowers, & Turkstra, 2016), and discourse analyses offer unique insights into these everyday communication behaviors (Coelho, Ylvisaker, & Turkstra, 2005; Togher, 2001). However, there is currently very little research exploring the nature of the relationship between discourse and psychosocial outcomes. In particular, there is a poor understanding of how discourse recovery interacts with psychosocial outcomes, particularly during the first year of recovery, which is a key period for rehabilitation.

A number of clinical insights could be obtained from investigating the association between discourse recovery and psychosocial outcomes across the first year post-injury. First, we may be able to better understand the impact of discourse disorders on everyday activities for individuals with TBI during their first year of recovery. For example, an individual may retain social relationships during early recovery (3–6 months), but persisting discourse deficits may contribute to a breakdown of relationships as the individual attempts community reintegration. This information could assist with timing of services, ensuring that appropriate resources and supports are engaged at the right time (Elbourn, Togher, Kenny, & Power, 2016). Second, we may be able to identify the predictive value of discourse in relation to psychosocial outcomes. For example, severity of discourse disorder may predict capacity to return to work or maintain strong social relationships. This information would be useful

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for rehabilitation providers to support service planning. Finally, this study may offer insights that support goal setting. For example, an individual with mild discourse difficulties may have poor work outcomes but relatively good social relationship outcomes. This may offer further direction and guidance for clinicians on which communication behaviors are the optimal targets to support the patient's goals (Hart, Hawkey, & Whyte, 2002; Levack et al., 2015; Webb & Glueckauf, 1994). Examining the dynamics between discourse recovery and psychosocial outcomes in the first year of rehabilitation has the potential to support positive psychosocial outcomes for individuals with severe TBI.

The relationship between discourse and psychosocial outcomes following TBI is largely unknown. A number of studies have linked broad measures of communication, such as the Functional Independence Measure (Keith, Granger, Hamilton, & Sherwin, 1987), to psychosocial outcomes (Hammond, Hart, Bushnik, Corrigan, & Sasser, 2004; Olver et al., 1996; Pagulayan, Temkin, Machamer, Sureyya, & Dikmen, 2006). However, these broad communication measures fail to adequately capture the communication deficits observed following TBI, which are best identified with discourse-level measures. Consequently, the lack of discourse measurement in relation to psychosocial outcomes has resulted in limited clinical implications from this group of studies. Similarly, a further group of studies have identified significant relationships between social or cognitive-communication skills in relation to return to work (Douglas, Bracy, & Snow, 2016; Isaki & Turkstra, 2000; Meulenbroek & Turkstra, 2016; Rietdijk, Simpson, Togher, Power, & Gillett, 2013; Struchen, Pappadis, Sander, Burrows, & Myszka, 2011; Tran et al., 2018), relationships (Shorland & Douglas, 2010; Tran et al., 2018), and social interaction (Dahlberg et al., 2006; Douglas, 2010a; Jones & Turkstra, 2011; Knox & Douglas, 2009; Turkstra, 2008; Watts & Douglas, 2006). Discourse measures are lacking from this body of research, despite the understanding that discourse is one of the most useful tools for evaluating cognitive-communication disorders (Coelho, 2007; Coelho et al., 2005; Togher, 2001; Togher, Hand, & Code, 1997).

A handful of studies have explored the relationship between discourse and psychosocial outcomes following TBI. One of the earliest studies compared 30 individuals with TBI, of unknown severity, at an average of 47 weeks ($M$ = 47.43, $SD$ = 105.52 weeks post-injury), with a matched control group ($n$ = 10; Galski, Tompkins, & Johnston, 1998). Discourse genres included conversational, narrative, and procedural, and the analysis included parameters of efficiency, complexity, topic management, information, and pragmatic behaviors, whereas the primary psychosocial outcome was a self-reported Community Integration Questionnaire (CIQ; Willer, Rosenthal, Kreutzer, Gordon, & Rempel, 1993). Numerous discourse characteristics, such as number of words and time for completion, were significantly correlated with social integration on the CIQ. Interestingly, the features of the conversational discourse did not correlate more strongly than the other discourse genres, and the authors attributed this to the potentially less challenging nature of the conversational task compared to the narrative and procedural. For example, the conversational task required minimal sequencing and abstraction. Conversational performance may have also been influenced by the supportive skill of the communication partners (Togher, McDonald, Code, & Grant, 2004).

Another earlier project studied 26 individuals with severe TBI initially at 18 weeks ($M$ = 17.8, $SD$ = 4.2) with follow-up at 139 weeks ($M$ = 139.1, $SD$ = 23.3) post-injury (Snow, Douglas, & Ponsford, 1998). Conversation was evaluated with a modified form of Damico's Clinical Discourse Analysis (CDA-M; Damico, 1991), and the psychosocial measure used was the self-reported Craig Handicap Assessment and Reporting Technique (CHART; Whiteneck, Charlifue, Gerhart, Overholser, & Richardson, 1992). A modest association was found between the CDA-M scores and the social integration section of the CHART, with a weak association found between the CDA-M and the occupational and cognitive independence sections. These two early studies provided the first empirical evidence of a possible link between discourse and psychosocial outcomes following TBI, but more recent studies have also contributed to this understanding.

One recent study, focusing on acute outcomes, examined 195 participants (55% mild injury severity) within 3 weeks of injury and again at discharge from an acute medical setting (LeBlanc et al., 2014). Conversational discourse was measured using a discourse checklist (Protocole Montréal d'Évaluation de la Communication; Joanette, Ska, & Côté, 2004) and two outcome measures, namely, the Disability Rating Scale (Rappaport, Hall, Hopkins, Belleza, & Cope, 1982) and the Extended Glasgow Outcome Scale (Jennett, Snoek, Bond, & Brooks, 1981). Key findings were that the conversation scores significantly predicted the moderate and severe Extended Glasgow Outcome Scale categories and, when combined with age and the Glasgow Coma Scale, accounted for 50% of the Disability Rating Scale variation. This study provides useful information regarding conversational discourse and acute outcomes; however, 72% of the participants were discharged to a rehabilitation setting, suggesting that many of the participants had ongoing rehabilitation goals. It is clear that follow-up beyond the acute period is necessary to determine the impact of discourse disorders along the recovery continuum.

Two further studies focused specifically on return-to-work outcomes. The first study examined whether communication measures, including discourse, could discriminate employment status between 10 employed and 10 unemployed participants with TBI (Isaki & Turkstra, 2000) at an average of 22.5 and 30.1 months post-injury, respectively. Discourse evaluation included two monologic discourse tasks, describing the TBI-related accident and a memorable family event, which were analyzed with a measure of local coherence. The coherence analysis showed no difference between the two groups, and consequently, the discourse measure was not included in the discriminant analysis. Similarly, Meulenbroek, Togher, and Turkstra (2013) compared discourse and return-to-work outcomes between 10 stably versus 10 unstably employed community participants with moderate–severe

TBI. The discourse measure included a voicemail message, which was analyzed with exchange structure analysis and coded for politeness and mazes. Contrary to the Isaki and Turkstra (2000) study, this project identified significant differences between the employment groups. Participants in the unstably employed group were less efficient with information giving and used fewer politeness markers than the stably employed participants.

This small group of discourse studies suggests that there is a link between conversational discourse and social outcomes (Galski et al., 1998; LeBlanc et al., 2014; Snow et al., 1998). The link between discourse and return-to-work outcomes is less clear, with one study implicating discourse features in employment outcomes (Meulenbroek et al., 2013) and the other study showing that discourse was not related to employment outcomes (Isaki & Turkstra, 2000). These findings are primarily limited by the use of self-reported outcome questionnaires, potential impact of communication partners with the use of conversational measures, and limited follow-up.

The relationship between psychosocial outcomes and discourse recovery following severe TBI remains uncertain. Consequently, there is little to guide rehabilitation efforts, particularly during the first year following injury. The prognostic value of discourse in relation to psychosocial outcomes also remains unknown, resulting in challenges with service planning. Furthermore, there is currently a poor understanding of how discourse skills interact with the key psychosocial domains, such as return to work, social relationships, and independence with daily activities. Returning to work, having a strong social network, and establishing independence are some of the key goals identified by individuals with TBI and their families (Levack et al., 2015). Also, the first year is a peak period for rehabilitation, which is the foundation for achieving these goals. Thus, an investigation into discourse skills in relation to these key goal areas across the first year may enable improved supports for these patients.

This existing body of evidence highlights the importance of selecting appropriate outcome and discourse measures. First, it is clear that self-reported measures pose limitations for outcome measurement. Sufficient evidence supports the high prevalence of self-awareness difficulties following TBI (Fleming & Strong, 1999; Ownsworth, Desbois, Grant, Fleming, & Strong, 2006; Prigatano, 2005; Richardson, McKay, & Ponsford, 2014), including reduced awareness of cognitive-communication difficulties, particularly during the acute and subacute phases of recovery (Douglas, Bracy, & Snow, 2007; McDonald & Flanagan, 2004). Thus, the accuracy of self-reported questionnaires and interviews, such as those used by Galski et al. (1998) and Snow et al. (1998), may be questionable. Alternatively, obtaining the perspective of a relative or close other can verify the accuracy of a self-report and provide information relating to the individual's insight. Second, another important consideration for outcome measurement is the sensitivity of the measures utilized. The CIQ and CHART as well as the employed/unemployed or stably/unstably employed criteria used in the aforementioned studies may lack sensitivity in revealing the critical qualitative features of reintegration such as quality of relationships and standard of work performance. The past two decades have seen the development of a valid and reliable measure of psychosocial reintegration for TBI populations, namely, the Sydney Psychosocial Reintegration Scale–2 (SPRS-2), which can capture these qualitative aspects of reintegration (Kuipers, Kendall, Fleming, & Tate, 2004; Tate, Hodgkinson, Veerabangsa, & Maggiotto, 1999; Tate, Simpson, Soo, & Lane-Brown, 2011). This measure is sensitive and stable over time and addresses consideration of insights by obtaining the perspectives of both the individual with TBI and a relative or close other. The SPRS-2 is additionally recommended as a supplemental measure in TBI outcome studies (Honan et al., 2017). Thus, the SPRS-2 is a suitable candidate for an accurate and sensitive outcome measure for this study.

Finally, careful consideration of the discourse measure and analysis for this study is clearly essential (Coelho, 2007; Snow & Douglas, 2000). While there is an argument that conversational measures are more sensitive than some monologic discourse measures (Coelho et al., 2005), the communication partner poses a potential confounding variable for the study of recovery (Togher et al., 2004). On the other hand, monologic measures that elicit complex language structures may offer sufficient sensitivity for the study of recovery (Galski et al., 1998; Snow, Douglas, & Ponsford, 1999). The Cinderella narrative has been shown to fit the criteria for eliciting complex language structures (Cupit, Rochon, Leonard, & Laird, 2010; Stark, 2010) and has shown adequate sensitivity for studying recovery in TBI populations. Furthermore, there is growing evidence supporting the ecological validity of narrative discourse assessment (Armstrong & Ulatowska, 2006; Body & Perkins, 2004; Cannizzaro & Coelho, 2013). Similarly, Main Concept Analysis (MCA) has been identified as a useful tool for analyzing narratives in a range of populations, including those with TBI (Kong, 2011; Nicholas & Brookshire, 1995; Richardson & Dalton, 2016). MCA simultaneously evaluates accuracy and completeness of spoken discourse in relation to the overall message and thus offers useful insights into discourse competence in everyday activities.

The interrelationship between discourse recovery and psychosocial outcomes after severe TBI remains largely unknown. Consequently, there is little understanding of how discourse recovery relates to work performance, the development and maintenance of relationships, and independence with daily activities. Goals around work, relationships, and independence are common following TBI, and rehabilitation across the first year after injury plays a vital role in establishing a strong foundation for obtaining these goals. Thus, the aim of this research is to examine the relationship between narrative discourse recovery and psychosocial outcomes, as measured by the SPRS-2, across the first year after a severe TBI. Exploring the potential for early discourse patterns to predict psychosocial outcomes at 1 year is also highly relevant for rehabilitation and clinical services. Hence, the research aims are as follows.

*Aim 1.* Describe the relationship between discourse scores and overall psychosocial reintegration outcomes quarterly (3, 6, 9, and 12 months) across the first year post-injury.

*Aim 2.* Explore the potential for discourse scores at 3 and 6 months to predict psychosocial outcomes at 12 months.

*Aim 3.* Describe the nature of the interaction between discourse patterns and psychosocial measures relating to work, relationships, and living skills/independence.

## Method

### *Study Design*

A longitudinal inception cohort comprising 57 individuals with severe TBI was evaluated by qualified speech pathologists at 3, 6, 9, and 12 months post-injury using discourse and psychosocial outcome measures. Participants completed additional tasks during the assessment as part of a larger longitudinal project [632681]. This study met the necessary ethical requirements as approved by the [Australian National Human Research] Ethics Committee. Informed consent was obtained from all participants or a significant other, when indicated.

### *Participants*

#### Recruitment

Participants were recruited from three brain injury services in [New South Wales, Australia], including metropolitan and regional areas over a 21-month period. Participants were required to have sustained a severe TBI as an adult, to be medically stable and cleared of post traumatic amnesia (PTA) by the time of assessment, and to be proficient English speakers. The full inclusion and exclusion criteria are presented in Appendix A. A total of 79 participants were referred for the study. Some of these participants were unable to be contacted or had time limitations that prevented their involvement, and a small number did not meet the full inclusion and exclusion criteria. Hence, a total of 57 participants met the full criteria for the study. Eleven participants were lost to follow-up at 12 months, and missing data across each time point are outlined in Appendix B.

#### Participant Characteristics

Participant ages ranged from 16 to 66 years with a mean of 35.25 years ($SD$ = 13.11). The gender distribution was 46 males to 11 females. Years of education ranged from 8 to 20 years with a mean of 13.58 years ($SD$ = 2.99). Motor vehicle accidents were the cause of injury for 67% of the participants, with falls accounting for 21% of cases, assaults accounting for 9% of cases, and the remaining 3% owing to other causes. PTA duration ranged from 6 to 215 days with a mean of 52.89 days ($SD$ = 40.02). Initial Glasgow Coma Scale scores ranged from 3 to 15 with a mean score of 6.82 ($SD$ = 3.47). Mild hearing impairments were indicated in 16% of the participants, with a further 16% reporting mild visual impairments. These mild hearing and visual impairments did not impact the assessment tasks, which were mostly conducted in a quiet office setting. A significant visual impairment was identified in one participant. However, the participant was able to adequately complete the task without the visual support and did not show any different patterns of performance. Although all participants were proficient in English, 9% of the participants identified English as a second or third language. Pre-injury employment data are presented in Table 1, whereas data around distribution of participants in various rehabilitation settings across the first year are seen in Table 2.

*Characteristics of close other.* The close others who completed the psychosocial questionnaire were primarily parents (32%), partners (26%), or other family such as children or siblings (14%), and all of these were premorbid relationships. The average age of the close others was 45.22 years ($SD$ = 14.28), with 37 females and five males. One participant was unable to identify a close other at all data points.

### *Procedure*

#### Discourse Measure

A retell of the Cinderella narrative (MacWhinney, Fromm, Forbes, & Holland, 2011a) was evaluated and scored using MCA (Nicholas & Brookshire, 1995; Richardson & Dalton, 2016).

*Elicitation and stimuli.* An established protocol was used to elicit the Cinderella narrative retell. Participants were first presented with a Cinderella picture book, with the text covered (Grimes, Williams, Story, & Russell, 2005). Next, participants were told that they needed to tell a story and were asked if they were familiar with the story of Cinderella. Participants who were not familiar with the story were instructed to tell a familiar fairy tale. If participants indicated familiarity with Cinderella, they were asked if they remembered much about it and were then offered the picture book to remind them of the story. After viewing the picture book, participants were required to tell the story in their own words and, if required, were prompted to use their pre-existing knowledge of the story as well as the pictures to tell as much of the story as possible. Simple prompts were used to encourage participants if they faltered or provided a limited response. A troubleshooting question was utilized if the participant could not generate a sufficient response. The elicitation instructions are further described, with stimuli available from TalkBank (MacWhinney, Fromm, Forbes, & Holland, 2011b). Responses were transcribed into T-units to aid with the analysis.

*Main concept analysis.* Transcripts were analyzed using MCA. This involved several stages as follows.

1. Determining if the T-unit corresponded to one of the 34 main concepts of Cinderella, as detailed in Richardson and Dalton (2016).
2. Comparing the content of the T-unit against the essential concept components or acceptable variations, as outlined in Richardson and Dalton.

**Table 1.** Pre-injury employment data.

| | | | | | |
|---|---|---|---|---|---|
| **Employment status** | FT | PT | Casual | Unemployed | Other |
| | 60% | 4% | 16% | 19% | 2% |
| **Employment type** | Technician or trade | Laborer | Professional | Clerical or admin | Other |
| | 27% | 22% | 10% | 13% | 22% |

*Note.* FT = Full-time; PT = Part-time.

3. Rating the accuracy and completeness of each concept using one of the following codes: accurate-complete (AC), inaccurate-complete (IC), accurate-incomplete (AI), inaccurate-incomplete (II), or absent (AB).
4. Calculating the total MCA score, out of a total of 102, using the following formula: AC × 3 + IC × 2 + AI × 2 + II × 1.

Appendix C provides examples of the main concepts and their essential components and/or acceptable variations as well as examples of responses for each code.

*Impairment and severity*. A score ≥ 45 was considered within normal limits (WNL), a score between 25 and 44 was considered a mild discourse impairment, a score between 6 and 24 was considered a moderate discourse impairment, and a score of 5 or below was considered a severe discourse impairment.

*Reliability*. Reliability was completed on a random selection of the transcripts using a 20% sample size. Interrater reliability was an acceptable 80.1%, and consensus resulted in 100% agreement. Intrarater reliability was 81.78%, and this was completed about six months after the initial ratings.

### Psychosocial Measure

SPRS-2 (Tate et al., 2012, 2011) Form A (change since injury) was administered to both the individual with TBI and their significant other at each data point. The form was administered in interview format with the participant with TBI but was completed independently by the close other, with discussion as required.

The SPRS-2 is composed of three key sections relating to (a) work and leisure, (b) relationships, and (c) living skills. Each section contains four questions that are rated from 0 to 4, with 0 corresponding to extreme change since the injury and 4 corresponding to no change post-injury, with the total score out of 48. In the work and leisure section, the questions relate to changes in work hours or work type, work skills, the number or type of leisure activities, and organizing work and leisure.

**Table 2.** Rehabilitation setting changes.

| Time point | 3 months | 6 months | 9 months | 12 months |
|---|---|---|---|---|
| Inpatient | 25 | 1 | 0 | 0 |
| Transitional living unit | 6 | 4 | 1 | 0 |
| Outpatient | 8 | 18 | 17 | 13 |
| Community | 7 | 28 | 26 | 33 |
| General hospital | 2 | 3 | 0 | 0 |

In the relationship domain, the questions evaluate changes in relationships with a spouse or partner, other family members, friends, and other people and changes in communication skills. The final living skills section has questions surrounding social skills and behavior in public, personal habits, community travel, and accommodation. The SPRS-2 has been found to have high reliability of coefficients (≥ .90), good fit to Rasch models for person (3.36; 3.03) and item (7.78; 7.25), and no detectable floor or ceiling effects (Tate et al., 2011). A background interview is also offered to obtain further qualitative information around psychosocial outcomes; however, this was not utilized in the current study.

### *Data Analysis*

IBM SPSS (Version 24.0) was used for statistical analyses (International Business Machines, 2016). Correlations between the total MCA score and SPRS-2 were completed at each data point to describe the association between discourse scores and overall psychosocial reintegration outcomes (Aim 1). Next, linear regression was used to determine if early discourse scores, at 3 and 6 months, could predict psychosocial outcomes at 12 months (Aim 2). The data met the assumptions for the linear model and sample size requirements. Finally, descriptive statistics were utilized to describe the relationship between discourse patterns and psychosocial outcomes relating to work, relationships, and independence (Aim 3). Alpha was set at $p = .05$ for the linear regression but at a more conservative $p = .01$ for correlations to avoid overinterpretation of associations (Coolican, 2014, pp. 418, 426–429). Interpretation of $r$ was as follows: .00–.19, very weak; .20–.39, weak; .40–.59, moderate; .60–.79, strong; and .80–1.0, very strong (Evans, 1996).

## Results

### *Aim 1*

Correlations between the overall discourse scores (3, 6, 9, and 12 months) and the psychosocial outcomes across the first year are presented in Table 3. The discourse scores at 3 months were most strongly correlated with psychosocial outcomes reported by the relatives at both 9 and 12 months, with moderate and statistically significant correlations identified ($r = .51$, $p = .006$, $r^2 = .26$; $r = .54$, $p = .002$, $r^2 = .29$). A moderate correlation, trending toward significance ($p \leq .05$), was also found between the 3-month discourse scores and the 6-month psychosocial outcomes reported by relatives ($r = .41$, $p = .015$, $r^2 = .17$). The discourse scores at 6 months were also moderately correlated with

**Table 3.** Pearson's correlation coefficient (*r*) between discourse and psychosocial outcomes.

| | Sydney Psychosocial Reintegration Scale–2 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3 months | | 6 months | | 9 months | | 12 months | |
| Discourse scores | Self | Relative | Self | Relative | Self | Relative | Self | Relative |
| 3 months | .19 | .37[a] | .38[a] | .41[a] | .29 | .51[b] | .26 | .54[b] |
| 6 months | *.14* | *.42*[a] | .32[a] | .56[c] | .17 | .52[c] | .18 | .56[c] |
| 9 months | *.01* | *.32* | *.23* | *.52*[c] | .19 | .48[b] | .31 | .60[c] |
| 12 months | *–.10* | *.29* | *.33*[a] | *.41*[a] | *.24* | *.49*[b] | .14 | .30 |

[a]Correlation is significant at .05 (trend). Italicized cells show relationships where the time point of the outcome preceded the discourse assessment time point. [b]Correlation is significant at .01. [c]Correlation is highly significant at .001.

the psychosocial outcomes reported by the relatives at 9 and 12 months post-injury. These associations were moderate, but the interaction between the 6-month discourse and 12-month outcome scores trended toward a strong association ($r = .52$, $p = .001$, $r^2 = .27$; $r = .56$, $p = .000$, $r^2 = .31$). The 9-month discourse scores had a moderate but significant correlation with psychosocial outcomes reported by relatives at 9 months ($r = .52$, $p = .001$, $r^2 = .27$) and a strong and significant correlation with psychosocial outcomes reported by relatives at 12 months ($r = .60$, $p = .000$, $r^2 = .36$). The 12-month discourse scores were weakly correlated with the psychosocial outcomes reported by relatives at 12 months, and this was not significant ($r = .30$, $p = .071$, $r^2 = .09$).

There were no interactions in which the self-rating of psychosocial outcomes was moderately or strongly associated with the discourse scores; however, a trend (at $p \leq .05$) toward a moderate and significant association was identified between the 6-month psychosocial outcomes and the 3-month discourse scores ($r = .38$, $p = .014$, $r^2 = .14$). Correlations also revealed a moderate and significant association between the 6-month outcomes reported by relatives and the 9-month discourse scores ($r = .52$, $p = .001$, $r^2 = .27$) as well as a moderate but significant relationship between the 9-month outcomes reported by relatives and the 12-month discourse scores ($r = .49$, $p = .003$, $r^2 = .24$). The 6-month relative-reported outcomes and 12-month discourse scores showed a moderate correlation with a trend toward significance ($r = .41$, $p = .013$, $r^2 = .17$).

## *Aim 2*

Two linear regression models were produced. First, a simple linear regression was used to predict psychosocial outcomes reported by relatives from 3-month discourse scores. The regression equation 28.059 + .240 × (3-month Discourse Score) was significant, $F(1, 29) = 11.722$, $p = .002$, $R^2 = .288$. Participants' predicted outcomes were equal to 28.059 + .240 × (3-month Discourse Score) when outcomes were measured with the SPRS-2 and discourse was measured with MCA. A second simple linear regression was used to predict psychosocial outcomes reported by relatives from 6-month discourse scores. The regression model 25.893 + .281 × (6-month Discourse Score) was also significant, $F(1, 34) = 15.677$, $p \leq .000$, $R^2 = .316$, and slightly more powerful than the 3-month model. With the latter model, a person who scored 35 on the MCA at 6 months was predicted to have a total psychosocial outcome score of 36.57, which is equivalent to a little degree of change by 12 months. Alternatively, a person who scored 8 on the MCA was predicted to have a psychosocial outcome score of 28.14, a moderate degree of change in psychosocial outcomes at 12 months.

## *Aim 3*

The three subscales of the SPRS-2 (Work and Leisure, Relationships, and Living Skills) were examined in relation to discourse recovery pattern ("Improved" by 12 months or "Slow to recover" across 12 months) and initial discourse severity (WNL–Mild or Moderate–Severe), revealing four subgroups as per Table 4.

**Subgroup 1: WNL–Mild + Improved**

A subgroup, comprising 10 participants whose discourse was initially WNL or mild and continued to improve over the first year, had the most optimal outcomes across all subtests. The average scores for this subgroup fell within the range of a little change in terms of relationships and living skills; however, the average scores for work and leisure represented moderate changes. The self-ratings of outcomes were, on average, slightly lower than their relative's scores across each subtest.

**Subgroup 2: Moderate–Severe + Improved**

A similar but slightly lower score pattern was observed in the next subgroup, including eight individuals whose discourse scores were initially moderate to severe but improved over the first year. The average scores for this subgroup again fell within the range of a little change with regard to relationships and living skills. However, there was again an average score representing moderate changes for the work and leisure subscale. In contrast to the previously described group, the outcome scores for this subgroup were slightly above the scores of their relatives.

**Subgroup 3: WNL–Mild + Slow Recovery**

The third subgroup comprises 13 individuals who had discourse scores WNL or mild but were slow to recover across the first year. This subgroup indicated moderate

**Table 4.** Discourse patterns and psychosocial outcomes at 12 months.

| Discourse | | | Sydney Psychosocial Reintegration Scale–2 (12 months) *M* (*SD*) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Work and leisure | | Relationships | | Living Skills | |
| Group | Severity and recovery[c] | *n* | Self | Relative | Self | Relative | Self | Relative |
| 1 | WNL–Mild + Improved | 10 | 10.67[b] (2.96) | 11.29[b] (2.2) | 13.89 (2.65) | 14.86 (2.29) | 13.56 (2.04) | 15 (1) |
| 2 | Mod–Severe + Improved | 8 | 9.61[b] (3.35) | 8.19[b] (2.8) | 13.13 (2.27) | 12.05 (3.66) | 13.57 (3.11) | 12.57 (3.23) |
| 3 | WNL–Mild + Slow Recovery | 13 | 10.5[b] (4.63) | 9.86[b] (2.6) | 12.75 (3.06) | 10.57[b] (4.18) | 14.25 (3.55) | 12.86 (2.79) |
| 4 | Mod–Severe + Slow Recovery | 26 | 11[b] (3.37) | 7.33[a] (1.63) | 14 (1.73) | 10.67[b] (4.16) | 10.5[b] (4.04) | 10.67[b] (4.73) |

*Note.* A score of 16 indicates no change from pre-injury. WNL = within normal limits; Mod = Moderate.
[a]Extreme change. [b]Moderate or little change. [c]Initial severity of injury plus recovery pattern.

changes reported by both the participant and relative in the work and leisure domain. With regard to the relationship section, relatives reported moderate changes on average, whereas the self-ratings were within the range of a little change. Little changes, on average, were reported for the living skills subsection. Similar to Subgroup 2, participants in Subgroup 3 had, on average, slightly higher scores than their relatives across all domains.

#### Subgroup 4: Moderate–Severe + Slow Recovery

The final subgroup included 26 participants (46% of the cohort) whose discourse scores were initially moderate to severe and slow to recover. In the work and leisure section, relatives indicated extreme changes, whereas the participants indicated moderate changes on average. In the relationships outcomes, moderate changes were indicated on average by relatives, whereas little changes were reflected in the scores of the participants with TBI. Average living skills scores for this group were relatively equal between the relative and participant, representing moderate changes. In this final subgroup, there was a large discrepancy between the average scores reported by the participants and those reported by their relatives in both the work and leisure and relationship domains.

## Discussion

The aim of this study was to better understand the nature of discourse recovery in relation to psychosocial outcomes in the year following a severe TBI. Key findings were that psychosocial outcomes reported by relatives were moderately correlated with discourse and the early discourse scores significantly predicted 12-month outcomes. Exploring the interaction between discourse and work and leisure, relationships and living skills domains revealed four discourse recovery subgroups with different patterns relating to the psychosocial domains. These findings offer useful insights that may support clinical decision making in addition to guiding the timing and planning of rehabilitation services.

### *Interrelationship Between Discourse and Psychosocial Outcomes (Aim 1)*

Overall, findings from the current study reinforce that discourse skills are important for everyday activities. Significant moderate correlations were found between discourse scores and psychosocial outcomes reported by relatives across the first year in this study. There was one strong and significant correlation identified between 9-month discourse and 12-month outcomes, with a further two interactions trending toward a strong and significant correlation (6-month discourse/6-month outcomes; 6-month discourse/12-month outcomes). Other studies have typically reported modest associations between measures of discourse and outcomes (Galski et al., 1998; Snow et al., 1998). The identification of relatively stronger correlations in this study may be due to incorporation of relative ratings or the larger sample size compared to earlier research. These findings contribute increased evidence to support the importance of discourse skills in everyday interactions relating to work and leisure, relationships, and living skills following TBI. However, caution must be used in interpreting these results due to the small effect sizes.

#### Impact of Self-Awareness

Findings also reinforce that individuals with TBI can have impaired self-awareness regarding everyday activities. Correlations between the discourse scores and psychosocial outcomes when rated by the individual with TBI were mostly very weak and not significant. The discrepancy between the relative-reported ratings and self-ratings is most likely due to poor self-awareness on behalf of the individual with TBI, which has been reported extensively in the TBI literature (Douglas, 2010b; Fleming & Strong, 1999; Fleming, Strong, & Ashton, 1996; Schmidt, Lannin, Fleming, & Ownsworth, 2011; Smeets, Ponds, Verhey, & van Heugten, 2012).

Interestingly, one time point reflected a potential improvement in self-awareness. The self-ratings were weakly,

as opposed to very weakly, associated with discourse at the 6-month point. A potential explanation is that awareness may be improved at the 6-month time point, and this could be related to the initial period of transitioning to a community setting. Alternatively, a subgroup with a relatively intact insight may have over critiqued their limitations at this time point. In summary, self-awareness difficulties may impact an individual's perception of their everyday experiences and, by extension, perception of discourse performance in everyday interactions.

**Influence of Recovery**

The discourse recovery process following TBI appears to shape the nature of psychosocial outcomes following TBI, but it is clear that this is an imperfect interaction. The relationships between discourse scores and psychosocial outcomes were not uniform across the first year. For example, the 3-month discourse scores were more strongly correlated with psychosocial outcomes reported by relatives at 9 and 12 months compared to those at 3 and 6 months, whereas the 9-month discourse scores were strongly correlated with the 12-month psychosocial outcomes reported by relatives. A potential explanation is that the awareness and expectations of relatives changed over the first year (Fordyce & Roueche, 1986; Prigatano, Borgaro, Baker, & Wethe, 2005). For example, at earlier stages of recovery, there may be higher expectations for return to premorbid capacity, which may be lowered toward the latter stages of the first year. Indeed, another study found that the nature of conversation topics shifts over the first year of injury, suggesting that relationships can evolve over this period (Brassel et al., 2016).

Relatives may also more readily identify challenges as the individual with TBI begins to engage in new and more complex tasks, including work-related tasks, as part of their rehabilitation (Fleming & Strong, 1999). Other studies have found that relatives' perceptions of challenges can also be mediated by emotional factors such as distress (Prigatano et al., 2005). Conclusively, there is an imperfect interaction between discourse recovery and relative outcome ratings across the first year, which may be related to subtle shifts in the relatives' perceptions across this period. Such findings reinforce the importance of supporting families during the first year of recovery, which may occur with structured education and training programs (Togher, McDonald, Tate, Power, & Rietdijk, 2013).

**Other Findings**

*Direction of interrelationship.* One of the unanticipated findings of this study was an inverse relationship between discourse recovery and psychosocial outcomes. A couple of moderate and significant correlations were identified between outcomes that preceded discourse assessment. For example, moderate and significant correlations were identified between 6-month outcomes and 9-month discourse scores as well as between 9-month outcomes and 12-month discourse scores. Such findings force us to consider not only how discourse might shape outcomes but also how outcomes, or what the outcomes are measuring, might be influencing discourse skills. For example, reduced interactions with friends and lack of work-related tasks may be limiting opportunities to practice using discourse skills. It may be that those who return to work sooner have a relatively more "discourse-rich" environment that facilitates ongoing discourse recovery and/or prevents a decline in discourse skills. Emerging evidence suggests that environmental enrichment may play a crucial role in recovery and prevention of decline following TBI (Bondi, Klitsch, Leary, & Kline, 2014; Miller, Colella, Mikulis, Maller, & Green, 2013). Indeed, the INCOG guidelines reinforce the need to engage individuals in real cognitive-communication activities as part of their rehabilitation (Togher et al., 2014). The findings of the current study reiterate the value of incorporating real discourse activities into rehabilitation and facilitating environments that are rich in discourse, particularly between 6 and 12 months. For example, this might include monitoring discourse opportunities using a Discourse Inventory (see Supplemental Material S1). Alternatively, this might include communication partner training (Togher et al., 2013) to promote and monitor the frequency of discourse-level interactions. Future research examining the relationship between communication environment and discourse skills may provide further insights to promote recovery and inhibit the decline of discourse skills following TBI.

*Critical time points.* Results from the current study also offer insights into timing of recovery and outcomes. First, the 6-month time point appeared to be a critical juncture. This was the first point where discourse and psychosocial outcomes reported by relatives first largely correlated. Also, the 6-month time point was slightly more predictive of psychosocial outcomes when compared to the 3-month data point. As proposed above, this may be related to subtle changes in the relative's perceptions over the first 6 months. This is also consistent with a time when most individuals are reintegrating back into the community. Indeed, 80% of the participants in this study were in outpatient or community settings by 6 months compared to 26% at 3 months, as evidenced in Table 2. Hence, the 6-month period may be a useful point for re-evaluating rehabilitation goals.

The second insight into timing occurred at the 12-month data point. At this data point, the discourse–outcome relationship pattern changed substantially to a weak and nonsignificant correlation. There are several potential explanations. First, the discourse measure may be showing a ceiling effect at the 12-month point. Indeed, 37% of participants scored WNL at 12 months. This may reflect a limitation of the task for evaluating sustained cognitive-communication skills. For example, the task requires approximately 5–10 min of sustained attention and skill, whereas a typical workday requires sustained cognitive-communication skills for many hours. Consequently, at this 12-month stage, the discourse assessment may need to be supplemented with more challenging cognitive-communication tasks, such as the Functional Assessment of Verbal Reasoning and Executive Strategies (MacDonald & Johnson, 2005), to better align with

psychosocial outcomes. Alternatively, the relatively high proportion of missing data at this time point (33.33%) may have also impacted these findings. There is clearly a need for further research with larger sample sizes. Further exploring the utility of the discourse measure, particularly beyond the first year, is also warranted.

### *Predicting Outcomes From Discourse (Aim 2)*

The regression analyses revealed useful insights into outcome prognosis, which is the cornerstone of service planning. Discourse scores at 3 and 6 months were significantly predictive of psychosocial outcomes evaluated by relatives at 12 months. The 3-month model explained 29% of the variance in outcomes, whereas the 6-month discourse scores explained 32% of the variance. Subsequently, the 6-month regression was slightly more accurate than the 3-month model, which may reflect subtle discourse improvements between 3 and 6 months. Only one other previous study has examined discourse as an early predictor of psychosocial outcomes using a conversation measure and only up to discharge from acute care (LeBlanc et al., 2014). This is the first study to identify discourse as a significant predictor of psychosocial outcomes up to 1 year following injury. Specifically, higher discourse scores predicted better psychosocial outcomes.

These findings have important implications for rehabilitation services. First, prognosis is often a key query of patients and their families. The discourse equation offers an objective prediction of an individual's outcome. This should be considered in conjunction with an individual's injury severity, age, premorbid years of education, cognitive and executive functioning profile, level of social and family support, and motivation. It should be reinforced that even relatively mild discourse difficulties predict challenges with everyday activities, such as work, at 12 months. Second, early discussions around prognosis can be helpful in setting up the right supports and establishing the timing of supports. For example, if return to work is a goal for the individual but prognosis at 12 months is poor, it may be useful to explore subgoals such as volunteer work or work-related study for the first year, which is suited to a multidisciplinary rehabilitation approach. Interprofessional collaboration is indicated for all patients with TBI (Togher et al., 2014). However, the timing of this collaboration may be of most benefit between the 6- and 12-month phase and possibly beyond 12 months, particularly for individuals who fit a slow-to-recover discourse profile (see Appendix D).

Finally, these results also reinforce the value of routine discourse assessment during the first year of recovery, which may not be occurring in current practice (Frith, Togher, Ferguson, Levick, & Docking, 2014). Discourse ability can contribute to the prediction of important psychosocial outcomes relating to work and leisure, relationships, and independence and is therefore a useful tool for evaluating the cognitive-communication skills that relate to everyday activities and common rehabilitation goals following TBI.

### *Discourse Patterns and Psychosocial Domains (Aim 3)*

Heterogeneity is a common problem in TBI that can be addressed with subgrouping. Outcomes relating to work and leisure, relationships, and living skills at 12 months were examined in relation to initial discourse severity and discourse recovery patterns, revealing four distinct subgroups. Psychosocial outcomes appeared to be best considered in relation to discourse severity and the discourse recovery pattern rather than either of these groupings alone. All subgroups reflected a change in work and leisure capacity compared to pre-injury, and both the individual and their relative typically identified these changes.

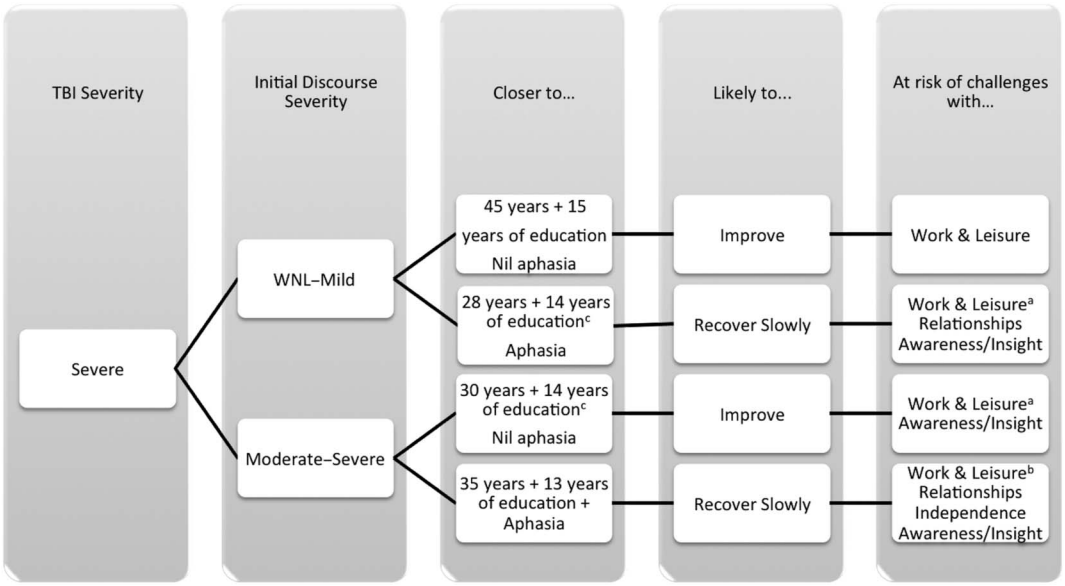
A large subgroup comprising 46% of the sample had moderate–severe discourse impairments that were slow to recover. This subgroup had the poorest outcomes for work and leisure and moderate changes in living skills. Characteristics of this subgroup included lengthy PTA duration ($M$ = 65.42, $SD$ = 43.81), high-school education level ($M$ = 13.15, $SD$ = 2.91), and the presence of aphasia at 3 months (82%). The predominant linguistic pattern was consistent with mild anomic aphasia, characterized by mild–moderate confrontational naming deficits and mild linguistic deficits across spontaneous speech, auditory verbal comprehension, and repetition. In contrast, the top-performing group had overall good outcomes but persisting changes in the work and leisure domain. This group was identified by mild or subtle discourse impairments that showed consistent and reasonable improvement over 12 months. This subgroup was characterized by older age ($M$ = 43.4, $SD$ = 8.32), greater education level ($M$ = 15.1, $SD$ = 3.28), and lower proportion of aphasia at 3 months (30%). Refer to Appendix D for further demographic details of each subgroup.

This is the first study to examine psychosocial outcomes in relation to discourse severity and recovery patterns. Cautious interpretation is required due to the small sample sizes yielded through subgrouping. Nevertheless, this research highlights that discourse severity and recovery patterns may be important parameters in determining outcomes. The impact of discourse severity and recovery on outcomes may also be mediated by PTA duration, education level, age, and aphasia. These findings offer preliminary clinical insights and direction for future research using larger sample sizes. Further discussion of each subgroup is offered in Appendix E.

#### Prioritizing Rehabilitation Goals

A decision tree is offered in Figure 1 to assist clinicians with prioritizing goals for rehabilitation in conjunction with the patient and family. The initial discourse severity is combined with pre-injury and injury variables to predict a pattern of improvement. These patterns are subsequently linked to areas where there is a risk of challenges for this subgroup. While this is not prescriptive, it may offer some direction to clinicians in terms of prioritizing goals for rehabilitation that can be discussed with the patient and family. Clinicians are encouraged to judiciously apply this information

**Figure 1.** Decision tree for prioritizing rehabilitation goals. [a]Substantial difficulties with this domain. [b]Very substantial difficulties with this domain. [c]Participants < 28 years of age were most prominent in these subgroups. TBI = traumatic brain injury; WNL = within normal limits.




due to the small sample sizes of each subgroup. Future research may refine and further develop this decision tree.

## *Clinical Implications*

There are clinically useful implications relating to assessment and treatment arising from this study. First, this study has reinforced the importance of routine discourse assessment across the first year following injury to support reintegration with everyday activities. Findings also support the ecological validity of narrative discourse assessment in the first year, acknowledging that this may have a ceiling effect for the patients with mild or subtle discourse impairments, which requires a more comprehensive assessment beyond 12 months. The findings also support the use of the SPRS-2 as a useful supplementary assessment tool for the rehabilitation team and for the managing speech pathologists to help evaluate and monitor outcomes relating to communication and awareness. This is in line with other research recommendations (Honan et al., 2017).

This article additionally offers a preliminary method for prioritizing goals and treatment directions based on a patient's early discourse profile. Prognostic evaluation and decision making should incorporate consideration of age, education years, and the presence of aphasia. Clinicians are also encouraged to account for injury severity, cognitive and executive functioning, personal factors such as motivation, and environmental factors such as social networks. Finally, clinicians are encouraged to apply these recommendations cautiously until findings are validated by further research.

With regard to treatment, the findings of this research support the use of discourse-based treatments and the need to practice discourse skills in real contexts, which is again in line with current recommendations (Coelho, 2007; Togher et al., 2014). Speech pathologists might also consider monitoring and facilitating the "richness" of discourse in the patient's communication environments to maximize outcomes. In terms of timing, the 6-month time point appears to be a critical milestone, and this may be a useful time to assess discourse environments, provide further education on the discourse–psychosocial outcomes link, and establish positive discourse environments and opportunities for the 6- to 12-month period.

## *Limitations and Future Directions*

The results of this study, particularly those relating to subgroups, need to be interpreted with caution due to small sample sizes and small effect sizes. Although retention rates were reasonably good, missing data were a potential confounding variable, particularly for the 9- and 12-month relative-reported outcome ratings. This study may have also been limited by the use of a single discourse measure and analysis. As previously discussed, the measure did appear to be well suited to the study of psychosocial outcomes across the first year, but it may have a ceiling effect beyond the first year. A further potential limitation was the absence of a quality-of-life outcome measure, which may reveal different qualitative insights into outcomes.

Future research exploring the relationship between discourse and outcomes beyond the first year is indicated. There is also clearly a further need for research examining treatments for discourse impairments as well as treatments tailored to each of the aforementioned subgroups.

The current study suggests the importance of examining subgroups in future treatment studies. An improved understanding of the influence of aphasia, environmental supports, and motivation on prognosis is also recommended.

## Conclusion

This study identified a strong interrelationship between discourse and psychosocial outcomes, as reported by relatives, over the first year following severe TBI. Discourse appears to be an important factor in determining psychosocial outcomes relating to key rehabilitation goals such as work, relationships, and independence. Findings offer several novel clinical insights, including identification of the 6-month critical time point, an objective equation to support prognosis, and a method for mapping patient data to rehabilitation goals. The discourse and psychosocial measures utilized in this study appear to be well suited to examining recovery over the first year. Future research utilizing large samples sizes and examining outcomes beyond the first year is indicated. There is also a need for further research examining discourse treatments.

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## Appendix A

Inclusion and Exclusion Criteria

| Inclusion | Exclusion |
|---|---|
| Consent was able to be obtained from the person with traumatic brain injury (TBI) or a significant other | Consent was unable to be obtained from the person with TBI or a significant other |
| Severe TBI determined by a Glasgow Coma Scale score less than 8 (Campbell, 2000; Teasdale & Jennett, 1974) and/or post traumatic amnesia (PTA) duration of greater than 24 hr (Campbell, 2000; Sherer, Struchen, Yablon, Wang, & Nick, 2008) | Mild–moderate TBI severity determined by a Glasgow Coma Scale score greater than 8 (Campbell, 2000; Teasdale & Jennett, 1974) and/or PTA duration of less than 24 hr (Campbell, 2000; Sherer et al., 2008) |
| Cleared of PTA by time of assessment | Persisting PTA |
| Aged between 16 and 65 years at the time of the injury | Aged younger than 16 years or 66 years or older at the time of injury |
| Less than 7 months post-injury at time of initial assessment | More than 7 months post-injury at time of initial assessment |
| Medically stable | Medically unstable |
| Absence of previous neurological illness or injury or significant medical history such as developmental delay | History of previous neurological illness or injury or significant medical history such as developmental delay |
| Proficient English speakers | Non-English speakers |
| Residing within Sydney metropolitan area or within 3 hr traveling distance | Residing outside Sydney metropolitan area or more than 3 hr traveling distance |
| Able to be followed up for at least one appointment | Unable to be followed up for at least one appointment |

## Appendix B

Missing Data Overview ($n$ = 57)

| Data point | Discourse measure | Outcome measure (self-reported) | Outcome measure (relative-reported) |
|---|---|---|---|
| 3 | 19.30% | 19.30% | 22.81% |
| 6 | 5.26% | 10.52% | 21.05% |
| 9 | 22.81% | 22.81% | 36.84% |
| 12 | 19.30% | 21.05% | 33.33% |

*Note.* Inception cohort: $n$ = 57; late recruitment (6 months): $n$ = 11; lost to follow-up (12 months): $n$ = 11.

## Appendix C

Main Concept Analysis Examples

| | |
|---|---|
| **Example 1 (Element 15)** | The fairy godmother makes a pumpkin turn into a carriage/coach. |
| Accurate-Complete (AC) | The fairy godmother turns the mice into horses. |
| Accurate-Incomplete (AI) | The fairy godmother does some magic. |
| Inaccurate-Complete (IC) | The fairy turns the mice into a coach. |
| Inaccurate-Incomplete (II) | The fairy waves her wand. |
| Absent (AB) | *None of the essential information is given.* |
| **Example 2 (Element 18)** | She knew **she had to be home by midnight** because everything will turn back at midnight. |
| Accurate-Complete (AC) | Cinderella needed to get back home by the stroke of midnight. |
| Accurate-Incomplete (AI) | Cinderella needed to go home. |
| Inaccurate-Complete (IC) | She had to be home by darkness or she would turn into a pumpkin. |
| Inaccurate-Incomplete (II) | He had until nighttime. |
| Absent (AB) | *None of the essential information is given.* |
| **Example 3 (Element 23)** | As she was running down the stairs, **she lost one of the glass slippers.** |
| Accurate-Complete (AC) | As she was running away, she dropped one of her shoes. |
| Accurate-Incomplete (AI) | As she was running down the stairs, she lost everything. |
| Inaccurate-Complete (IC) | She put down the glass shoes. |
| Inaccurate-Incomplete (II) | She had a shoe. |
| Absent (AB) | *None of the essential information is given.* |

## Appendix D

Demographic and Recovery Variables of Subgroups

| Subgroup | | *n* | Age *M* (*SD*) | Education *M* (*SD*) | PTA *M* (*SD*) | Aphasia (WAB-R) |
|---|---|---|---|---|---|---|
| 1 | Improved + Normal–Mild | 10 | 43.4 (8.32) | 15.1 (3.28) | 33 (16.62) | 3/10 (30%) |
| 2 | Improved + Moderate–Severe | 8 | 33.25 (16.78) | 12.75 (2.96) | 64.63 (49.54) | 3/5 (60%) |
| 3 | Slow + Normal–Mild | 13 | 30.23 (12.42) | 13.77 (2.86) | 35.92 (27.6) | 4/12 (33%) |
| 4 | Slow + Moderate–Severe | 26 | 35.23 (12.88) | 13.15 (2.91) | 65.42 (43.81) | 14/17 (82%) |

*Note.* PTA = post traumatic amnesia duration in days; WAB-R = Western Aphasia Battery–Revised (Kertesz, 2012); Normal = within normal limits.

## Appendix E

Discussion of Subgroups With Clinical Implications

**Subgroup 1: Within Normal Limits–Mild + Improved.** As expected, the optimal outcomes were observed in those individuals who typically started out with a normal or mild discourse pattern and who improved over time. An individual, for example, may have started at a score of 45 (within normal limits with subtle qualitative differences to controls) but continued to improve to 65 by 12 months (within normal limits). However, this group had, on average, moderate changes in their work and leisure outcomes compared to pre-injury. This suggests that, even in the top-performing group, outcomes relating to work and leisure remain problematic. Such findings indicate that even subtle or mild difficulties with discourse might impact work and leisure outcomes. It was also found that the self-ratings of outcomes were, on average, slightly lower than their relative's scores for this group, which may reflect improved insight in this group. Subgroups of participants, who rate themselves poorer than their relatives, have been described in other studies (Fleming & Strong, 1999). This group might also have a relatively good insight into their communication skills and may benefit from more direct treatment addressing their discourse deficits to facilitate rehabilitation for work and leisure.

**Subgroup 2: Moderate–Severe + Improved.** A similar but slightly lower score pattern was observed in the next subgroup, including eight individuals whose discourse scores were initially moderate to severe but improved over the first year. The average scores for this subgroup again fell within the range of a little change with regard to relationships and living skills. However, there was again an average score representing moderate changes for the work and leisure subscale. In contrast to the previously described group, the outcome scores for this subgroup were slightly above the scores of their relatives, suggesting potential challenges with insight. Consequently, this group may benefit most from a focus on discourse awareness training such as through a communication partner training program (Togher et al., 2004) to facilitate rehabilitation for work and leisure. This group is at risk of poor work and leisure outcomes.

**Subgroup 3: Within Normal Limits–Mild + Slow to Recover.** The third subgroup comprises 13 individuals who had discourse scores within normal limits or mild but were slow to recover across the first year. This subgroup indicated an average of moderate changes reported by both the participant and relative in the work and leisure domain. With regard to the relationship section, relatives reported moderate changes on average, whereas the self-ratings were within the range of a little change. Little changes, on average, were reported for the living skills subsection. Similar to Subgroup 2, participants in Subgroup 3 had, on average, slightly higher scores than their relatives across all domains. This group would appear to be benefit from a two-pronged approach to rehabilitation incorporating a focus on not only work but also relationships. They may also benefit from a focus on developing awareness not only for work-related discourse but also for discourse in their key relationships. This might include practicing conversations with key communication partners, such as family, friends, and carers (Behn, Togher, Power, & Heard, 2012; Jorgensen & Togher, 2009; Togher et al., 2004).

**Subgroup 4: Moderate–Severe + Slow to Recover.** The final subgroup included 26 participants (46% of the cohort) whose discourse scores were initially moderate to severe and slow to recover. In the work and leisure section, relatives indicated extreme changes on average, whereas the participants indicated moderate changes on average. In the relationships outcomes domain, moderate changes were indicated on average by relatives, whereas little changes were reflected in the average scores of the participants with TBI. Average living skills scores for this group were relatively equal between the relative and participant, representing moderate changes. In this final subgroup, there was a large discrepancy between the average scores reported by the participants and their relatives in both the work and leisure and relationship domains. This group appears to have not only the most significant challenges with return to work according to relatives but also the greatest lack of insight into these challenges. Strategies to promote independence and choice may be important for this group, as they may have limited independence with daily activities. Communication partner training could focus on enabling independence and choice (Sloan, Winkler, & Callaway, 2004), and this might be practiced in daily discourse activities. This group also had the highest incidence of aphasia, with impairment-based therapy and/or aphasia-based supports possibly indicated for this group.