Narrative after

traumatic brain injury:

A comparison of monologic and

jointly-produced discourse

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Statements

This thesis is being presented as part of the requirements for the degree of Bachelor of Applied Science Honours (Speech Pathology) in the School of Communication Sciences and Disorders, Faculty of Health Sciences, University of Sydney, on 14th December 2007.

This work has not been submitted for any form of credit to any other university or institution.

This research project was developed and data collected by Leanne Togher, as part of a larger project investigating everyday communication skills of people with TBI using communication partners other than speech pathologists or research assistants. The literature review, analysis of data, and writing of the thesis was carried out by Mikaela Jorgensen with appropriate help and supervision for honours level projects.

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ABSTRACT

Primary objective: To investigate the effects of a familiar communication partner on the production of narrative after traumatic brain injury (TBI).

Method: Ten participants with TBI were matched with ten control participants for sex, age, and education. Participants independently retold a story from a picture sequence and also retold a video segment with a friend to a researcher. The resulting discourse was analysed for productivity, cohesion, story grammar, informational content and exchange structure.

Results: There was a significant difference between participants with and without TBI for all measures in the monologic narrative. In the jointly-produced narrative, there was no significant difference in performance and participation between individuals with TBI and control participants. Participants with TBI demonstrated a significant improvement between the monologic and the jointly-produced task in story grammar and informational content.

Conclusions: The natural scaffolding provided by the friends of participants with TBI in a meaningful narrative task facilitated competent participation in and production of narrative. These findings indicate an avenue for training everyday communication partners in supporting narrative skills after TBI, and for the use of jointly-produced narrative as an additional assessment tool to create a holistic view of everyday skills.

INTRODUCTION

Traumatic Brain Injury (TBI)

Traumatic brain injury (TBI) results from an external physical force to the brain causing transient or permanent neurological dysfunction [1]. In the period 1997-1998 there were more than 25 000 cases of TBI in Australia [2]. The primary risk group for TBI is young males aged 15-19 years with motor vehicle accidents being the main cause [1]. TBI can produce widespread and significant disabilities in the lives of those affected. Physical deficits such as difficulties with walking, coordination, balance, fine motor skills, fatigue and sensory loss are well-documented [1]. However, for most survivors of TBI the primary disabling factors involve a wide range of cognitive, communicative, emotional, and psychosocial dysfunctions [3]. With survivors often requiring health, welfare and social services for the rest of their lifetime [2], continuing research into outcomes after TBI is essential.

Communication and TBI

Research into communication following TBI has revealed a variety of subtle deficits in language use. Performance on traditional clause level language measures are usually within the normal range [4], however it is clear that those with TBI do not manage *discourse* adequately (discourse refers to both monologic and conversational abilities above clause level). The discourse produced by individuals with TBI has been described as 'off-target', 'tangential', 'disorganised', 'confabulatory', 'irrelevant', 'confused', 'unclear', 'inefficient' and 'self-focused' [5-7]. These perceptual descriptions are

consistent with the major research findings that people with TBI have particular difficulties with topic management and the expression of information in a logical fashion [8].

Problems with communication appear to be a barrier in major areas of living for people with TBI. Communicative deficits compromise the interpersonal relationships of those with TBI, leading to social isolation and decreased quality of life [4, 9]. Impaired conversational skills have also been identified as a major predictor of failure to return to work after severe TBI [10].

Narrative as an assessment tool

Individuals with TBI have presented a challenge when assessing communication deficits [5]. Traditional language assessments may be useful in the early stages of recovery [7]. However these assessments are not usually sensitive enough to identify residual deficits, due to the relatively intact sentential abilities of people with TBI [4]. Difficulties are revealed only with increased communicative demands. Narrative requires the ability to organise and integrate both coherent goal-directed ideas and content within an overall macrostructure [11, 12]. It also requires the ability to flexibly modify implementation on-line according to the social context. The complex interaction of these cognitive, linguistic and psychosocial skills appears to place a sufficient communicative load to enable individual difficulties to be highlighted [13, 14].

Moreover, assessing the narratives of those with TBI has social validity. Storytelling is very common in everyday conversation [15, 16] and increasing amounts of time are being spent with crafted or 'public' narrative in the form of television, movies, books, and plays [11]. Furthermore, narrative serves an important function in virtually all societies by helping people make sense of their experiences and helping people represent themselves to others [17]. Considering the prevalence of narrative in conversation, and the psychosocial problems which are the result of impaired conversational skills in people with TBI, difficulties with narrative production are likely to have negative real world consequences [17].

Difficulties in narrative production

A diverse range of deficits has been documented in the narratives of those with TBI [18]. This variability may be due in part to participant characteristics. For example, TBI is more common among those who are unskilled or semi-skilled [9]. However university students are commonly used as control subjects, and this may result in the overestimation of the deficits of those with TBI. Thus, several researchers have highlighted the importance of using a control group with similar demographics [19-22].

Many researchers have also acknowledged that the use of both varied narrative elicitation tasks and analysis tools also contributes to the variability of findings in the TBI population [5, 7, 13, 23]. Furthermore, the use of different elicitation tasks is a common cause for variability in findings across other populations, for example, aphasia [24].

Despite this, there are a number of common measures and outcomes in the evaluation of narration after TBI.

Syntactic complexity (e.g. ideas per sentence) has been studied extensively in the narratives of people with TBI, although it has generally been found comparable to control groups [19]. However productivity measures, such as total T-units (i.e. independent clauses plus any associated subordinate clauses), have often been found to be reduced among people with TBI (e.g. [25]). Cohesion, the grammatical and lexical links that hold a text together and give it meaning, has also been found to be problematic for individuals with TBI in many studies (e.g. [7]). In addition, story grammar, a measure of narrative structure where the main unit is the episode, is usually seen to be reduced after TBI (e.g. [17]).

Measures of content and efficiency have been used to study the narratives of people with TBI, with the descriptions of tangential, confused and inefficient discourse [6, 25]. Studies based on pragmatics have also looked at the ability of people with TBI to take the perspective of the listener when transferring information [9]. Additionally, non-professional listener judgments on perceptual descriptors such as clarity and content have been used as a more reliable measure of everyday discourse abilities than linguistic measures [23].

Jointly-produced narrative

All of the aforementioned narrative research assessed narrative as a monologue. While

this research has valuable implications for identifying deficits in particular linguistic parameters, it fails to acknowledge the bigger picture of narrative in communication and everyday interaction. Narrative with multiple active co-tellers is much more frequent in conversation [26]. In addition, storytelling by a single individual naturally differs from the polyphonic storytelling typical of conversation [27]. Co-tellers, and even active listeners, can have a big influence on production of narrative through differential interest and competence in details [27]. As a result, studies examining narrative with a passive listener may not be representative of everyday abilities in the genre.

Furthermore, monologue genres do not tax the ability of TBI to observe subtle conventions pertaining to turn-taking rules [28], which has been noted as an area of deficit [29]. Co-tellers need to work in unison to create a coherent text through negotiating perspective and 'point' of the story, as well as through agreeing on details and proposed conclusions [27]. These factors could either support or hinder a person with TBI in the interaction.

Jointly-retold narratives also serve a number of particular social purposes. For example, co-narration of familiar stories can enhance rapport and ratify group membership through shared knowledge of joint experiences and common values [27]. This is important considering that poor communication abilities of people with TBI act as a barrier to community and social reintegration [4]. It also indicates the need to study the narratives of people with TBI in a more representative setting.

Jointly-produced narratives in the typical population

Jointly-produced or 'co-constructed' narratives have been examined among the typical population. Stemming from the narrative work of Labov and Waletsky (1967), there has been a recent ideological shift towards understanding and describing the co-construction of narrative as an interactive process between narrator and listener [30]. However, there does not appear to be a common rhetoric or tools for analysis of co-constructed narratives, perhaps due to the natural variability in performance across the normal population [23, 27].

The use of dimensions of descriptors, such as linearity, as opposed to a fixed set of defining features has been suggested [26]. Norrick (2000) alternatively proposes a set of 'typical features' of co-constructed narratives, such as both participants contributing information, detail, and evaluative comments [27]. However, these descriptions do not always allow for controlled comparison. The participation in narrative by pairs of people of various interpersonal roles has also been studied. Quasthoff and Becker (2005) found that the more integrative the partnership, the higher the percentage of shorter utterances used. This indicates a more rapid exchange of turns and possibly greater participation in dialogue by both participants [26].

Similar issues of power and familiarity have been explored in the co-construction of narrative in areas of clinical practice such as psychology and social work. Nye (1998) relates that in ordinary conversation, the roles of vulnerable narrator (whose story can potentially be challenged) and responsible listener (who needs to be actively engaged) are

shared and traded back and forth within a conversation [30]. However, in clinical practice the roles are fixed with the client as the perpetual vulnerable narrator. The fixed role inequality can lead to a lack of trust and disempowerment of the client unless the clinician is sensitive to the power differential inherent in the process and is aware of the need to work collaboratively rather than authoritatively [30]. A similar ideology has been used to study the participation in conversation of people with TBI: systemic functional linguistics (SFL).

Systemic Functional Linguistics (SFL)

SFL suggests that the linguistic choices we make depend on who we are speaking to and the situation we are in [31]. That is, it identifies the subtle ways speakers respond to familiarity and power imbalance in social interaction. The exchange of information is examined in SFL using exchange structure analysis, which demonstrates who is in charge of the information in the interaction and how this information is transferred [21]. The dominant partner in an information exchange is more likely to be the primary knower (KI), or the person who has the information that the secondary knower (K2) wants to access [32]. Exchange structure analysis examines how often a person is given the opportunity to be a primary knower, or information-giver, in different interactions. In other words, we can examine what individuals are doing in interactions. SFL provides a framework to analyse the discourse of people with TBI in a way that acknowledges the increasing belief of the impact of communication partners on discourse production.

Conversational exchanges in TBI

Individuals with TBI experience difficulty with communicative effectiveness across a number of discourse production genres [33]. For example, the conversations of people with TBI have been rated as less interesting, less appropriate, and more effortful than conversations with non-brain-injured controls [34]. However conversational discourse has been less frequently investigated than monologic genres. While important advances have been made over the past decade with respect to the refinement of conversational measurement tools and sampling techniques [29, 35, 36], too frequently the other person in the interaction is a researcher or therapist. Since the way a person interacts is determined by a number of factors that vary immensely from one interaction to the next [37], the representativeness of the discourse sample may be questionable. In an effort to overcome this, some have focused on how information is exchanged between people with TBI and a variety of communication partners.

Togher and colleagues (1997) examined conversations of participants both with and without TBI during telephone interactions with a range of communication partners of varying familiarity and power relations [21]. Using exchange structure analysis, it was found that the participants with TBI were potentially disempowered by their communication partners compared to matched controls. Participants with TBI were given less information than control participants, were more frequently asked questions regarding the accuracy of their contributions and understanding, and were sometimes asked for information that the communication partner already had. In a related study by Togher (2000), participants with TBI were placed in a community education information-

giving role and an information-requesting interaction with a researcher [38]. Exchange

structure analysis revealed that participants with TBI were able to give amounts of

information comparable with those given by control participants during the community

education session. Significant qualitative differences were also evident in the information

requested and given in the research condition. This demonstrates that people with TBI

should not only be evaluated with a number of interlocutors, but also need to be evaluated

in situations with different goals and roles to gain a representative view of their skills.

Jointly-produced narratives in other populations

The importance of jointly-produced or socially co-constructed narratives have been noted

in the literature on children following TBI. Ylvisaker, Sellars and Edelman (1998)

recommend that rehabilitation professionals work collaboratively with parents, carers,

teachers and other everyday communication partners so that all conversations with the

child can be transformed through effective use of scaffolding procedures for memory and

organization of ideas in discourse [39]. Carers are trained to use collaborative and

elaborative techniques to jointly-construct narratives of shared experiences. Given the

increasing acknowledgement of the impact of communication partners, there has also

been a move towards training communication partners in other areas of rehabilitation.

SPPARC (Supporting Partners of People with Aphasia in Relationships and

Conversation) has been used successfully with people with aphasia and their partners

[40]. This program moves the focus from the individual to the everyday conversation

patterns of the couple in an attempt to facilitate generalisation. A similar intervention

demonstrated gains in participation of people with aphasia [41]. Similarly, a training

program by Togher, McDonald, Code and Grant (2004) aimed to improve police officers'

responsiveness to people with TBI [42]. The intervention, involving education and

strategies, was found to have a significant impact on the communicative effectiveness of

people with TBI. Since cognitive deficits in those with TBI also often limit the extent to

which they are able to compensate for their impairments or learn and apply new skills

[18], the training of communication partners for the purposes of narrative may be

indicated.

Aim

Given the gap in research, the aim of the research project is to investigate the effects of a

familiar communication partner on the production of narrative after TBI.

Two questions will be specifically addressed:

(1) Are participants with TBI as equally able to jointly-produce a narrative as control

    participants?

(2) Does a familiar partner facilitate the production of narrative in those with TBI?

METHOD

Participants

This study included two groups of participants: a clinical group of ten participants with

severe TBI, each paired with a friend, and a matched control group of ten participants

without TBI, each paired with a friend. The data presented in this study forms part of a larger study addressing discourse and psychosocial outcomes of individuals with TBI. All participants and their friends provided oral and written consent prior to participating in this study. The project was passed by the University of Sydney Human Ethics Committee.

Selection and description of participants with TBI (clinical group)

Ten participants with severe TBI were recruited through brain injury rehabilitation units in Sydney, Australia. The selection criteria were based upon the participants having:

(1) provided consent to participate in the study

(2) sustained a severe TBI as indicated by the duration of their post traumatic amnesia (PTA) (> 24 hours) and/or loss of consciousness of > 6 hours [43]

(3) no PTA, a state of confusion which may occur after a TBI [44]

(4) a time post TBI of ≥ 4 years [45]

(5) a social communication disorder on the Pragmatic Protocol

(6) a cognitive communication disorder based on a severity score below 17 obtained in the Scales of Cognitive Abilities for Traumatic Brain Injury (SCATBI) [46]

(7) no presentation of aphasia, which manifests as a specific impairment of basic language function consequent to brain damage [47], as evaluated during the screening assessment. If there was doubt regarding the presence of aphasia, the Western Aphasia Battery was administered [48] and participants were required to score above the cut-off of 93.8 on the Aphasia Quotient

(8) adequate concentration and attention to complete research tasks

(9) a friend willing to participate in research tasks.

Most of this information was obtained from the participants' medical records. Participants were not excluded on the basis of their socio-economic, employment or relationship status.

All participants with TBI were male, most of whom had sustained a severe TBI consequent to a motor vehicle accident (MVA). Their ages ranged from 24.00 to 67.00 years (mean= 39.4 ± 13.3 years), and their education ranged from attending high school to obtaining TAFE diplomas and university degrees. The mean length of PTA was approximately 17.8 weeks, ranging from 1.5 days to 40 weeks. All participants with TBI were in the latter stages of rehabilitation, with a mean time of 13.05 years post-injury (range= 4.10- 28.00 years). Their SCATBI severity scores ranged from 8-12 (mean= 10.1 ± 1.60). Table 1 contains a summary of the demographics of participants with TBI.

[Insert table 1 about here]

Description of friends of participants with TBI

Each participant with TBI attended with a friend of theirs willing to participate in the study. Of the ten friends that participated, three were females and seven were males. Their ages ranged from 33.00 to 68.00 years (mean= 44.00 ± 12.11 years). The lengths of friendships with participants with TBI ranged from 0.04 to 41.00 years (mean= 14.20 ± 14.19 years), with the most common type being one of 'close friends'. Half of the friends did not know the person with TBI prior to their TBI. Most friends had an education to

high school, and some had further tertiary education. Table 2 contains a summary of the demographics of friends of participants with TBI.

[Insert table 2 about here]

Selection and description of participants without TBI (control group)

Ten participants without TBI were matched according to sex, age and education to the participants with TBI. Participants in the control group were not excluded on the basis of their socio-economic, employment or relationship status. All control participants spoke English, and had a friend willing to participate in the study.

All control participants were males. Their ages ranged from 22.00 to 67.00 years (mean= 38.40 ± 13.79 years), which was not significantly different from the ages of participants with TBI (t= 0.15, df= 9, p= 0.89). Control participants had education levels ranging from high school to TAFE and university. Table 3 contains a summary of the demographics of participants without TBI.

[Insert table 3 about here]

Description of friends in the control group

Each control participant was paired with a friend of theirs willing to participate in the study (CF) (table 3). Of the ten friends that participated in the control group, one was female and nine were males. Their ages ranged from 29.00 to 67.00 years (mean= 39.50 ± 11.57 years). The lengths of their friendships ranged between 3.00 and 35.00 years

(mean= 16.45 ± 12.84 years), with the most common type being one of 'good friends'.

Most friends in the control group had an education up to high school at least.

Procedure

Participants with TBI and control participants were asked to complete two narrative tasks:

a monologic narrative on their own and a jointly-produced narrative with their friend.

Description of monologic narrative task

Participants were asked to produce a narrative based on a series of six black and white

line drawings depicting a novel sequence of events. This comic strip, entitled 'The

Flowerpot Incident' (adapted from Kossatz, 1972), has been used in previous

investigations of narrative abilities following TBI [9, 25]. Participants were asked to

'look at the pictures and then tell the story of what happened from beginning through to

the end'. The monologic narratives (in both clinical and control groups) were video

recorded and then orthographically transcribed.

Description of jointly-produced narrative task

Participants were asked to retell a segment from a holidays / home improvement video

with a friend. This activity was based on a task contained in Test of Language Use:

Research version [49]. Participants and their friends were asked to 'watch this video

about holidays / home improvements. I haven't seen the video and need to know whether

it is worthwhile to use in the clinic with other clients. When it's finished come and get me

and I'll ask you both to tell me what the video was about.' As indicated, the clinician left

the room during the showing of the video in order to present as a naïve listener. The jointly-produced narratives between participant- friend pairs (in clinical and control groups) were video recorded and then orthographically transcribed.

Analysis measures

Discourse transcripts included the entire discourse produced after the time of the initial instruction, including any false starts or revisions. The transcriptions were distributed into communication units, or C-units, before any further analyses were applied. A C-unit is defined as an independent clause plus any subordinate clauses associated with it [50]. A C-unit is identical to the more commonly used T-unit, with the exception that the C-unit includes responses that lack an independent clause when answering questions [50]. C-units and T-units are similar to sentences but are more reliably identified as they solve the problem of delineating sentence boundaries in speakers who tend to continuously conjoin clauses with coordinating conjunctions [51]. It was deemed necessary to use C-units as opposed to T-units in this study in order to analyse more of the discourse in the jointly-produced narratives. Mazes, which include false starts, revisions, filled pauses and sound, syllable or word repetitions [50], were bracketed and not included in analysis. However mazes were retained in the transcripts in case they included a cohesive referent.

Measurement of story narrative performance in the monologic task was made at three levels: productivity, cohesion, and content. In the jointly-produced narrative task, measurement of performance included these three levels as well as exchange structure analysis [52]. Each of the measures are described below and summarised in table 4.

Productivity

Two measures of productivity were examined and compared across tasks and groups.

SALT for Windows Standard Version 7.0 (2002) was used to calculate the following

productivity measures for the target participant after discourse transcripts were divided

into C-units and entered into the program [53].

(1) *Total number of C-units*: the total number of C-units produced in each of the

discourse tasks.

(2) Words per C-unit: the average number of words per C-unit over the discourse

produced in each of the narrative tasks.

Cohesion

Procedures for identifying cohesive markers and categories of cohesive markers were

taken from Halliday and Hasan (1976) [54]. Each cohesive marker or tie was judged as

either complete (the information referred to by the cohesive marker was easily found and

defined with no ambiguity) or incomplete / error (the information referred to by the

cohesive marker was not provided in the text or the listener was guided to ambiguous

information). The number of complete ties were tallied and compared to the number of

total ties to produce the *percentage of complete cohesive ties* in both narrative tasks. In

the jointly-produced narrative task, the measure was calculated for the target participant

only. However, ties were also judged as complete if referents were present in the discourse of their friend, due to the nature of the task.

Content

Two measures of content were examined and compared across tasks and groups.

(1) *Percentage of story grammar elements:* the number of story grammar elements present in the participants' narrative as a percentage of the number of expected elements. In the monologic task, Stein & Glenn's (1979) taxonomy of story grammar elements was used [55]. Participants' narratives were marked for the presence or absence of seven story grammar elements (setting, initiating event, internal response, plan, attempt, consequence, reaction). Appendix 5 contains an example. Due to the elicitation task in the jointly-produced condition, an adaptation of Stein & Glenn's taxonomy was used, as seen in Coelho (2002) [19]. Participants' narratives were marked for the presence or absence of three story grammar elements (initiating event, action, direct consequence).

(2) *Percentage of essential units of information*: both narrative tasks were coded according to Informational Content Analysis [56]. Each information unit was marked as either essential (relevant information consistent with major details selected for the task) or non-meaningful (irrelevant, redundant, off-topic or incorrect). The number of essential units of information were tallied and recorded as a percentage of the total units of information provided.

Exchange structure

This measure was used in the jointly-produced narratives, as a measure of discourse participation. Discourse transcripts were divided into moves using a systemic functional linguistic (SFL) approach so that each move could be considered as a unit of information [57]. K1 (information-giving) moves contributed by the target participant were tallied and reported as a percentage of total moves to produce the *percentage of K1 moves*.

Data analysis

Non-parametric statistical analyses were performed on SPSS Version 14.0 for Windows [58]. A significance level of $p< 0.05$ was set as an appropriate level for all analyses in this study. All of the above measures were compared across tasks and between groups.

Reliability of analysis measures

The narratives were analysed by author M.J. To assess inter-judge reliability, a sample of 20% of discourse transcripts from both clinical and control groups were randomly selected. Co-author L.T. re- analysed the selected transcripts using exchange structure analysis. For the other measures, a third judge was trained and explicit written instructions were provided for classification. Judges consulted with one another in the event of discrepancies between judgments, and aimed to reach 80% for reliability measures [59]. Inter-judge reliability for productivity measures was 85%, for cohesion was 80%, for content was 89% and for exchange structure analysis was 87%.

RESULTS

Mann Whitney U and Wilcoxon W were applied to determine if the discourse was

different between and within clinical and control groups. Descriptive statistics were also

used. Tables 6 and 7 contain a summary of descriptive statistics for all measures.

[Insert tables 6 and 7 about here]

Comparison of discourse performance between groups

Productivity

    Monologic narrative

Productivity was measured by the total number of C-units and words per C-unit. Mann

Whitney U indicated a significant difference for both of these measures (U = 6.500, p =

0.0365 and U = 6.000, p = 0.0365 respectively). Participants with TBI used significantly

more C-units but significantly *fewer* words per C-unit than control participants to produce

a monologic narrative.

    Jointly-produced narrative

For the total number of C-units and words per C-unit, Mann Whitney U *did not* indicate a

significant difference (U = 16.500, p = 0.876 and U = 12.000, p = 0.432 respectively).

There was no significant difference between participants with TBI and control

participants in jointly-producing a narrative using these productivity measures.

A graphical comparison of discourse performance across groups can be seen in figures 8(a) and 8(b), which contain summaries of mean scores for productivity in both tasks.

[Insert figures 8(a) and 8(b) about here]

Cohesion

Monologic Narrative

Mann Whitney U indicated a significant difference for percentage of complete cohesive ties (U = 5.500, p = 0.024). Participants with TBI used significantly *fewer* complete cohesive ties than control participants when producing a monologic narrative.

Jointly-produced Narrative

Mann Whitney U *did not* indicate a significant difference for percentage of complete cohesive ties in the jointly-produced narrative (U = 8.000, p = 0.149). There was no significant difference between the jointly-produced narratives of participants with TBI and that of control participants using this measure

Content

Monologic Narrative

Content was measured by the percentage of story grammar elements and the percentage of essential units of information present. Mann Whitney U indicated a significant difference for both measures (U = 5.000, p = 0.024 and U = 0.000, p = 0.0015 respectively). Participants with TBI used significantly *fewer* story grammar elements and

significantly *fewer* essential units of information (more extraneous information) than control participants when producing a monologic narrative.

Jointly-produced Narrative

For the percentage of story grammar elements and percentage of essential units of information present, Mann Whitney U *did not* indicate a significant difference (U = 16.000, p = 0.876 and U = 12.000, p = 0.432 respectively). There was no significant difference between the jointly-produced narratives of participants with TBI and that of control participants with respect to percentage of story grammar elements or percentage of essential units of information.

Exchange Structure Analysis

This measure was (by definition) used to assess the jointly-produced narrative alone. Mann Whitney U *did not* indicate a significant difference for the percentage of K1 moves in jointly-produced narrative (U = 44.000, p = 0.684). There was no significant difference between the percentage of K1 moves in the jointly-produced narrative of participants with TBI and that of control participants.

Summaries of mean percentages for cohesion, story grammar, information units, and exchange structure in both tasks can be seen in figures 9(a) and 9(b), which compares discourse performance across groups.

[Insert figures 9(a) and 9(b) about here]

Comparison of discourse performance between narrative tasks

Productivity

      Participants with TBI

It was hypothesized that there would be a difference between narrative tasks for the total

number of C-units and words per C-unit. However, Wilcoxon W *did not* indicate a

significant difference (p = 0.345 and p = 0.310 respectively). There was no significant

difference between the monologic and jointly-produced narratives of participants with

TBI using these productivity measures.

      Control participants

For the total number of C-units between narrative tasks, Wilcoxon W *did not* indicate a

significant difference (p = 0.500). There was no significant difference between the

monologic and jointly-produced narratives of control participants with respect to total

number of C-units. For words per C-unit between narrative tasks, Wilcoxon W indicated

a significant difference (p = 0.043). Control participants used significantly *fewer* words

per C-unit to jointly-produce a narrative than to produce a monologic narrative.

A graphical comparison of discourse performance across tasks can be seen in figure 10(a)

and 10(b), which contain a summary of mean scores for productivity for both groups.

[Insert figure 10(a) and 10(b) about here]

Cohesion

   Participants with TBI

Wilcoxon W *did not* indicate a significant difference for the percentage of complete

cohesive ties between narrative tasks (p = 0.176). There was no significant difference

between the monologic and jointly-produced narratives of participants with TBI with

respect to percentage of complete cohesive ties.

   Control participants

Wilcoxon W *did not* indicate a significant difference for the percentage of complete

cohesive ties between narrative tasks for the control participants either (p = 0.465). There

was no significant difference between the monologic and jointly-produced narratives of

control participants in terms of percentage of complete cohesive ties.

Content

   Participants with TBI

Results for the percentage of story grammar elements and the percentage of essential

units of information were compared between narrative tasks. Wilcoxon W indicated a

significant difference (p = 0.0135 and p = 0.014). Participants with TBI used significantly

more story grammar elements and significantly *more* essential units of information (less

extraneous information) when jointly-producing a narrative than when producing a

monologic narrative.

Control participants

For the percentage of story grammar elements present between narrative tasks, Wilcoxon W *did not* indicate a significant difference (p = 0.713). There was no significant difference between the monologic and jointly-produced narratives of control participants using this measure.

However, on the other content measure of percentage of essential units of information between narrative tasks, Wilcoxon W indicated a significant difference (p = 0.034). Control participants used significantly *fewer* essential units of information (more extraneous information) when jointly-producing a narrative than when producing a monologic narrative.

Summaries of mean percentages for cohesion, story grammar and information units for both groups can be seen in figures 11(a) and 11(b), which compares discourse performance between tasks.

[Insert figures 11(a) and 11(b) about here]

DISCUSSION

Narrative discourse is perhaps the most frequently sampled genre by speech pathologists, however this is typically done as a monologue. While monologic discourse is clearly valuable as a diagnostic tool, it may not reflect typical everyday interactions of the person

with TBI. The impact of communication partners on the production of narrative in everyday conversational exchange has been recognised [28]. Despite this, there are no known studies to date which have addressed the jointly-produced narratives of adults with TBI. One of the reported difficulties with analysing jointly-constructed or conversational discourse is the variability of research tasks [60]. This study addressed this issue by using standardised, manualised stimuli [49] and reliable discourse measures [21].

Did participants with TBI perform as expected in the monologic narrative task?
Many studies have noted that people with TBI have difficulties with monologic narrative production. The present study sought to replicate these findings but also to compare performance with a more naturalistic jointly-produced narrative with a friend. The monologic narrative findings in this study were consistent with many of the major findings of previous narrative research, thus confirming the diagnostic value of asking people with TBI to complete these tasks.

In terms of productivity, participants with TBI in this study used fewer words per C-unit than control participants in their monologic narrative. This finding is consistent with other studies (e.g. [19, 25]. Participants with TBI in this study also used a greater number of C-units than control participants to produce their monologic narrative. While lengthier oral narratives of participants with TBI were reported by Ehrlich (1988), one subgroup of Hartley and Jensen (1992) and in conversational studies [6, 14, 29, 34], other studies note decreased productivity in participants with TBI [25, 61]. However, Hartley and Jensen

(1991) acknowledged that concomitant difficulties with word retrieval and dysarthria in a majority of their participants could have been a contributing factor [25].

Participants with TBI used significantly fewer *complete* cohesive ties than control participants when producing a monologic narrative. Cohesion has been found to be problematic for individuals with TBI in many studies [5, 7, 25]. However, Coelho (2002) in a review of five studies of narrative after TBI reported no significant difference in cohesion between clinical and control groups [19]. Nonetheless, the cohesive scores in the control group were higher than that of the clinical group in that study.

In the monologic task, participants with TBI used fewer story grammar elements than control participants. Generally, the story grammar abilities of people with TBI in generation tasks are seen to be reduced when compared to controls (e.g. [62, 7, 17]), although there are some disparities [9, 19]. These disagreements may be attributed to the employment of different inclusion criteria and measures of story grammar [9]. However, Coelho (2002) acknowledged that participants with TBI appeared to have greater difficulty with using story grammar to organise language as they had more extraneous T-units that did not contribute to episodic structure [19]. The element most likely to be left out by both clinical and control groups in this study was the 'plan' (see appendix 5), which corresponds with the findings of Snow and colleagues (1999) [9].

Provision of sufficient and appropriate informational content is a frequently reported difficulty for people with TBI [5]. Determining the 'correct' amount of information relies

on a range of requisite skills such as intact word finding skills, appropriate social

judgment, ability to inhibit extraneous thoughts and evaluation of the needs of the listener.

Participants with TBI in this study used significantly fewer essential units of information

than control participants to produce a monologic narrative. This basically means that

participants with TBI often used non-essential or extraneous information in their

narratives. Numerous repetitions of information were also seen in the narratives of the

clinical group. This matches the findings of Snow and colleagues (1998) of 'information

redundancy' in the narratives of people with TBI [10]. The following example

demonstrates these features (TBI participant 1):

'Seems apparent that there is a person, upstairs obviously, and (they have the)

they want to walk down the stairs. They start walking down the staircase and as

they get near the bottom of the staircase they might notice someone else, and I'm

unaware that they have a conversation, it doesn't look like they have as past, and

the person that's walking down the stairs keeps walking down the stairs, and the

other person (is on) is doing what they're doing, don't know just they just pass

staircase, they're walking down the stairs.'

The result for informational content was highly significant in this study (i.e. control mean

of 86.3, clinical group mean of 31.2). Interestingly, measures of content in narratives of

people with TBI are also the most agreed upon in research. Many studies have noted a

reduction in the amount of target content or a failure to include critical information [17,

25, 63]. Similarly, the inclusion of inaccurate information and using more words to

convey information has been reported [6, 25]. While this may appear to create a substantial listener burden, Norrick (2000) notes that listeners recognize incompleteness and incoherence in the narrative of typical speakers, and use questions to fill in information [27]. However in narrative assessment and research, the clinician or researcher often participates minimally in the task to maintain a controlled environment. This creates a non-realistic setting for the demonstration of skills. The jointly-produced narrative task aimed to provide a context where the effect of a familiar communication partner could be taken into account.

Are participants with TBI as equally able to jointly-produce a narrative as control participants?

There is growing literature on the impact of communication partners on discourse both in TBI and other populations. Particularly, the previous studies in this series have demonstrated the impact of power and familiarity of different communication partners on the discourse of those with TBI [21, 38, 64, 65]. In the study by Kilov and colleagues, people with TBI contributed equally to a unique problem-solving task with friends, and did not differ from the control group in how they participated [65]. The authors hypothesized that the participants with TBI were empowered to contribute as their friends had equal social status and similar levels of 'background knowledge'. In this study, people with TBI also appeared to be empowered to participate in and produce narrative competently while engaging in a meaningful interaction with friends. Participants with TBI could not be statistically differentiated from control participants in all of the

discourse measures in the jointly-produced task. Thus, in this study, participants with TBI appear as equally able to jointly-produce a narrative as control participants.

As mentioned above, there were no significant differences between participants with TBI and control participants for productivity, cohesion, content, or participation in the jointly-produced narrative. There was a trend, however, for participants with TBI to produce a greater number of C-units than control participants (control mean of 15.6, clinical group mean of 17.0) and fewer words per C-unit (control mean of 8.6, clinical group mean of 7.6), as well as fewer complete cohesive ties and fewer story grammar elements (see table 7 for further details). These 'trends', while not significant, follow the same pattern as the differences in the monologic task. The participants with TBI clearly perform much more like control participants over a number of measures in the jointly-produced narrative.

The findings of informational content were surprising however. Participants with TBI did not significantly differ from controls in amount of informational content, however there was a trend for the clinical group to provide *more* essential units of information than the control group in the jointly-produced narrative (control mean of 60.6, clinical group mean of 72.6). That is, control participants tended to divert from the task with personal chat more often than participants with TBI. Kilov and colleagues also found that unrelated / personal talk occurred in a higher frequency in the control group [65]. While this tangential language is often considered characteristic of communication in individuals with TBI, its prominence in the discourse of the control group suggests that it is more a typical conversational behaviour, perhaps used to strengthen relationships between

communicators [15]. It is hypothesized that participants with TBI had greater difficulty shifting between the task and social oriented talk due to a difficulty with cognitive flexibility, which is a common feature of TBI [66]. However, some participants with TBI were able to initiate and sustain tangential personal narratives and general chat, possibly indicating a greater degree of cognitive flexibility. This can be seen in the following example of the jointly-produced narrative of TBI participant 5:

Participant: 'I'd like to go there, it looks really nice, even like to (scuba) learn to scuba dive.'

Friend: 'Yeah –'

Participant: 'That looks (like) really nice too.'

Friend: 'Well, you could snorkel, snorkelling's –'

Participant: 'Oh, that'd be good…'

Friend: 'Have you ever snorkeled?'

Participant: 'No, I never, never. No, I did quite a lot of water sports but (I) I never, never had a snorkel or things like that. I'd never had the opportunity to do it… Have you?'

Friend: 'Only snorkeling, (not) not scuba diving.'

Participant: 'Oh, I see…'

Participants with TBI also did not significantly differ from controls in respect to the percentage of K1 information-giving moves they used in the jointly-produced narrative. Hence, the jointly-produced condition empowered participants with TBI to contribute

equally to the task in a similar way to the clinical group in the study by Kilov and colleagues [65]. There was, however, a slight trend for participants with TBI to use less K1 moves than control participants. This was somewhat surprising, as it was hypothesized that friends may encourage participants with TBI to take over more of the discourse, in the knowledge that the person with TBI was the target of the study. However, two of the participants with TBI (participants 9 and 10) requested scaffolding by their friends to begin the narrative before they took over the information-giving role, which may have impacted the result. The following example demonstrates this request (TBI participant 9):

Participant: 'You start.'

Friend: 'Do you want me to start?'

Participant: 'Yeah.'

Friend: 'Okay, well first of all (they started all) they started off with a little…'

Does a familiar partner facilitate the production of narrative in participants with TBI? While people with TBI appear as equally able to jointly-produce a narrative as control participants, further examination of results between tasks reveals some interesting findings.

Participants with TBI used significantly more story grammar elements and significantly more essential units of information when jointly-producing a narrative than when producing a monologic narrative. That is, people with TBI were facilitated to produce a

more content-competent narrative in collaboration with their friends. However, no significant differences were found between the narrative tasks for productivity and cohesion. This appears to challenge the findings that the clinical group was able to perform as well as the control group for these measures in the jointly-produced task. By looking closer at the data, however, it appears that the control group changes are <u>greater</u> between the conditions relative to participants with TBI. For example, the average total number of C-units for the control group was 11.6 for the monologic task and 15.6 for the jointly-produced task (difference of 4), whereas the average total number of C-units for participants with TBI changed from 19.6 in the monologic task to 17 in the jointly-produced task (a lesser difference of 2.6) (see tables 6 and 7 for further details).

One possible reason to explain the lack of change in productivity and cohesion between the conditions concerns the impact of communication partners. Communication partners appear to have a significant facilitatory effect on informational content and story grammar due to their ability to scaffold the macrostructure of the discourse. However, it is perhaps more difficult for a communication partner to have an effect on measures that rely on the cognitive-linguistic skills of the individual with TBI. That is, it is harder to help a communication partner produce more words or greater levels of cohesion.

It appears that participants with TBI are unable to modify their language resources for productivity and cohesion measures between the tasks, which could further indicate a difficulty with cognitive flexibility. Difficulty in adapting language for the social situation has been noted by Galski and colleagues (1998). However, participants with

TBI did follow some control trends across the discourse tasks. This is similar to the findings of Togher and colleagues (1997), where participants with TBI were able to vary their moves and types of requests between interactions although not as sensitively as the control group [21].

Control participants used significantly fewer words per C-unit in the jointly-produced task than in the monologic task. The participants with TBI also followed this trend, though it was not significant. The finding of shorter utterances is consistent with that of Quasthoff and Becker (2005), who found a higher percentage of shorter utterances in more integrative partnerships in the typical population [26]. The interrupting and overlapping of discourse in the jointly-produced task is likely responsible and easily observed in out data. For example, following is part of the transcript of control participant 2 (n.b. '=' means overlap):

Friend: 'No no oh not a very ='

Participant: = (unintelligible)

Friend: 'I'm not a very hand bloke that's –'

Participant: 'I like that stuff so – '

Friend: 'I'm not a handy man… you know, 'cause I'm so playstation = or anything like that.'

Participant: '= (laugh) I wouldn't have a problem (laugh).'

Friend: '(laugh) That's right.'

While it was not statistically significant, participants with TBI tended to be more cohesive in the jointly-produced narrative than in the monologic task. This trend was also reflected in the control group's performance. However, these findings may be in part attributed to differences in the elicitation tasks. Both Davis and Coelho (2004) and Liles and colleagues (1989) found that adequacy of cohesive use was greater in a narrative retell task for both control and clinical groups [7, 67]. It was also noted that lower ratios in the picture-elicited generation task may be indicative of a normal communicative phenomenon: when pictures are in view of both speaker and listener, the speaker may assume the listener already knows the referents [67].

As reported previously, participants with TBI used significantly more story grammar elements in the jointly-produced task than the monologic task, and the control group followed this trend. Again, Liles and colleagues (1989) found that both control and clinical groups produced a much higher frequency of complete episodes in a narrative retell task [7]. While differences in elicitation tasks indicate the need for replication of this study with more controlled tasks, the clinical and control groups did not significantly differ in their cohesive use and story grammar in the jointly-produced task. That is, the comparison between groups in the jointly-produced task demonstrates the increased competency of the participants with TBI.

The jointly-produced narrative environment clearly provides insightful information about the potential for people with TBI to use their language resources in different situations. The results may indicate the use of jointly-produced narrative as an additional assessment

tool for creating a more representative view of everyday language abilities in an empowering environment. Competent participation and production of narrative appears possible for individuals with TBI when they engage in meaningful interactions with friends. Qualitatively, however, there still were some interesting observable differences in the discourse of TBI in the jointly-produced task.

Participants with TBI often focused on the recall of facts and details during the jointly-produced task, as apposed to relating the story as a whole. They appear to have believed it was a testing situation with a memory task expectation. For example, TBI participant 5 states '(I, I, you) you're not going to ask some questions? I was looking at with a view to what questions you were going to ask'. Participants with TBI also had different responses to the researcher prompt 'did you find it interesting?'. Several participants in the clinical group replied that they did not, however all control participants replied that they did, though often after hesitation. The affirmative response was a perhaps a politeness strategy. For example, control participant 8 says 'Oh… I mean, it was… I mean, it was okay' whereas TBI participant 4 states 'No… too short'. The frankness of people with TBI here may relate to difficulties to recognise the contextual features of familiarity and social distance that have been noted in the discourse of people with TBI. According to Togher and Hand (1998), participants with TBI were able to access a wide variety of politeness strategies however used fewer politeness markers than matched controls in a number of interactions [64].

Additionally, some friends in the clinical group asked the participants with TBI questions to which they knew the answer. This can be seen in the following example from the jointly-produced narrative of TBI participant 4:

Friend: 'Well, what sort of things did they use?'

Participant: 'They use –'

Friend: 'The sandstone, you said that.'

These 'teaching exchanges' potentially disempower people with TBI [21]. Ylvisaker and colleagues (1998) noted that using a directive, interrogational communicative style results in a large degree of failure and frustration for children with TBI [39]. If a communicative partner shifts to a more collaborative style, the rate of failure is easily reduced and the ability to organise and remember information is simultaneously increased [39]. This appeared to be the case in this study: participants with TBI who were involved in the teaching exchanges did not make as much improvement as other participants between discourse tasks. However, it must be noted that these subjects also had the greatest difficulties with the monologic task.

Two of the participants with TBI (participants 1 and 8) performed comparatively better than the other participants with TBI when they engaged in talk with their friends after watching the video, but before the researcher came back into the room. This 'practice' at the task appeared to facilitate their jointly-produced narrative. For example, the clarification of facts can be observed in the discourse of TBI participant 1:

Participant: 'What was the hotel at, Indonesia was it?'

Friend: 'It's Fiji.'

Participant: 'Fiji. Sounded good.'

Ylvisaker and colleagues (1998) note that greater reliance on antecedent supports and scaffolding sets the stage for communicative success [39]. Thus, there are implications for the training of friends in rehabilitation after TBI. Friends appear to have the potential to fill supportive and therapeutic roles in treatment, similar to the aforementioned aphasia programs, and rehabilitation for children with TBI.

Limitations

Despite these positive results, there are a number of issues pertaining to this study that need to be addressed. These issues, along with the small sample size and exploratory nature of this study, highlight the need to interpret the results with caution.

Firstly, the informational content of the control group varied considerably, which made the application of informational analysis to the clinical group difficult. Variability among control groups is a recurrent pattern in the literature. Armstrong (2002) found a large degree of variability between non-brain injured speakers in a recount task, not just quantitatively but also qualitatively [68]. This makes the issue of differentiating normal and impaired discourse far from trivial. Further, other researchers have reported on the overlap in narrative performance of control and clinical groups [13]. In this study, there

was large variation in the clinical groups' performance on many of the measures, and also an overlap between the groups in many of the measures on the monologic task. For example, in the monologic task the range of cohesiveness for control participants was 88.46 to 96.23 while the participants with TBI scored between 64.29 and 95. Whether this is due to the small participant numbers, the elicitation tasks, or the analysis tools is hard too determine. However, the variation and overlap limits the ability to extrapolate the findings.

One way to possibly offset this problem is through lay listener-judgments. These judgments are the most reliable measures of everyday discourse abilities [10]. Olness, Ulatowska, Carpenter, Williams-Hubbard and Dykes (2005) also suggest the use of lay listeners alongside analytic quantitative measures to help contribute to our understanding of the normal range of performance and for narrative assessment to reflect everyday narrative skills [69]. The variability in findings in this and other studies implies the need to maintain multi-level analysis in studying the discourse of those with TBI [5]. As such, exchange structure analysis appears to be a valuable tool for assessing the performance of people with TBI and other groups in interactional discourse.

While this study aimed to investigate the language resources of people with TBI in a more representative environment, some artificial parameters may have affected the results. As mentioned previously, the knowledge that participants with TBI were the target of the study could have had an effect on the contribution of their friends to the discourse. In addition, it was difficult to find participants with TBI for this study who

actually *had* friends, which will have impacted the results. That is, the participants in this study may have had a higher level of social awareness and social skills in order to have maintained friendships since their TBI.

This was a preliminary study of jointly-produced narrative, and the difficulties discussed imply the need for replication with a larger number of participants. However, the findings indicate an avenue for training everyday communication partners in supporting narrative skills after TBI, and for the use of jointly-produced narrative as an additional assessment tool to create a holistic view of everyday skills.

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Table 1: Demographics of participants with TBI (S)

ID Code	Sex	Age (years)	Type TBI	Duration of PTA (weeks)	Time Post TBI (years)	Frontal injury on CT scan (Yes/ No)	SCATBI Severity Score	Education
S1	M	38.00	MVA	24	16.00	Yes	9	High School, TAFE
S2	M	41.00	Pedestrian	16	20.00	Yes	12	High School
S3	M	24.00	Assault	13	4.10	Yes	11	High School
S4	M	38.00	MVA	40	22.00	Yes	8	High School
S5	M	58.00	MVA	12	28.00	No	12	High School, University
S6	M	30.00	MVA	20	>10.00	No	10	High School
S7	M	32.00	Fall	>24	6.00	Yes	10	High School,Course
S8	M	35.00	MVA	1.5 days	5.50	No	12	High School, TAFE
S9	M	31.00	Pedestrian	>20	7.10	No	9	High School, TAFE
S10	M	67.00	Fall	9	7.80	No	8	High School, University, Rep Training

PTA= Post Traumatic Amnesia; (L)= Left; (R)= Right

Severity score ranges: 3-6 = Severe, 7-9 = Moderate, 10-13 = Mild, 14-16 = Borderline, $\geq$ 17 = Average Normal

TAFE= Technical And Further Education

Table 2: Demographics of friends of participants with TBI (SF)

ID Code	Sex	Age	Education	Length of friendship with TBI participant (years)	Type of Friendship	Knew prior to TBI (Yes/ No)
SF1	F	34.00	High School, TAFE	0.50	Girlfriend, best friends	No
SF2	F	41.00	University	41.00	Close friends	Yes
SF3	M	42.00	High School	4.50	Good mates	Yes
SF4	M	46.00	University	5.00	Professional/ personal friends	No
SF5	M	62.00	University	9.00	Good friends	No
SF6	M	45.00	High School	6.00	Carer, friend, neighbour	No
SF7	M	33.00	High School	25.00	Best friends	Yes
SF8	F	35.00	High School, TAFE	0.04	Girlfriend	No
SF9	M	34.00	High School, TAFE	20.00	Best mates	Yes
SF10	M	68.00	High School, University	31.00	Close friends	Yes

Table 3: Demographics of the participants without TBI (control participants) (C) and their friends (CF)

Participant ID Code	Sex	Age	Education	Friend ID Code	Sex	Age	Education	Friendship Type	Friendship Length (years)
C1	M	38.00	TAFE	CF1	M	34.00	University	Neighbours, 'good mates'	3.00
C2	M	36.00	TAFE	CF2	M	38.00	TAFE, University	'same wavelength'	4.00
C3	M	26.00	High School	CF3	M	29.00	High School, University	Cousin, 'good friends'	29.00
C4	M	36.00	TAFE	CF4	M	35.00	High School, TAFE	'good friends'	27.00
C5	M	38.00	High School, TAFE	CF5	F	45.00	High School, TAFE, University	'good friends'	10.00
C6	M	57.00	High School, University	CF6	M	49.00	High School, University	'good friends'	3.50
C7	M	36.00	High School, TAFE	CF7	M	36.00	High School, University	'close friends'	20.00
C8	M	22.00	High School, TAFE, University	CF8	M	33.00	High School, University	close mates	4.00
C9	M	67.00	University	CF9	M	67.00	High School, University	'strong male friend'	35.00
C10	M	28.00	High School	CF10	M	29.00	High School, University	'good mates'	29.00

Table 4: Summary of discourse measures

Measures	Description
Productivity	
Total number of C-units	Total number of communication units (C-units) produced by the speaker
Words per C-unit	Average length of C-units calculated by dividing the number of words by the number of C-units
Cohesion	
Percentage of complete cohesive ties	Total number of complete cohesive ties divided by the total number of cohesive ties × 100
Content	
Percentage of story grammar elements	Number of story grammar elements present divided by the number of expected elements × 100
Percentage of essential units of information	Number of essential information units divided by the total number of information units × 100
Exchange structure	
Percentage of K1 moves	Number of K1 (information-giving) moves contributed by the target participant divided by the total number of moves × 100

Appendix 5: Example of story grammar elements (control two)

(1) *Setting:* '(Um) the man and the dog are walking along the street –'
(2) *Initiating event:* '– when a pot plant falls from an apartment building.'
(3) *Internal response:* 'The man's angry, he looks up and yells (abu) abuse to the particular apartment –'
(5) *Attempt:* '– and then proceeds to go inside the apartment building, up the stairs and knocks on the door.'
(6) *Direct consequences:* '(Ah) the lady comes out and pats the dog, giving him a bone'
(7) *Reaction:* 'and (thanks the la) the gentleman then thanks the lady and the dog runs off all happy.'

Missing element
(4) *Plan:* 'so he decides to go in and confront the person.' [taken from control one]

Table 6: Results for all measures across groups in monologic narrative task

		Monologic narrative measures				
		Total C-units	*Words per C-unit*	*% complete cohesive ties*	*% story grammar elements*	*% essential units of information*
Control group	*Mean*	11.60	11.28	91.42	88.57	86.29
	SD	8.62	1.97	4.91	11.95	14.80
	Min	5.00	9.40	86.36	71.43	70.00
	Max	22.00	14.00	98.73	100.00	100.00
TBI group	*Mean*	19.57	8.72	82.20	59.18	31.19
	SD	5.91	1.63	9.41	25.32	20.11
	Min	9.00	5.56	64.29	28.57	7.14
	Max	26.00	10.23	95.00	85.71	64.71

Table 7: Results for all measures across groups in jointly-produced narrative task

		Total C-units	Words per C-unit	% complete cohesive ties	% story grammar elements	% essential units of information	% K1 moves
				Jointly-produced narrative measures			
Control group	*Mean*	15.60	8.55	93.19	93.33	60.64	34.82
	SD	6.58	0.68	3.21	14.91	18.57	15.50
	Min	10.00	8.00	88.46	66.67	28.57	19.47
	Max	26.00	9.60	96.23	100.00	76.00	61.54
TBI group	*Mean*	17.00	7.56	86.61	90.48	72.61	32.62
	SD	9.29	3.56	9.72	16.26	11.00	13.45
	Min	6.00	3.60	66.67	66.67	61.11	19.56
	Max	30.00	13.76	95.74	100.00	88.46	55.95

Figure 8(a): Summary of mean scores for productivity across groups in monologic narrative
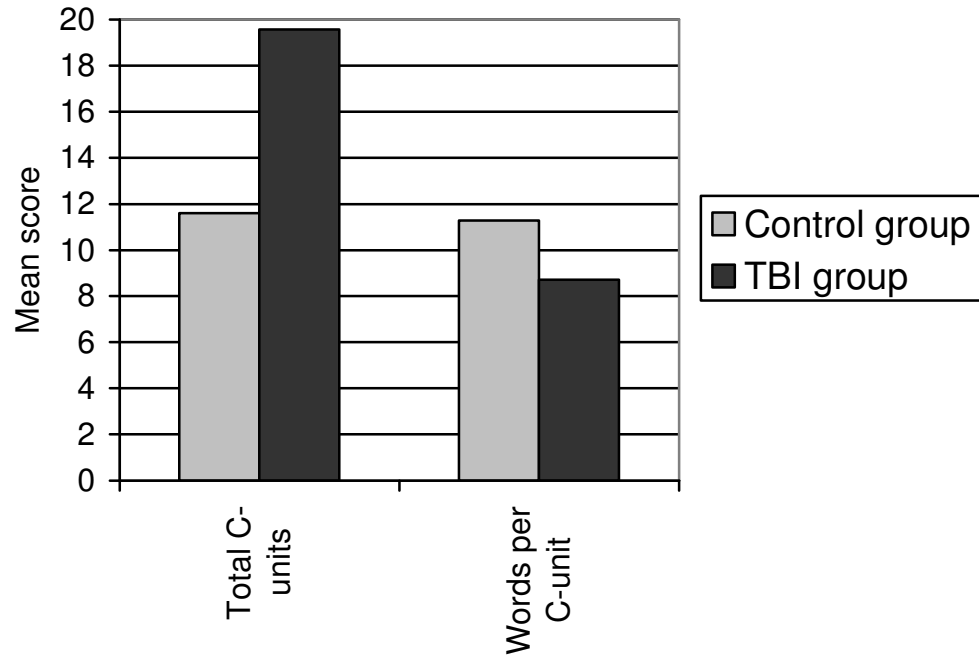
Figure 8(b): Summary of mean scores for productivity across groups in jointly-produced narrative
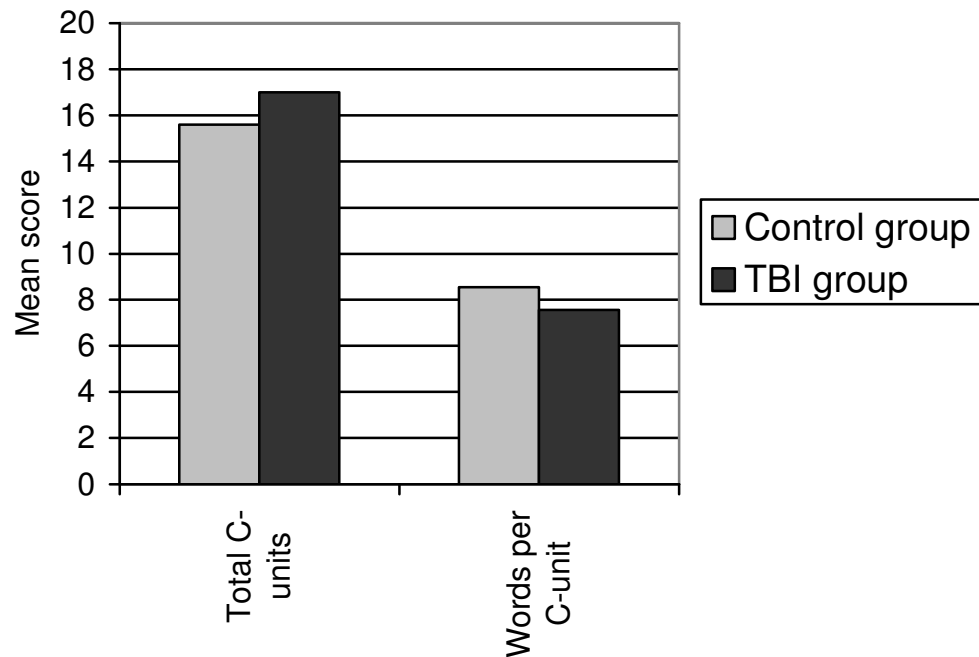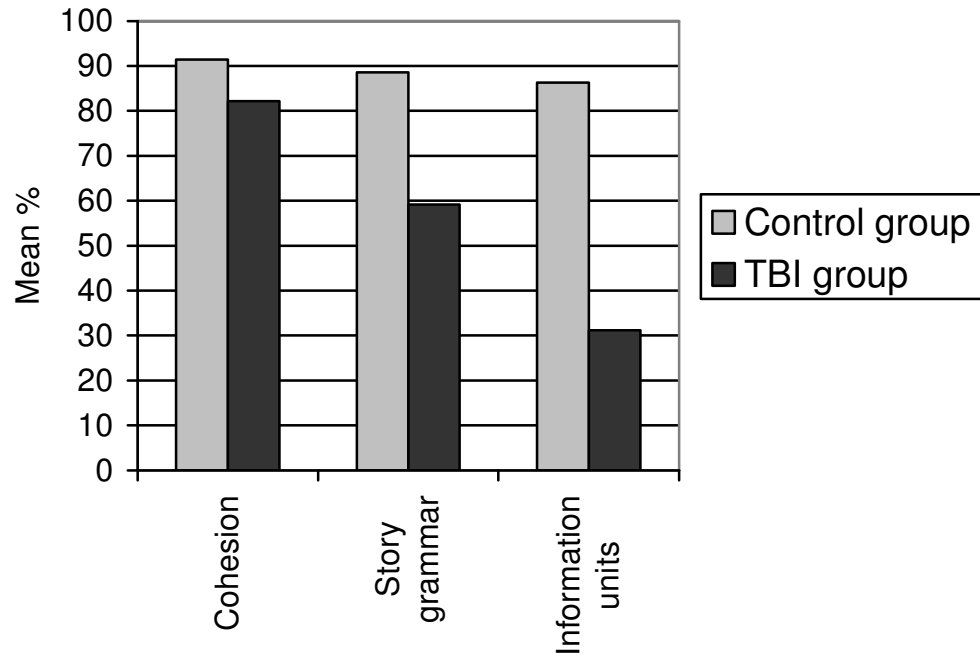
Figure 9(a): Summary of mean percentages for cohesion, story grammar and information units across groups in monologic narrative
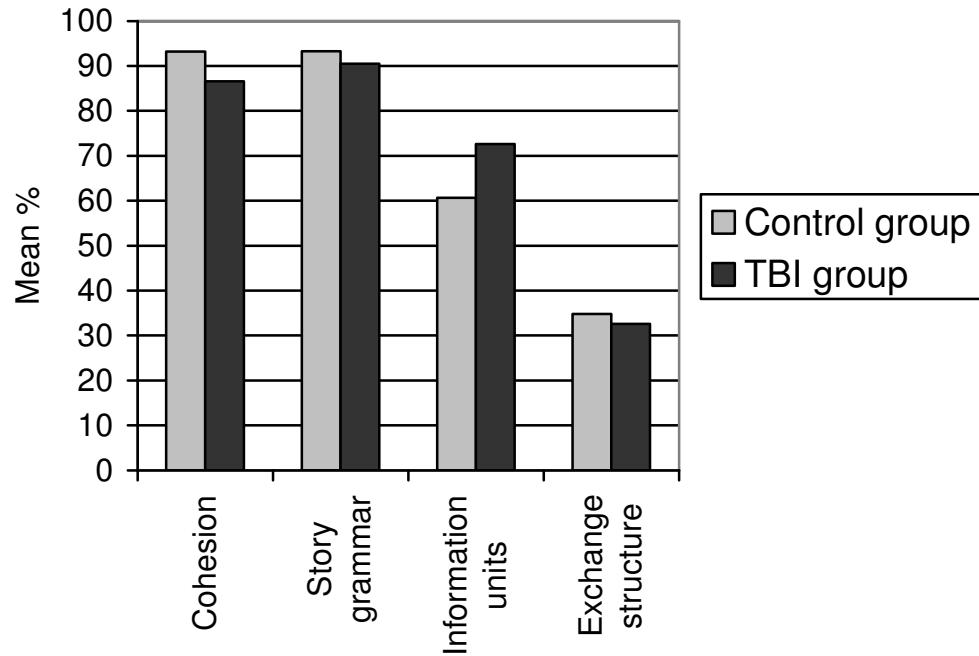

Legend:
Cohesion = no. complete cohesive ties as a percentage of total cohesive ties
Story grammar = no. story grammar elements present as percentage of expected elements
Information units = no. essential info units as a percentage of total info units

Figure 9(b): Summary of mean percentages for cohesion, story grammar, information units, and exchange structure across groups in jointly-produced narrative

Legend:
Cohesion = no. complete cohesive ties as a percentage of total cohesive ties
Story grammar = no. story grammar elements present as percentage of expected elements
Information units = no. essential info units as a percentage of total info units
Exchange structure = no. K1 moves as a percentage of total moves

Figure 10(a): Summary of mean scores for productivity across tasks for participants with TBI
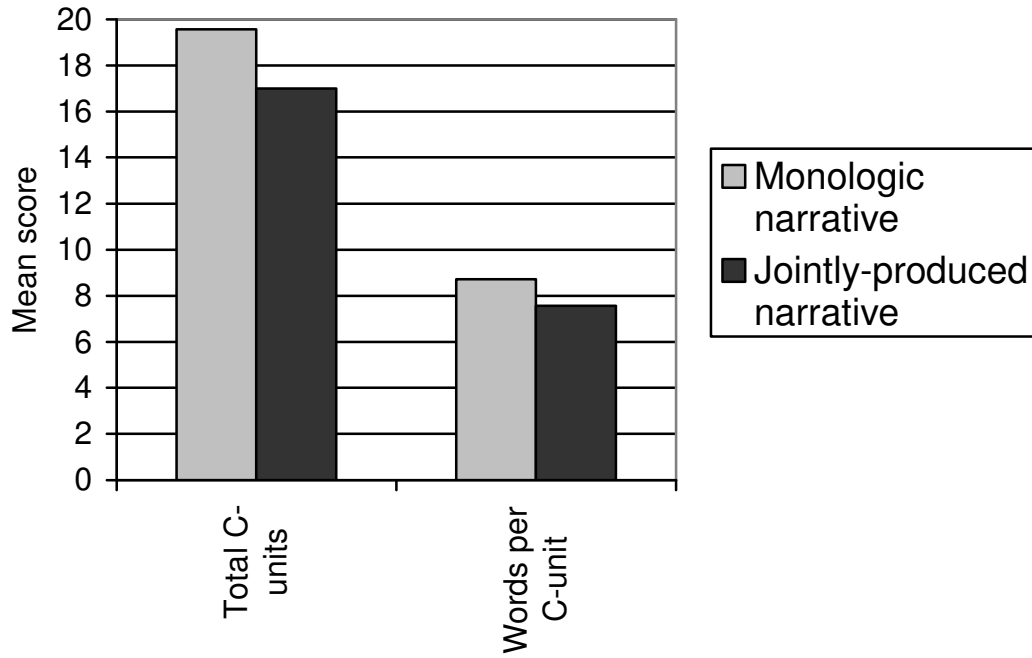
Figure 10(b): Summary of mean scores for productivity across tasks for control participants
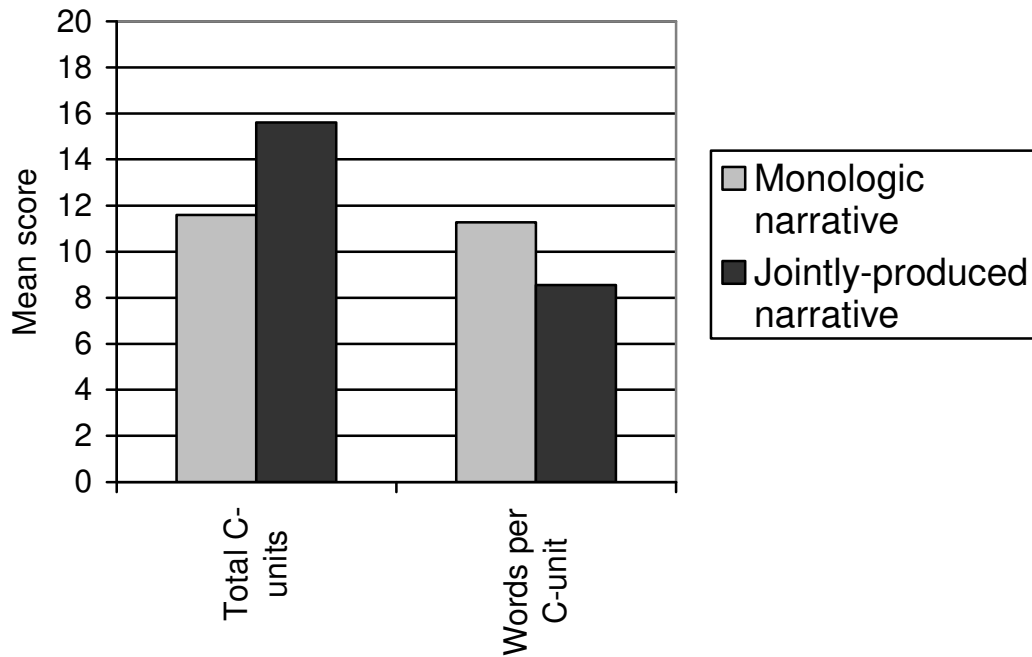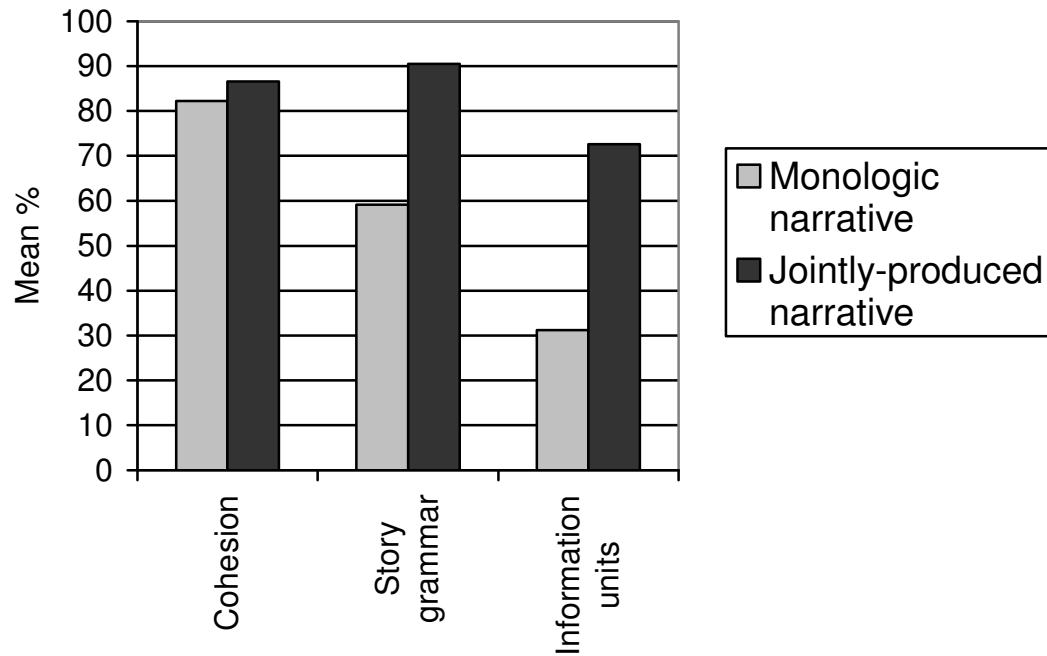
Figure 11(a): Summary of mean percentages for cohesion, story grammar, and information units across tasks for participants with TBI
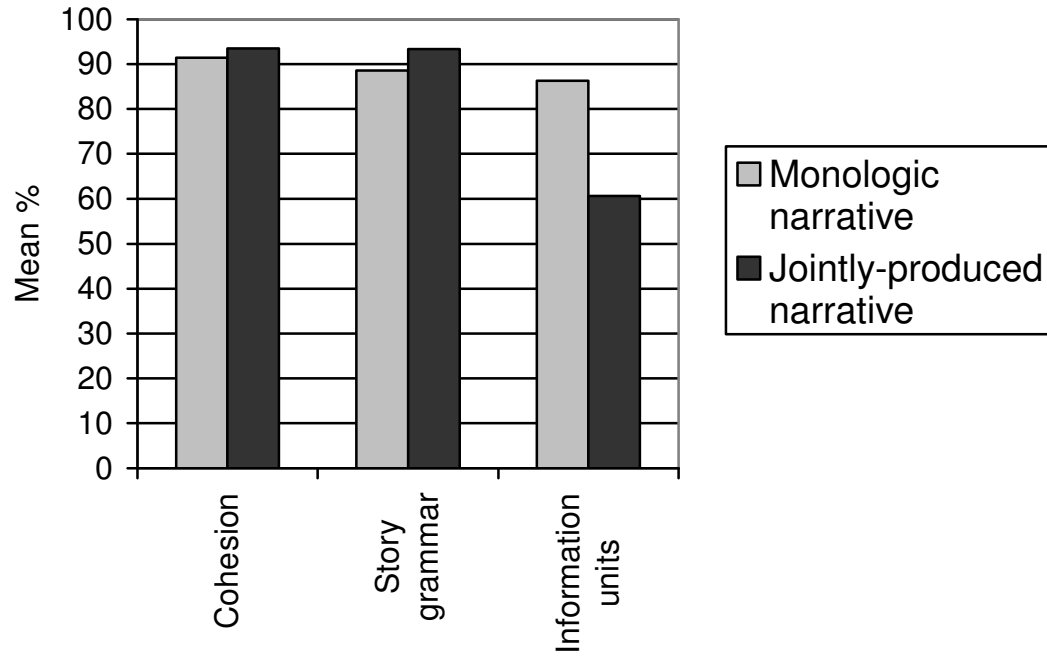

Legend:
Cohesion = no. complete cohesive ties as a percentage of total cohesive ties
Story grammar = no. story grammar elements present as percentage of expected elements
Information units = no. essential info units as a percentage of total info units

Figure 11(b): Summary of mean percentages for cohesion, story grammar, and information units across tasks for control participants

Legend:
Cohesion = no. complete cohesive ties as a percentage of total cohesive ties
Story grammar = no. story grammar elements present as percentage of expected elements
Information units = no. essential info units as a percentage of total info units