DISCOURSE IN TRAUMATIC BRAIN INJURY

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Abstract

Analysis of discourse production can be chosen as a means for testing cognitive-linguistic abilities of individuals with traumatic brain injury (TBI). The aim of the present study was to assess the cognitive-linguistic abilities in terms of discourse analysis in participants with traumatic brain injury and to compare them with discourse of neurologically intact individuals. The participants included 20 individuals with TBI (closed head injury) and 20 healthy talkers. The task involved use of a conversational topic, "family". Conversation was audio recorded using computer software and speech sample was transcribed verbatim using IPA and analyzed for discourse parameters using a discourse analysis scale. The results of this study showed a significant difference between the participants with TBI and healthy talkers. Participants with TBI were deficient on certain parameters of discourse. The details are discussed.

Key words: Discourse analysis scale, traumatic brain injury, cognition, linguistic ability

Discourse can be defined broadly as language use "in the large", or as extended activities that are carried out via language (Clark, 1994). It is a unit of language longer than a single sentence for verbal exchange and conversation. Discourse is a broad term used to describe four forms of connected speech (Rosenbek, LaPointe & Wertz, 1989): Procedural discourse deals with describing the procedures involved in performing an activity. Expository discourse deals in conveying information on a single topic by a single speaker. Conversational discourse is the one which conveys information between a speaker and listener or among speakers and listeners. And narrative discourse is a description of events. According to Brown and Yule (1983), discourse can be studied at comprehension level where it checks the ability to establish relationships within and between sentences by using context as the foundation for comprehension to form a coherent representation.

At expressive level, it can be transactional discourse which checks for the ability to express content and have interactional discourse which deals with the expression of personal attitudes and social relationships. Conversation is fundamental for socializing and strengthening interpersonal relationships through good comprehension ability and expressive skills. Individuals with TBI show poor conversational competence due to their verbosity, inappropriate responses to social communication, poor topic maintenance and reliance on additional conversational prompting. Thus, it is not surprising that their conversations have been described as less enjoyable, interesting or rewarding (Coelho, Youse & Le, 2002; Godfrey & Shum, 2000; Paterson & Stewart, 2002).

Discourse can be analyzed at microlinguistic and macrolinguistic levels (Ulatowska, North & Macaluso-Haynes, 1981; Ulatowska, Freedman-Stern, Doyle & Macaluso-Haynes, 1983; Glosser & Deser, 1990; Cannizzaro & Coelho, 2002): At microlinguistic level the processing of phonological, lexical-semantic and syntactic aspects of single words and sentences can be analyzed. Measures of syntactic complexity and production at the single word level are often used here. At macrolinguistic level, the ability to maintain conceptual, semantic and pragmatic organization at the suprasentential level can be analyzed.

Coherence and cohesion are often used as measures of macrolinguistic abilities (Halliday &

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Hasan, 1976). It relies on the interaction of both linguistic in terms of comprehension and expression and non-linguistic knowledge, especially the non-linguistic systems of executive control and working memory (Cannizzaro & Coelho, 2002). Competent speakers use a range of discourse levels in their daily communication to meet the demands of situations and partners (Bloom, 1994; Coelho, Liles & Duffy, 1994; Togher, 1998).

Finally, the discourse can be examined via a text, viewing it as a product or as a joint activity of discourse as a process. Because of its inherently dyadic nature, Clark (1994) suggested to view discourse as a joint and more meaningful activity, referring to interactional conversation as well as to stories told to others by single narrator.

Ehrlich (1988) has indicated that examination of communication skills of persons with TBI should always include assessment at the discourse level, particularly because these deficits on traditional linguistic tests are more subtle than what is observed for aphasia and/or other adult communication disorders. Discourse analysis has been widely used by psychologists, speech pathologists, and other professionals to analyze everyday language interactions (Stubbs, 1983). Discourse elicited from monologues and narrative tasks does not always represent interactional communication of everyday and therefore may not capture true communicative competence or incompetence of individuals with TBI (Snow, Douglas & Ponsford, 1995; Snow & Douglas, 2000). These tasks are used as controlled elicitation tasks mostly for research purposes.

Conversation and "social chat" have been recognized as important communication genres for individuals with TBI (Davidson, Worral & Hickson, 2003; Larkins, Worrall & Hickson, 2004). It is well documented that individuals with TBI do not always produce proficient conversational discourse because they have difficulty in maintaining appropriate pragmatic and social skills. They may also have difficulty producing proficient discourse due to impaired attention, planning, organization, and self-regulation processes (Bond Chapman, Levin, Matejka, Harward & Kufera, 1995; Cherney, Shadden & Coelho, 1998). Previous research on conversational discourse of individuals with TBI has depicted their incompetence and communication

difficulties. Conversations with individuals with TBI have been described as more effortful and less enjoyable because their partners are required to use "additional" prompting to maintain the topic and flow of conversation (Coelho, Youse & Le, 2002). Conversational interaction between friends, parents and siblings of individuals with TBI has been occasionally included in clinical studies, and it is difficult to identify if discourse performance of individuals with TBI may be improved in the presence of people who share meaningful (social) relationships with them. But this causes bias in choosing discourse partners and does not provide an accurate judgment of TBI individuals' discourse ability. So, discourse studies in the TBI literature have focused on "conventional" genres such as monologues, narratives, procedural texts and structured conversations to make the task more controlled from a research point of view.

Many investigators have also made incidental comments on the salient impairments in conversation exhibited by participants with TBI. Coelho, Liles, Duffy and Clarkson (1993) examined conversations of five individuals with TBI, five individuals with aphasia, and five non-brain-injured controls using Blank and Franklin's (1980) procedure for evaluating appropriateness within a conversation. Results indicated that the individuals with TBI had more turns, shorter utterances, decreased response adequacy, as well as difficulty initiating and sustaining topics. These findings suggested such analysis to be promising for delineating distinctions in conversational performance across groups. Functional communication requires language competence in a variety of settings ranging from informal social interactions to formal educational or work-related tasks (Snow, Douglas & Ponsford, 1997).

Recent investigations have demonstrated that individuals with TBI experience difficulty with communicative effectiveness across a number of discourse production genres. In various other studies (Allen & Brown, 1976; Milton, 1984; Mentis & Prutting, 1991), TBI patients were found to be lacking in many areas of conversational discourse like interactional/ non-propositional aspect and propositional aspect of conversation. The discourse abilities of adults who have suffered TBI have revealed that although these

individuals display "normal" or "near normal" language on traditional aphasia tests, they demonstrate varying levels of impairment in the coherence, cohesion, and informational content of their extended verbal production (Hagen, 1984; Ylsivaker & Szekeres, 1989, 1994; Hartley & Jensen, 1991; Coelho, Liles & Duffy, 1994).

The present study sought to validate a comprehensive discourse analysis using "Discourse Analysis Scale" (Hema & Shyamala, 2008) for conversation task in Kannada language. The scale consists of conversation parameters categorized under two headings. The propositional aspect deals with how discourse is organized with respect to overall plan, theme or topic and how individual utterances are conceptually linked to maintain unity. And the non-propositional aspect deals with the important category of social communication behavior. These behaviors reflect the reciprocal nature of conversation and the joint co-operation required from the participants. This is a perceptual rating scale formed on the basis of standardized Damico's Clinical Discourse Analysis scale (1985) and Grice's (1975) Cooperative Principles for conversation, for differentiating discourse abilities between the groups of individuals with TBI and healthy talkers. A detailed description of all the parameters of discourse is shown in Appendix A.

Aim

The study aimed to assess, compare and differentiate the discourse abilities among the individuals with TBI and the healthy talkers.

Method

Participants: A total of 20 right handed individuals with TBI (Closed Head Injury) following road traffic accidents (male – 16, female – 6) in the age range of 20 to 40 were taken as TBI group. Although Kannada as mother tongue was the criteria, knowledge of other languages (English, Hindi, Tamil and Telugu) were noted. None of the patients included in the study had Aphasia as confirmed by Western Aphasia Battery test (Kertesz, 1982). They all belonged to a middle/high socioeconomic status confirmed from NIMH Socioeconomic Status Scale (NIMH, 1997). Participants were also selected according to the severity of the trauma. Participants who were identified as having moderate to severe

injury on the basis of Glasgow Coma Scale (Jennette & Teasdale, 1981) were selected for the study. Participants with any other type of trauma like open head injury and mild insult were not selected for the study. All participants presented a history of post-traumatic amnesia and there was a gap of at least 1-5 months post accident.

The group of healthy talkers comprised of 20 normal individuals matched for age, sex and education with no history of traumatic brain injury or any other brain insult. They were also screened for any speech, language, cognitive-linguistic and hearing impairment using Western Aphasia Battery (Kertesz, 1982), Mini Mental Status Examination (MMSE) (Folstein, Folstein & McHugh, 1975) and routine pure tone audiometry. The detailed demographic data is tabulated in Table 1.

Procedure: The target task was free conversation between the participants and the investigator. A total of two sessions of conversation, each varying from 10 to 20 minutes, was carried out on various topics. The first session was aimed to improve interaction between the investigator and the participants to build rapport. During the second session the participants showed less inhibition in their conversation, since they became quite accustomed to the investigator. The succeeding single session was recorded. Only ten to fifteen minutes speech sample of this session was selected for the final analysis. The conversation was recorded using a Wave Surfer 1.5.7, computer software program. The participants were aware that their speech was being recorded. All the recordings were carried out in a quiet room with no distraction in between the recordings. Before recording, the participants were instructed to talk in a way similar to two friends talking to each other. They were also informed that they were free to ask any questions to the examiner during the conversation. Conversation sample was centered on particular topics like family and other few general topics like job, hobbies, hospital etc in order to keep the topic of conversation constant across all the participants.

From the recorded audio sample, transcription was done using broad International Phonetic Alphabet, (2007). Conversations between investigator (I) and participants (S) were transcribed. During transcription, initiation time, pause time, filled

Pt No	Sex	Age at injury	DAA (months)	Type of trauma	Severity	D H	GC S	PT A	LK	Lesion
1.	M	50	5	RTA	Severe	L	6/15	+ve	K,E, H	RTA with concussive head injury with fracture of left frontal bone with underlying fracture haematoma (small extra dural haematoma). Left frontal haemorrhagic contusion
2.		40	3	RTA	Severe	L	8/15	+ve	K, E	RTA with concussive head injury with deep lacerated wound on left side of occipital scalp
3.	M	20	3	RTA	Severe	L	8/15	+ve	K, H, E	RTA with se vere concussive head injury
4.	M	28	5	RTA	Severe	L	6/15	+ve	K, H, E	RTA with severe concussive head injury. Fracture of right temporal bone and right zygoma with multiple intra cerebral contusion in le ft frontal and temporal region with gross cerebral edema
5.		40	3	RTA	Severe	L	5/15	+ve	K, E	RTA with moderate head injury with left frontoparietal subdural haematoma with faciomaxillary injury
6.	M	38	4	RTA	Severe	L	8/15	+ve	K, E	RTA with severe he ad injury
7.	M	40	5	RTA	Severe	L	8/15	+ve	K, E, H, Te	RTA with concussive head injury
8.	M	40	5	RTA	Severe	L	7/15	+ve	K, E	RTA with head injury with left emporomastoid bone fracture with left parietal bone fracture with underlying pneumozephalum
9.	M	45	5	RTA	Severe	L	7/15	+ve	K, E	RTA with severe head injury with large temporal contusion
10	M	34	4	RTA	Severe	L	6/15	+ve	K, E, H	RTA with head injury with fracture post column left acetabulum with deep laceration of left frontal region

Table 1: TBI group case by case description

Pt No	Sex	Age at injury	DAA (months)	Type of trauma	Severity	D H	GCS	PT A	LK	Lesion
11.	M	26	1	RTA	Severe	R	6/15	+ve	K, E, H, Ta	RTA with closed head injury with right temporal bone fracture with underlying moderate sized extra dural haemorrhage
12.	M	23	4	RTA	Severe	R	5/15	+ve	K, E, H, Ta, Te	RTA with severe head injury with right temporal bone fracture
13.	M	50	5	RTA	Severe	R	5/15	+ve	K, E, H	RTA with severe head njury
14.	M	21	5	RTA	Severe	R	7/15	+ve	K, E, H	RTA with concussive head injury with right temporal bone fracture with mild cerebral edema
15.	M	45	2	RTA	Severe	R	8/15	+ve	K, E	RTA with concussive head injury with hematoma in occipital region
16.	M	28	1	RTA	Severe	R	5/15	+ve	K, E	RTA with severe head njury
17.	M	50	3	RTA	Severe	R	6/15	+ve	K, E	RTA with concussive head in jury with soft tissue injury. Right parieto occipital scalp haematoma
18.	M	23	3	RTA	Severe	R	8/15	+ve	K, E	RTA with severe concussive head injury with traumatic subarachonoid haemorrhage with extensive faciomaxillary injury
19.	M	26	3	RTA	Severe	R	8/15	+ve	K, E	RTA with concussive head injury left temporal lobe small hyperdense area ? contusion
20.	M	50	4	RTA	Severe	R	7/15	+ve	K, E, H	RTA with severe head injury with fracture of left sphenoid and zygomatic arch and gyriform hyperdensity right parietal lobe suggestive of ? subarachnoid haemorrhage with small pneumocephalus

Table 1: TBI group case by case description
(Pt No-Patient Number, M-Male, F-Female, DAA-Duration After Accident, RTA-Road Traffic Accident, DH-Damaged Hemisphere, R-Right, L-Left, GCS-Glasgow Coma Scale, PTA-Post Traumatic Amnesia, LK-Language Known, K-Kannada, E-English, Te-Telugu, Ta-Tamil)

pauses, unfilled pauses, false start etc. were carefully noted, for each episode. The time taken by the participants to respond to any question was noted from the same software.

The discourse was analyzed using "Discourse Analysis Scale" developed by Hema and Shyamala (2008) for the conversation and picture description task in Kannada. The scale consists of conversational parameters under two headings, the propositional aspect and the non-propositional aspect of conversational discourse (Hartley, 1995). Each parameter of this discourse scale is explained in detail in Appendix-A.

Scoring: Each parameter was rated and recorded on a specific criterion as shown in Appendix A. A five point perceptual rating scale (Appendix-A) was used to score two of the parameters, coherence and gaze inefficiency. A four point perceptual rating scale (Appendix-A) was used to score delay before responding. The other parameters were scored using a three point rating scale. The investigator repeated the process of transcription of discourse sample i.e., the conversation sample of two TBI and two healthy talkers were transcribed again after 10 days for verification of transcription, scoring, and reporting of the features. The findings were found to be correlating in the two instances.

Results

A comparison was made at the level of propositional and non-propositional aspects of discourse in communication tasks among the two groups using Mann-Whitney U test. Experimental group consisted of 10 TBI participants with LHD, 10 TBI participants with RHD and 20 healthy talkers as control group. As can be seen in Table 2, the healthy talkers showed very good performance in the discourse task when compared to TBI group.

It can be observed from Table 2 that the mean value for all the parameters in normal healthy talkers are higher compared to the TBI participants, except for information adequacy, inappropriate speech style and inappropriate intonation contour where it was found comparable.

Individual scores were calculated and Mann Whitney test applied for the sub-parameter of the discourse analysis procedure. The results are tabulated in Table 3. Among the TBI participants and healthy talkers, there was significant difference in their performance at both propositional and non-propositional aspects for conversation task. Except for information content and message inaccuracy, all the other parameters in discourse analysis showed significant difference at 0.05 level between the TBI and healthy talkers group for conversation task.

Discussion

An attempt is made in the present study to describe the features impaired in the discourse mode of conversation in TBI individuals comparing them with that of the healthy talkers. A comparison was made at the level of propositional and non-propositional aspects of discourse in communication tasks. Here, the healthy talkers showed very good percentage of performance when compared to TBI group. The significant difference in performance of TBI participants as compared to healthy talkers are discussed in detail under various sections.

The findings of this study have several implications pertaining to the characterization of conversational discourse performance following TBI and the use of discourse analysis procedure.

Propositional aspects of discourse

Failure to structure discourse

Between the TBI participants with LHD/RHD and healthy talkers, there was a significant difference for few parameters under discourse analysis. There are studies which support the results of the present study where the TBI groups lack forethought and organizational planning in their discourse structure. Study by Martin and McDonald (2003), describes a frontal lobe executive function account of pragmatic deficits resulting from traumatic brain injury. Pragmatic and discourse deficits resulting from RHD often mirror executive function deficits. Impulsivity, disorganization, poor planning, and poor judgment associated with executive function deficits are reflected in tangential, disorganized discourse, including responses that are not well thought out and may not be appropriate for a given situation according to Tompkins (1995). In summary, the TBI participants with LHD/RHD exhibit this particular feature of disorganized discourse and poor planning of discourse compared to normal control group.

Communication intent

Healthy talkers tended to greet others by themselves, but TBI participants did not make an effort to greet others by themselves. TBI groups were able to greet in response to other's greeting. When compared to healthy talkers, these individuals were however, poor at initiating a conversation.

Parameters *		GROUP			
		TBI		Normals	
	Mean	Std. Deviation	Mean	Std. Deviation	
FSD	85.00	18.84	100.00	.00	
CI	59.90	14.92	100.00	.00	
TM	83.65	13.49	100.00	.00	
IA	100.00	.00	100.00	.00	
IC	97.50	11.18	100.00	.00	
MI	92.50	18.31	100.00	.00	
COH	83.80	11.56	100.00	.00	
NSV	85.00	23.50	100.00	.00	
LNF	52.50	37.95	100.00	.00	
ISS	100.00	.00	100.00	.00	
IIC	100.00	.00	100.00	.00	
GI	85.00	20.51	100.00	.00	
TT	50.75	9.64	100.00	.00	
CR	47.65	34.69	100.00	.00	
RB	65.00	32.84	100.00	.00	
NPT	51.25	14.85	100.00	.00	
PNPT	72.10	7.88	100.00	.00	

Table 2: Showing the mean, standard deviation of discourse analysis of conversation task for the TBI versus normal group

(* FSD-Failure to Structure Discourse, CI- Communication Intent, TM- Topic Management, IA- Information Adequacy, IC- Information Content, MI- Message Inaccuracy, COH- Coherence, NSV- use of Non-Specific Vocabulary, LNF- Linguistic Non-Fluency, ISS- Inappropriate Speech Style, IIC- Inappropriate Intonational Contour, GI- Gaze Insufficiency, TT- Turn Taking, CR- Conversation Repair, RB- Revision Behavior, NPT- Non-Propositional Total, PNPT- Propositional and Non-Propositional Total)

Parameters †	/Z/	'P' value
FSD	3.341	0.001
CI	5.793	0.000
TM	5.346	0.000
IC	1.000	0.317*
MI	1.778	0.075*
COH	4.531	0.000
NSV	2.623	0.009
LNF	4.487	0.000
GI	3.346	0.001
DR	5.510	0.000
PT	**5.786**	**0.000**
TT	5.822	0.000
CR	4.902	0.000
RB	4.052	0.000
NPT	**5.796**	**0.000**
PNPT	**5.787**	**0.000**

Table 3: Results of Mann-Whitney test for the parameters of discourse analysis for conversation task (Note: '*' indicate not significant difference)

(†FSD-Failure to Structure Discourse, CI- Communication Intent, TM- Topic Management, IC- Information Content, MI- Message Inaccuracy, COH- Coherence, NSV- use of Non-Specific Vocabulary, LNF- Linguistic Non-Fluency, GI- Gaze Insufficiency, DR- Delayed Response, PT- Propositional Total, TT- Turn Taking, CR- Conversation Repair, RB- Revision Behavior, NPT- Non-Propositional Total, PNPT- Propositional and Non-Propositional Total)

Topic management

Lesser and Milroy (1993) define topic as "what is talked about through some series of turns at talk". Topic coherence can be defined as

something that is constructed across turns by the collaboration of participant. It was noted that some of the TBI participants exhibited irrelevant introduction of topics which is an abnormal behavior. This result is in support with the study by Mentis and Prutting (1991) and Coelho, Liles and Duffy (1994) who found that TBI individuals produced unrelated topic changes.

There was a significant difference between TBI and healthy talkers for the parameter called rapid topic shift. It is reported in literature that some TBI participants change topics rapidly within few seconds. There was a mean difference between TBI participants and healthy talkers for this feature. This finding is in support of the study by Ehrlich and Barry (1989) where they report of rapid topic shift in TBI participants. The reason for this could be the deficit at executive functional level of the participants.

For non-coherent topic change there was significant difference between TBI participants and healthy talkers. Mentis and Prutting (1991) and Coelho, Liles and Duffy (1994) observed that TBI participants produced non-coherent topic changes compared to healthy talkers. Results of this study thus support, to some extent, that TBI participants, in general, exhibit this particular abnormal behavior in a conversation. This finds support with an Indian study done by Tanuja (2004) who found that TBI participants showed irrelevant and non-coherent topic changes when compared to normal speakers.

Perseveration in speech is reported in TBI participants. Here, an attempt was made to see if perseveration in terms of topic maintenance was observed even when the conversation partner changed the topic. TBI group showed some amount of perseveration behaviors. Most of the times, perseveration for topic was seen for a shorter time, which faded after two to three turns and very few times it persisted for a longer time. That is, TBI participants kept talking about the same topic for a long time.

Healthy talkers are seen to expand all the turns, unlike TBI participants who expand very few turns, according to study done by Tanuja (2004). This finding is in support of the earlier study done by Coelho, Liles and Duffy (1994) where they found that individuals with TBI contribute less elaboration to the topics, more often leaving it to the communication partner to develop and extend the topic.

Usually, healthy talkers give adequate elaboration to topics. They do not give more or less information. According to Hartley and Jensen (1991), some individuals with brain injury provide too many details and speak longer than required, while other individuals provide only short utterances and then give drastically reduced information. In the present study, the presence of this particular behavior was assessed and scored using three point perceptual rating scale (Appendix- A). There was a significant difference between the TBI participants and the healthy talkers.

Study done by Coelho, Liles and Duffy (1994) found that TBI participants provided shorter, less elaborations of a topic, more often leaving it to the communication partner to introduce and develop the topic. The results of the present study partially support this observation as minimal elaboration of topic was observed in the TBI groups. This could be because of individual's linguistic and cognitive abilities. However, significant difference was found between the TBI participants and the healthy talkers.

In summary, it was seen that all the parameters under topic management showed significant difference between the TBI participants and the healthy talkers.

Other propositional aspects of discourse

Information adequacy

It was noted whether the information adequacy was at word level, sentence level or multiple sentence level. It was said to be adequate when it satisfied the question asked by the conversation partner. There was no significant difference between the TBI participants and the healthy talkers. These results are in contrast with the few studies, where the authors have revealed some pragmatic inappropriateness relative to difficulty in initiating and/or sustaining conversation with decreased response adequacy in individuals with TBI (Mentis & Prutting, 1991; Parsons, Lambier, Snow, Couch & Mooney, 1989; Snow, Douglas & Ponsford, 1997). Another supporting study by Hartley and Jensen (1991) reports that participants with closed head injury produce only one half or two-thirds the amount of accurate content produced by normal participants and have drastically reduced information. This was quoted with reference to the narrative discourse but

the same findings are not seen in the present study on conversational discourse, where both the groups performed equally well.

Information content and message inaccuracy

There was no significant difference between the TBI participants and healthy talkers for information content and message inaccuracy. Thus it is suggested that none of the participants showed any redundancy, incoherence and ambiguity in their speech. But studies have shown reduced informational content in TBI participants (Chapman et al., 1992; Ehrlich, 1988; Mentis & Prutting, 1991). In this study however, the difference was not seen.

Coherence

The present study reveals the same results as that of studies by Hough and Barrow (2003), Glosser (1993), Myers (1999a), Van Dijk and Kintsch (1983), where TBI participants demonstrate greater difficulty with global than local coherence showing more performance variability among participants in global as compared to local coherence.

Use of non-specific vocabulary

The speaker uses deictic terms such as "this", "that", "then", "there", pronominals, proper nouns and possessives when no antecedent or referent is available in the verbal or nonverbal context. Consequently, the listener has no way of knowing what is being referred to. Individuals displaying this difficulty also tend to overuse generic terms such as "thing" and "stuff" when more specific information is required. There are a few reports which say that individuals with TBI exhibit this behavior. Here TBI participants showed the presence of this particular behavior to a greater extent with a rating as 'partially present' when compared to healthy talkers. Statistical results showed significant difference at 0.05 level between the TBI participants and healthy talkers.

Linguistic nonfluency

Linguistic nonfluency can be defined as the speaker's production disrupted by the presence of repetitions, unusual pauses, and hesitation phenomena. TBI groups have exhibited this particular behavior to a greater extent than healthy talkers, while there was a significant difference between the TBI participants and healthy talkers. In the present study among the many propositional aspects of discourse, linguistic nonfluency was present more in the TBI participants than among healthy talkers.

Inappropriate Speech Style

Inappropriate Speech Style means that the speaker does not change the structural, lexical, or prosodic form of his utterances according to the needs of the audience or the context. This may involve the occurrence of dialectal structural forms, code switching, style-shifting, language transfer, or interlanguage phenomena or idiosyncratic language codes. The TBI participants and healthy talkers did not show any difference in their mean and standard deviation as is shown in Table 1. Thus, between the two groups there was no significant difference.

Inappropriate Intonational contour

Both the groups did not show the presence of inappropriate intonational contour in terms of abnormal rising, falling and flat intonation contour with respect to a particular context. There was no difference in the mean and standard deviation, thus there was no significant difference between the two groups. But the study says the joint construction of discourse and the role of the conversational partner's tone in the communicative exchange are additional factors to be considered in the analysis of discourse of adults with CHI (Togher, Hand & Code, 1997). These investigators studied information-seeking exchanges with five adults with CHI and with their non-brain injured matched controls. Their results suggest that not only did the participants with CHI differ from the controls in the way they "provided, requested, and negotiated information exchange", but the communication partners interacted differently with the CHI population as well. For example, they found evidence of less information being given to the TBI population. Such features were not found in the present study.

Gaze insufficiency

The percentage score for gaze insufficiency was considered and the result of non-parametric test showed significant difference at 0.05 level between the TBI participants and healthy talkers.

Delay before responding

Time taken by the TBI participants in responding to any questions asked by investigator was noted using a four point rating scale (Appendix- A). The participants in TBI group with LHD and RHD showed a delay of 4-6secs respectively in responding to any question. There was a significant difference between the TBI participants and healthy talkers.

Non-Propositional aspects of discourse

Turn taking

Between the TBI participants with LHD/RHD and healthy talkers, there was significant difference for all the parameters under non propositional aspects of discourse. Normal participants are seen to initiate many turns in a conversation. In contrast, TBI participants are reported to take less initiation of turns. They initiate very few turns in conversation. This result is in support with the findings of Milton, Prutting and Binder (1984). TBI group were very reluctant to initiate the turns. Only few participants were able to initiate the turns.

Wave Surfer 1.5.7, computer software was used to note down the time (in terms of seconds) taken to start a turn. From the individual scores it was noticed that all the TBI participants showed the presence of this particular feature. Participants took little time to start the turn. However, there was significant difference between the TBI participants and healthy talkers.

According to Schegloff (1987), normal individuals are reported to take contingent turns in conversation. Results suggest that there was a significant difference between the two groups. This is supported by literature where, according to Milton, Prutting and Binder (1984), three out of five adults in their study presented problem in taking contingent turns. The non-contingent turns can be attributed to lack of perception of flow of conversation. It seemed like they could not perceive the meaning of the preceding turn because of lack of concentration, subsequent to which they concentrated on one particular word and started speaking in relation to that word in a non-coherent way.

Many studies have implicated the right hemisphere in the production and comprehension of prosody, specifically emotional prosody (Baum & Dwivedi, 2003; Pell, 2006; Ross, 1981; Walker, Daigle, & Buzzard, 2002). In general, prosodic cues are necessary in conversation to take over the turn from the other partner. A normal speaker is able to understand the prosodic cues in a sentence to take over the turn. However, the TBI groups failed to take prosodic cues from the conversation partner in order to take over the turn. Results from Table 1 show that there was significant difference between the TBI group with LHD/RHD and healthy talkers. This observation supports the proposition by Milton (1984)

and Hartley (1995) who reported that TBI participants had problem in understanding prosodic cues to take over the turn. It is seen that individuals with very severe TBI shift their mode of communication to nonverbal because of the impairment in verbal mode. In the present study, the TBI participants exhibited this particular behavior and there was significant difference between the TBI and healthy talkers.

In normal conversation, it is expected that only when one communication partner stops, the other partner initiate the turn. Results showed that there was significant difference between the TBI participants and healthy talkers. But all participants in the TBI groups showed the presence of a behavior called 'persistent to listener's or speaker's mode' in their conversation. These participants started speaking abruptly without letting the other person finish his turn and used to stay either in listener's mode or speaker's mode. This result is in support of a study by Mc Tear (1985), where the TBI population persists longer in either speaking or listening mode. This conversation behavior can be attributed to their lack of the ability to appropriately monitor and shift attention in TBI individuals.

Conversation repair

Conversation repair is a necessary strategy present in the conversation to convey a message in an effective manner. Results suggested significant difference between TBI participants and healthy talkers. But the individual scores in TBI group indicated that except for four participants all the other participants used too much of self repair through repetition in their conversation. This result is in support with the study by Tanuja (2004), who found that in TBI group, participants showed more of self repair strategy. The possible reasons for use of too much self repetition could be due to variability in terms of participants' features. Many participants showed disfluencies, because of which there were many self corrections observed. The TBI participants used too much of revisions through clarification in their conversation when compared to healthy talkers. This result contradicts the one found by Marsh and Knight (1991) where the TBI individuals do not ask for clarification even if they do not understand the conversation. The reason for observation of more revisions in the speech of experimental group in the present study can be explained on the basis of their

inability to add on further information in speech in terms of giving clarification. Few participants made an effort to use clarifications given by the investigator and tried using the same as revisions.

Too much of other initiated repair behavior was seen when participants failed to convey the message and the partner asked for more clarification. The reason for use of too much of other initiated repair strategy is because of lack of perception of their own speech due to which they do not try to self-initiate the repair. Other reasons could be increased redundancy, incoherence, dysfluency, reduced information, fast rate of speech and unintelligibility in their speech leading to inability of the conversation partner to understand the message conveyed by the participants. This was observed more in TBI participants than healthy talkers.

Revision behavior

Revision behavior was observed and assessed based on the presence or absence of false starts and self-interruptions (Appendix-A). The results show significant difference between the TBI participants and healthy talkers. From the individual scores it was seen that in the TBI group, all the participants showed the presence of revision behavior except four participants.

Inter-rater reliability

To check for inter-rater reliability, ten percent of the data from the TBI participants and healthy talkers was considered. The alpha co-efficient was found to be 98% indicating good inter-rater reliability.

Conclusion

Everyday use of language underlies a complex system of cognitive and linguistic process. Language can be viewed and analyzed on many levels, one of which is "language in use" or discourse. Compared to production of sounds, words, or sentences in isolation, discourse production as an integrative and context-driven construct is thought to be representative of the complex communication needed for daily life activities. Therefore, cognitive and linguistic analysis at the level of discourse should be more sensitive to characterizing the types of communication deficits that various clinical populations may exhibit in the context of daily living.

An effort was made to combine all parameters taken from many discourse analysis tests and use

as a "Discourse Analysis Scale" (Appendix- A). This will help the clinicians to tap the totality of discourse impairment in conversation. Thus, discourse analysis procedure was used to assess the discourse ability in individuals with TBI and healthy talkers. All the parameters of discourse were significantly different between the TBI participants and healthy talkers except information content and message inaccuracy of propositional aspects of discourse.

It is concluded that TBI participants have impairment in discourse when compared to healthy talkers because of injury effects. In summary, there was significant difference between the TBI participants and healthy talkers on a few parameters. In general, the healthy talkers performed better compared to TBI group in all the aspects of discourse. Both the groups showed a better performance on propositional aspects of discourse compared to non-propositional aspects of discourse. The clinical implications are many and they would further help in assessment, formulation of prognosis and development of appropriate treatment strategies for such population. The study could be extended to include not only a larger sample but also different post morbid durations as well as comparison of unstructured verses semistructured conversational tasks of discourse in the traumatically brain injured.

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Appendix- A
Discourse Analysis Scale
By Hema and Shyamala, 2008

Points to be considered while using Discourse Analysis Scale:

The parameters of propositional and non-propositional aspects of conversation were quantified with few general instructions to the evaluator as:

1. Scoring procedure involves the use of rating scale.

2. Should read the keys provided in each sub headings which explains the exact meaning of the parameters to be scored.

3. Each appropriate behavior *(normal)* is given a *higher score* and the inappropriate behavior *(abnormal)* is scored as *lowest value.*

4. Finally if needed, one can find discourse quotient, using the total score on propositional and non-propositional aspects of communication which should be divided by total scores of all the features of propositional and non-propositional aspects of communication. This may be multiplied with hundred to get the score in percentage.

Propositional aspects of communication.

1) ***Failure to Structure Discourse (DS)*** [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

   Key: The discourse is confusing even if it's organized with respect to overall plan, theme or topic and how individual utterances are conceptually linked to maintain unity.

   a) Lacks for thoughts → (   )

   b) Lacks organizational planning →(   )

2) ***Communication intent (CI)*** [Score: 0-Absent, 1-Seldom present, 2-Frequently present, except for (e)]

   Key: Presence or absence

   a) Greets others:

      -By themselves →(   )

       -In response to other's greeting →(   )

   b) Introduces self → (   )

   c) Starts a conversation→(   )

   d) Asks for information → (   )

   e) Asks for assistance in understanding conversation → (   )

     [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

   f) Criticizes the conversation by agreeing or disagreeing to a part in the conversation→ (   )

   g) Fabricates/ imagines events → (   )

   h) Understands advancers and blockers in the conversation → (   )

3) ***Topic management (TM)*** [Score: 0-Frequently present, 1-Seldom present, 2-Absent, except for (e)]

    Key: Presence or absence

   a) Irrelevantly introducing topics → (   )

   b) Rapid topic shift → (   )

   c) Non coherent topic changes/Inappropriate topic changes → (   )

   d) Perseveration in the topics → (   )

e) Responses which expand topics → (   )

[Score: 0-Absent, 1-Seldom present, 2-Frequently present]

f) Minimal responses(Giving only Yes/No responses) → (   )

g) Extra elaboration of topics → (   )

h) Minimal elaboration → (   )

4)   *Information adequacy (IA)*

Key: Answer to any question during conversation at word level/ single sentence level/multipl sentence level. Underline the level at which the patient is positioned.

● Word level/ Single Sentence level/ Multiple sentence level →(   )

[Score: 0-Absent, 1-Seldom present, 2-Frequently present]

5)   *Information content (IC)*

Key: Meaningful and adequate information to any of the question in terms of initiating and/or sustaining conversation or if you know what the person is talking about...even if the information doesn't appear to be available then give higher score.

● Non-meaningful and inadequate information → (   )

[Score: 0-Frequently present, 1-Seldom present, 2-Absent]

6)   *Message Inaccuracy (MI)*

Key: An attempted communication involving inaccurate/misinformation.

● Incorrect answers to the question/confabulation within the same question frame→(   )   [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

7)   *Coherence (COH)*

● Global coherence→(   )

Key: Presence of relationship between the meaning and content of verbalization with respect to the general topic of conversation.

 [Score: 0-Absent, 1- Seldom presents 2- Frequently present, 3-Very frequently present, 4-Always present]

● Local coherence→ (   )

Key: Presence of relationship between the meaning and context of verbalization with that of the immediately preceding utterance produced either by interviewer or participant. [Score: 0-Absent, 1- Seldom presents 2- Frequently present, 3-Very frequently present, 4-Always present]

8)   *Use of Nonspecific Vocabulary (NSV)* →(   )

Key: Overuse of generic terms such as "thing" and "stuff" when more specific information is required. [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

9) *Linguistic Nonfluency (LNF)* → (   )

Key: Presence of repetition, unusual pauses, hesitations [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

10) *Inappropriate Speech Style (ISS)*→ (   )

Key: Presence of dialectal structural forms, code switching, style-shifting. [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

11) *Inappropriate Intonational Contour (IIC)*→ (   )

Key: Presence of abnormal rising, falling, flat intonation contour with respect to a particular context. [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

12) _Gaze Inefficiency (GI)_ → (   )

- Consistently no appropriate eye gaze with another person (Score- 0)
- Severe restricted eye gaze (appropriate eye gaze less than 50% of time?) (Score- 1)
- Appropriate eye gaze 50% of the time (Score- 2)
- Appropriate eye gaze 75% of the time (Score- 3)
- Consistent use of appropriate eye gaze (Score- 4)

13) _Delays before responding (DR)_→ (   )

Key: Time taken to respond to any questions during the conversation which should be measured in terms of seconds.

- 7-8sec (Score-0)
- 5-6sec (Score-1)
- 2-4sec (Score- 2)
- 0.5-1sec (Score- 3)

Non propositional or Interactional aspects of communication

This is one of the important categories of social communication behavior. These behaviors reflect the reciprocal nature of conversation and the joint co-operation required of the participant.

The following subcategories are considered:

1) _Turn taking (TT)_ [Score: 0-Frequently present, 1-Seldom present, 2-Absent, except for (a)]

Key: Presence or absence

a) Initiation of turn→ (   )   [Score: 0-Absent, 1-Seldom present, 2-Frequently present]

b) Taking (some amount of) time to start a turn → (   )

c) Non contingent turn→ (   )

Key: Does not fulfill the semantic or informational expectation of the previous turn, but shares the same topic. This also includes "don't know," "yes," and "no" responses _when used to avoid_ maintaining a topic, and echolalia.

d) Unable to take prosodic cues → (   )

e) Rapid shift in the mode → (   )

f) Persistent in listeners or speakers mode-→ (   )

2) _Conversation repair (CR)_ [Score: 0-Frequently present, 1-Seldom present, 2-Absent]

Key: Presence or absence

a) Too much of self repair through repetition→ (   )

b) Too much of revisions through clarification→ (   )

c) Too much of other initiated repair   (   )

3) _Revision behaviors (RB)_ → (   )

Key: Presence of false starts and self-interruptions.

[Score: 0-Frequently present, 1-Seldom present, 2-Absent]