A STUDY OF DISCOURSE ANALYSIS IN TRAUMATIC BRAIN INJURY (TBI): LEFT HEMISPHERE DAMAGE VS RIGHT HEMISPHERE DAMAGE

Register No: 06SLP008

A Dissertation submitted in part fulfillment of
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CERTIFICATE

This is to certify that this dissertation entitled **"A study of Discourse Analysis in Traumatic Brain Injury (TBI): Left hemisphere damage Vs Right hemisphere damage"** is bonafide work in part fulfillment for the degree of **Master of Speech Language Pathology of** the student **(Register No. 06SLP008).**

Mysore

April, 2008

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DECLARATION

This is to certify that this dissertation entitled **"A study of Discourse Analysis in Traumatic Brain Injury (TBI): Left hemisphere damage Vs Right hemisphere damage"** is the result of my own study under the guidance of Dr. K. C. Shyamala, Professor of Language Pathology, Department of Speech-Language Pathology, and has not been submitted earlier in any other university for the award of any diploma or degree.

Mysore

April, 2008

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INTRODUCTION

A complex system of cognitive and linguistic processes underlie the everyday use of language. Language can be viewed and analyzed on many levels, one of which is "language in use" (Frattali & Grafman, in press), 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. Traumatic brain injury is one of the most common neurological insults due to various causes like road traffic accident, falls, sports, industrial accidents and assaults that affect individuals discourse ability.

It was noted that pragmatic deficits might be the most pervasive communication problems in adults with TBI Sohlberg and Mateer (1989). Performance on pragmatic rating scales and analysis of response appropriateness and topic management revealed that TBI individuals experienced difficulty when called upon to function as a discourse partner, whether in conversation or referential communication (i.e. structural exchange on a specific topic requiring extensive listeners' feedback).

Haynes and Haak (2002) studied discourse in referential communication and conversational task in ten college students with closed head injury. They found that most of them had a significantly higher percentage of conversational discourse errors. In

various other studies (Allen and Brown, 1976; Milton, 1984; Mentis and Prutting, 1991), TBI patients were found to be lacking in many areas of conversation discourse like interactional aspects and propositional aspects of conversation.

A variety of cognitive deficits like attention, memory, visual-spatial perception, reasoning, executive controls like organization, affect etc, which are seen after TBI leads to this type of communication impairment. Attention impairment causes inability to focus on, filter relevant versus irrelevant stimuli, organize, retain and retrieve the stimuli in a conversation, thus resulting in impaired comprehension of discourse or social interaction (Hagen and Malkmus, 1979). Memory problems impair comprehension and retention, reflecting inability to retain what was said at the beginning of a conversation or remembering the topic or remembering who said what and in which order. Slow processing of information causes difficulty in shifting between speaking and listening roles.

Coherence refers to the ability to maintain thematic unity, and can be quantified as “global” (overall organization of goal, plan, or theme; Glosser & Deser, 1990) or “local” (links between individual propositions or sentences which help maintain conceptual meaning; Glosser & Deser, 1990).

Cohesion refers to specific “relations of meaning between elements within discourse” (Glosser & Deser, 1990).

Need for the study

Recent research with regard to discourse in individuals with TBI has confirmed deficits in the same. But, only few studies give information regarding the specific types of deficits in discourse of individuals with TBI, and especially with respect to differences in discourse deficits across LHD and RHD TBI patients.

There are various tools that have been used to analyze discourse production in aphasia which include:

1. The Clinical Discourse Analysis (Damico, 1985) - Include assessing insufficient information bits, message inaccuracy, poor topic maintenance, inappropriate speech style, and inability to structure discourse. This has been applied to various populations, including TBI, but contains no published psychometric evidence of reliability or validity.
2. Linguistic Communication Measure (LCM) (Menn, Ramsberger, & Helm-Estabrooks, 1994), quantifies the amount of information conveyed verbally and the proportion of informative to non-informative words produced.
3. Quantitative Analysis of Aphasic Sentence Production (Saffran, Berndt, & Schwartz, 1980; Rochon, Saffran, Berndt, & Schwartz, 2000) - focuses primarily on syntax, but also measures elaboration, which, similar to the LCM, may be a useful feature of an analysis of discourse production in Pre Frontal Cortex Damage patients (PFCD).
4. Cohesion Analysis (Mentis & Prutting, 1987) - utilizes a system created by Halliday and Hasan (1976) to analyze the discourse cohesion of head-injured and normal adults, both in narrative and conversational formats. Six cohesion categories were

analyzed, including lexical, reference, ellipsis (the omission of a word or words that are understood but that must be supplied to make a construction grammatically complete), conjunction, substitution, and incomplete cohesion, of which reference, ellipsis, conjunction, lexical, and incomplete cohesion which may be applicable to the PFCD population.

5. Topic Analysis (Mentis & Prutting, 1991) - It is a multidimensional topic analysis instrument, which is designed to be sensitive to problems and patterns in topic management in head-injured and normal adults. They applied the analysis to both monologue and conversational formats. In the monologue format, comprehensiveness of topic can be analyzed, along with topic and subtopic maintenance.
6. Intonation Unit Analysis (Wozniak, Coelho, Duffy, & Ziles, 1999) - Is the modified version of Topic Analysis, Mentis & Prutting (1991). Here conversational samples can be segmented into intonation units, and then place each intonation unit into an ideational intonation category. Ideational intonation categories included: containing new information, no new information, incomplete, or tangential. The "tangential" category is the only one that may be helpful in analyzing the discourse production of the PFCD population, but is so broadly defined that it is difficult to operationalize.

In contrast to these methods for coding output from aphasic patients, two computer assisted systems, namely Computerized Language Analysis (CLAN) MacWhinney, (2000) and Systematic Analysis of Language Transcripts (SALT) by Miller & Chapman, (1985) have been created to analyze language transcripts systematically and

quantitatively. Although they have been used primarily to analyze child language, they can also be adapted to analyze adult language.

Some of these tools utilize standard stimuli, such as the "cookie theft picture," (Boston Diagnostic Aphasia Examination) to elicit narrative discourse. None of these tools are computer assisted, and all are laborious and time-intensive in their use. In addition, many of these tools codify discourse features using general terminology that is difficult to operationally define. However, selected characteristics of these tools may be helpful in analyzing the discourse production of patients. Hence the need for the study, where many features of discourse are compiled together and an effort is made to analyze each feature and score them using perceptual rating scales.

Over the years, many scales are developed to tap the pragmatic deficits in neurogenic communication disorders. But very few have been developed exclusively for traumatic brain injured population. Many tests are developed to assess conversation deficit in TBI patients but none of the tests are able to give a comprehensive picture of all the affected parameters in conversation. Following tests are developed in the west to tap pragmatic deficits in the TBI individuals.

1. Damicos clinical discourse analysis (CDA) (Damico, 1985) - It was specially developed for TBI population covering around 9 conversation parameters. Drawback of the test is that, difficulty in the quality and manner of accounting for the bulk of the discourse errors produced by both, normal and TBI groups.
2. Modified clinical discourse analysis (CDA-M) (Snow, Douglas, Pansford, 1997b) - It is modified version of CDA. It assesses 10 parameters of conversation.

Disadvantage is that it is able to show difference between the two groups only or between only 3 conversation parameters

3. Profile of functional impairment in communication (PFIC) (Linscott, Knight, Godfrey, 1996) - It assesses 10 parameters of conversation. One of the disadvantage of the test is that there is lack of research inspecting its ability to discriminate discourse of TBI individuals from normal conversation discourse.
4. Pragmatic protocol (Prutting and Kirchner, 1987) - The test covers seven verbal and non verbal parameters of conversation. It was originally not developed for TBI population but was later administered on brain injured individuals to see the efficacy.
5. Conversation analysis (CA) (Friedland and Miller, 1998) - It is not a test but a descriptive analysis procedure. It fails to indicate the severity of the conversation impairment.
6. Scale for rating conversational ability (Ehrich and Sipes, 1985) - It covers 13 aspects of conversation but reliability of the test has not been addressed.
7. Rating communication behaviors in head injured adults, (Ehrlich and Barry, 1989) - It is a 9-point rating scale and covers only 6 aspects together for verbal and non-verbal communication.

In summary, these scales do not include all the parameters of conversation. Moreover they do not deliberate upon variability if any in terms of hemispheric involvement. Left hemisphere damaged individuals exhibit different conversational impairments compared to Right hemisphere damaged individuals. The tests do not comment on whether it is meant for TBI individuals without aphasic component or for TBI individuals with

aphasia, as the conversation impairment varies in these two groups. Hence the need for this study.

Aim of the study

The aims of the study are as follows:

1. To assess the discourse deficits in individuals with TBI and to compare with the discourse of normal speakers.
2. To differentiate the discourse deficits across TBI individuals with RHD and LHD, and to compare each of these with discourse of normal individuals.
3. To find out, specifically, which aspect of discourse- propositional/non-propositional, are affected in LHD and RHD TBI individuals.

In the study, the discourse samples of twenty TBI individuals and age education and sex matched normal group were collected. The obtained sample for conversation and picture description was transcribed and analyzed to look into differences between the two groups on the selected parameters of discourse. Various parameters were analyzed under two major domain, viz, I) Propositional aspects of speech in discourse and II) non-proposition aspects of speech in discourse. Each of the domains were further categorized to look into specific features as shown in Table 1.

I. Conversation task

Table 1: Propositional aspects of discourse in conversation

Parameter	Features
1) Failure to Structure Discourse (FDS)	• Lacks forethought

	• Lacks organizational planning
2) Communication intent(CI)	• Greets others: -By himself / herself -In response to other's greeting • Introduces self • Starts a conversation • Asks for information • Asks for assistance in understanding conversation • Criticizes the conversation by agreeing/disagreeing to a part in the conversation • Fabricates/ Imagines events • Understands advancers and blockers in the conversation
3) Topic management (TM)	• Irrelevantly introducing topic • Rapid topic shift • Non coherent topic changes /Inappropriate topic changes • Perseveration in the topics • Responses which expand topics • Minimal responses • Extra elaboration of topics • Minimal elaboration
4) Information adequacy (IA)	• Word level/ Single Sentence level/ Multiple sentence level
5) Information content (IC)	• Non-meaningful and inadequate information
6) Coherence (COH)	• Global coherence

	• Local coherence
7) Use of Nonspecific Vocabulary (NSV)	• Overuse of generic terms
8) Linguistic Nonfluency (LNF)	• Presence of repetition, unusual pauses, hesitations
9) Inappropriate Speech Style (ISS)	• Presence of dialectal structural forms, code switching, style-shifting
10) Inappropriate Intonational Contour (IIC)	• Presence of abnormal rising, falling, flat intonation contour with respect to a particular context
11) 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)
12) Delays before responding (DR)	

Table 2: Non-propositional aspects of discourse in conversation

1) Turn taking (TT)	• Initiation of turn • Taking (some amount of) time to start a turn • Non contingent turn • Unable to take prosodic cues • Rapid shift in the mode • Persistent in listeners or speakers mode
2) Conversation repair (CR)	• Too much of self repair through repetition • Too much of revisions through clarification • Too much of other initiated repair
3) Revision Behaviors (RB)	

II. Picture description task

Table 3: Propositional aspects of discourse in picture description

1) Failure to Structure Discourse (PCFDS)	• Lacks forethought • Lacks organizational planning
2) Communication intent (PCCI)	• Starts picture description • Asks for assistance in understanding picture • Criticizes the picture by agreeing/disagreeing to a part in the picture • Fabricates/ Imagines events

3) Topic management (PCTM)	• Irrelevantly introducing topic • Rapid topic shift • Non coherent topic changes /Inappropriate topic changes • Perseveration in the topics • Extra elaboration of topics • Minimal elaboration
4) Information adequacy (PCIA)	• Word level/ Single Sentence level/ Multiple sentence level
5) Information content (PCIC)	• Non-meaningful and inadequate information
6) Message inaccuracy (PCMI)	• Incorrect answers to the question/Confabulation within the same question frame
7) Coherence (PCCOH)	• Global coherence • Local coherence
8) Use of Nonspecific Vocabulary (PCNSV)	• Overuse of generic terms
9) Linguistic Nonfluency (PCLNF)	• Presence of repetition, unusual pauses, hesitations
10) Inappropriate Speech Style (PCISS)	• Presence of dialectal structural forms, code switching, style-shifting
11) Inappropriate Intonational Contour (PCIIC)	• Presence of abnormal rising, falling, flat intonation contour with respect to a particular context
12) Delay in describing picture (PCDR)	
13) Gist of information (PCGI)	

Table 4: Non-propositional aspects of discourse in picture description

1) Repair strategies (PCRS)	• Too much of self correction • Too much of repair through repetition / clarification / revisions • Too much of other initiated repair • Too much of request for clarification
2) Revision Behaviors (PCRB)	

Besides description non parametric test was used to note if there was any significant difference between the three groups in terms of discourse. Discourse analysis procedure was used to assess the discourse ability in individuals with TBI.

REVIEW OF LITERATURE

Traumatic brain injury (TBI) has been defined as “an insult to the brain, not of the degenerative or congenital nature, but caused by an external force, that may produce a diminished or altered state of consciousness” (National head injury foundation, 1985). According to this definition, TBI is caused by an external force and thereby excludes brain insult resulting from other neurological conditions. Road traffic accidents, falls, sports, industrial accidents and assaults are the most frequent causes of TBI.

Classification of TBI

Brain injury arising from head trauma is generally classified into two broad types: non penetrating (closed) injuries and penetrating (open) brain injuries. In closed head injuries or non penetrating, meninges remains intact, even though the skull is fractured. Open head injuries or penetrating, on the other hand, occur when the coverings of brain are ruptured as a result of tearing of the dura mater by skull fragments. This may occur in depressed fractures of the skull or when the brain is penetrated by some missile such as bullet or is lacerated by depressed bone fragments.

Closed head injuries tend to be associated with diffuse brain pathology and in contrast, penetrating head trauma tends to lead to more focal brain pathology, although diffuse effects also can be observed. The closed head injury patients show more evident speech and language communication disorders and are usually referred to speech language pathologists.

TBI is also classified according to severity and level of altered consciousness experienced by the patient following the trauma. For assessment of disturbance of consciousness, the Glasgow Coma Scale (Teasdale and Jennett 1974, 1976) is adopted. Classification of TBI according to severity is as shown in Table 5.

Table 5: Glasgow Coma Scale

Classification	Post Traumatic Amnesia	Glasgow Coma Scale	Features
	(a)	(b)	(c)
Mild (minor)	< 1hour	13-15	Unconsciousness & clouding of consciousness for up to 1 hour with subsequent complete recovery.
Moderate	1-2 hours	9-12	Unconsciousness & clouding of consciousness for up to 24 hours
Severe	1-7 days	3-8	Unconsciousness & clouding of consciousness for longer than 24 hours without signs of brain stem dysfunction
Very Severe	1 week	< 3	Signs of brain stem dysfunction in an already unconsciousness state of less than 24 hours.

(a) Modified from Jennet & Teasdale (1981)

(b) Modified from Miller (1986)

(c) Modified from Todorou, Oldenkott, Poremba, Petersen (1992)

The Glasgow Coma Scale (GCS) is the most commonly used clinical scale. The patient is assigned a score between 3 and 15 on the GCS, with points being assigned for the followings:

- Eye opening (ranging from 4 points for spontaneous eye opening to 1 point for no response).
- Best motor response (ranging from 6 points for obeying commands to 1 point for no response).
- Best verbal response (ranging from 5 points for good orientation to 1 point for no response).

The greater the scores on the GCS, the higher the conscious level in a patient. A total score of 13-15 indicates mild TBI, a score of 8-12 indicates moderate TBI and a score of 3-7 indicates a severe TBI.

As an alternative to GCS, the severity of TBI is also estimated on the basis of duration of post-traumatic amnesia (PTA). PTA represents the period from the time the patient regains consciousness but is still in a disoriented and confused state of the time the patient's memory for ongoing events becomes reliable and accurate.

Course and Prognosis after TBI

In mild TBI, functional disturbances in the brain are always reported to be reversible and are said to clear up without leaving a trace (Andrews, 1990). After approximately three months of trauma, 90% of the patients complain of occasional or lasting headache, giddiness, nausea, sickness and sleep disorders. Follow up studies

showed performance losses (attention, information processing) even in patients who were symptom free (Levin, 1987). In moderate to severe TBI, all the subjects with GCS score below 8 will have mortality rate of 34-50% and 15-20% will survive with severe disability (Vollmer & Daley, 1990).

Biomechanics of Head Injury

The after effects of TBI lead to neurological defects and communication disorders. These are due to complex biomechanical processes associated with head injury. The biomechanical forces involved in closed head injury include, compression, acceleration, deceleration and rotational acceleration which result in brain tissue being compressed, torn apart by the effects of tension and sheared by rotational forces (Murdoch, 1990).

Neuropathophysiology of TBI

The pathologies associated with closed head injury are categorized into two types: 1) Primary injuries (immediate on impact) and 2) secondary injuries (secondary to impact).

1) Primary injuries are the result of instantaneous events caused by the blow. It includes:

- *Diffuse axonal injury:* It is usually caused by rotational acceleration in which there is rotation of head around its own center of gravity, which results in permanent stretching or rupturing of neuronal fibers causing diffuse axonal injury. (Pang, 1985 & Bigler, 1990). It leads to damage of the axons in the white matter of brain produced at the moment of impact and is widely considered to be the

primary cause for closed head injury. The degree of diffuse axonal injury is directly related to duration and severity of coma and the clinical outcome.

- *Primary focal lesion:* It includes contusion (bruise) consisting of multifocal capillary haemorrhages, vascular engorgement and edema in an area of brain tissue. The injury can be at the site of the blow or impact of brain tissues to the skull (coup contusions) or at the opposite point to the trauma (contra-coup).
- *Laceration:* When a brain contusion is sufficiently severe, it causes a visible breach in the continuity of the brain causing lacerations. Lacerations are more associated with penetrating head injuries than with closed head injuries.
- *Basal ganglia haematoma:* It occurs in approximately 3% of severe closed head injuries. Although it can occur in isolation or in association with other intracerebral haematomas and contusions, it is mostly found in subjects who have severe diffuse white matter injury (Coloquboun & Rawlinson, 1999).
- *Cranial nerve lesions:* A severe closed head injury can cause dysfunction of number of cranial nerves either by damaging the cranial nerve nuclei in the brainstem or at intra cranial course (Murdoch, 1990).

2) Secondary injuries include cerebral edema, intra cranial hemorrhage, ischemic brain damage, increased intra cranial pressure, cerebral atrophy and ventricular enlargement (Murdoch, 1990).

Discourse and TBI

The discourse abilities of adults who have suffered traumatic brain injuries (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).

Ehrlich (1988) also indicated that examination of communication skills of persons with TBI should always include assessment at the discourse level, particularly because deficits in traditional linguistic skills for these individuals are more subtle than what is observed in aphasia and/or other adult communication disorders. Many investigators have made incidental comments on the salient impairments in conversation exhibited by subjects with TBI (Levin, Grossman, Rose, Teasdale, 1979; Thomson, 1975).

Before going into details of conversational discourse impairment after TBI, let us look into what is "normal conversation". Grice (1978) has proposed his model of conversational practice which mainly discuss regarding the Cooperative Principle that should be considered in any discourse. The categories of the Cooperative Principle are as follows:

1. *Quantity: The quantity of information to be provided.*

   - Make your contribution as informative as is required

- Don't make the contribution more informative than is required

- Conciseness

2. *Quality: Try to make your contribution one that is true.*

- Do not say what you believe to be false and represent it as true

- Do not say for which you lack adequate evidence

3. *Relation: Be relevant.*

- Your contribution to conversation should be appropriate to the immediate needs at each stage of the transaction.

4. *Manner: This is the act of relating not to what has been said but, rather, to how what is said is to be said.*

- Avoid Obscurity of expression

- Avoid Ambiguity

- Be brief and orderly

Discourse can be defined broadly as language use "in the large", or as extended activities that are carried out via language (Clark, 1994). It can be studied as:

I. <u>Discourse at various forms:</u>

- Procedural discourse describes the procedures involved in performing an activity.
- Expository discourse conveys information on a single topic by a single speaker.
- Conversational discourse conveys information between a speaker and listener or among several speakers and listeners.
- Narrative discourse is a description of events (Ulatowska, Allard, & Chapman, 1990; Hough & Pierce, 1994).

II. Discourse at the level of comprehension or production (Brown & Yule, 1983; Clark, Frattali & Grafman 1994; Caplan, 1999):

- At comprehension level it refers to the ability to establish relationships within and between sentences, using context as the foundation for comprehension to form a coherent representation.
- At expressive level it can be transactional discourse which refers to the expression of content and interactional discourse which refers to the expression of personal attitudes and social relationships.

III. Discourse distinguished at microlinguistic and macrolinguistic level (Ulatowska, North, & Macaluso-Haynes, 1981; Ulatowska, Freedman-Stern, Doyle & Macaluso-Haynes, 1983; Glosser & Deser, 1990; Cannizzaro & Coelho, 2002):

- Microlinguistic abilities refer to the processing of phonological, lexical-semantic, and syntactic aspects of single words and sentences. Measures of syntactic complexity and production at the single word level are often used here.
- Macrolinguistic abilities refer to the maintenance of conceptual, semantic, and pragmatic organization at the suprasentential level. Coherence and cohesion (refers to specific "relations of meaning between elements within discourse") are often used as measures of macrolinguistic abilities (Halliday & Hasan, 1976). It relies on the interaction of both linguistic and non-linguistic knowledge, especially the non-linguistic systems of executive control and working memory (Cannizzaro & Coelho, 2002).

IV. Discourse examined via a text view (e.g., discourse as a product) or as a joint activity (e.g., discourse as a process). Because of its inherently dyadic nature, Clark (1994) suggests that it is more meaningful to view discourse as a joint activity, which applies to interactional conversation as well as to stories told to others by single narrator.

I. Propositional aspects of Communication

It includes the notion of relevancy, clarity of reference & coherence. It deals with how discourse is organized with respect to overall plan, theme or topic and how individual utterances are conceptually linked to maintain unity (Hartley, 1995).

This includes subcategories like:

1) Failure to Structure Discourse (DS)

- Lacks forethought
- Lacks organizational planning

2) Communication intent

- Greets others:

  -By themselves

  -In response to other's greeting
- Introduces self
- Starts a conversation
- Asks for information
- Asks for assistance in understanding conversation
- Criticizes the conversation by agreeing/disagreeing to a part in the conversation
- Fabricates/ Imagines events

- Understands advancers and blockers in the conversation

3) Topic management

- Irrelevantly introducing topic
- Rapid topic shift
- Non coherent topic changes/Inappropriate topic changes
- Perseveration in the topics
- Responses which expand topics
- Minimal responses
- Extra elaboration of topics
- Minimal elaboration

4) Information adequacy

5) Information content

6) Message inaccuracy

7) Coherence

- Global coherence
- Local coherence

8) Use of Nonspecific Vocabulary (NSV)

9) Linguistic Nonfluency (LNF)

10) Inappropriate Speech Style (ISS)

11) Inappropriate Intonational Contour (IC)

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)

II. Non-propositional or interactional aspects of communication

This is one of the important category of social communication behavior. These behaviors reflect the reciprocal nature of conversation and the joint co-operation required of the participant (Mc Tear, 1985).

This includes subcategories like:

1) Turn taking

- Initiation of turn
- Time taken to start a turn
- Non contingent turn
- Unable to take prosodic cues
- Rapid shift in the mode
- Persistent in listeners or speakers mode

2) Conversation repair

- Too much of self repair through repetition
- Too much of revision through clarification
- Too much of other initiated repair

3) Revision Behaviors

Hemispheric difference in discourse processing

The discourse level has focused on the role of the right hemisphere in constructing a coherent discourse model. A number of studies have found that patients with right hemisphere (RH) brain damage have difficulty integrating ideas across sentences (Brownell, Potter, Bihrle, & Gardner, 1986) and identifying main ideas and themes. Studies have found that RH damaged patients' exhibit inference problems in a variety of comprehension tasks (Cicone, Wapner, & Gardner, 1980; Tompkins & Mateer, 1985; Brownell et al., 1986; Hough, 1990; Beeman, 1993). It should be noted, however, that several other studies have found no such deficits (McDonald & Wales, 1986; Tompkins, 1991), even when attempting to replicate previous findings. Few studies that have compared performance of RH-damaged patients to LH-damaged controls (rather than to non-brain-damaged controls) have shown no differences in discourse understanding between the two groups (Zaidel, Kasher, Soroker, & Batori, 2002).

In an fMRI investigation, Robertson et al. (2000) manipulated discourse coherence by presenting sentences containing noun phrases that were introduced with either definite or indefinite articles. They found greater LH activation when participants comprehended unrelated sentences, those containing indefinite articles, and greater RH activation when participants comprehended sentences that included definite articles, which cues that the sentences should be integrated. In contrast, Ferstl and Von Cramon (2001) found no RH involvement in establishing a coherent discourse representation using an event-related fMRI paradigm.

Divided-visual-field paradigms have been used to examine hemispheric difference in discourse processes in intact brain. Beeman, Bowden, and Gernsbacher, (2000) suggest that the RH plays a unique role in generating predictive inference during discourse processing. Long, Baynes, & Prat, (2005); Long, Baynes, & Prat, (2003); Long & Baynes, (2002) have used lateralized item-priming-in-recognition paradigms to investigate how the propositional representation and the discourse model are distributed across the two hemispheres. They found that only the LH was sensitive to propositional relations, whereas the LH and RH were equally sensitive to discourse model relations.

RHD subjects have deficits in two interdependent areas (a) Understanding language used in a non canonical manner & (b) Integrating varied information in order to interpret discourse materials appropriately (Weinstein & Kahn, 1955; Wechsler, 1973; Gardner, 1975; Gardner, Brownell, Wapner & Michelon, 1983; Joanette, Ska, Goulet & Nepoulous, 1986). With regard to the first category, investigators have found that RHD patients have trouble interpreting indirect requests (Hirst LeDouse & Stein 1984; Foldi, 1987; Weylman, Brownell, Roman & Gardner, 1989) understanding jokes (Bihrle, Brownell, Dowelsons & Gardner, 1989; Brownell & Gardner, 1988) & interpreting nonliteral language such as metaphors, irony & sarcasm (Kaplan, Brownell, Jacobs & Gardner, 1990). Under the second category, these subjects have difficulty with holistic context-dependent tasks such as deriving the main point or theme of a dialogue or narrative (Gardner, 1983; Hough, 1990) and drawing inferences in stories (Brownell, Potter, Bihrle & Gardner, 1986).

Vanhalle, Lemieux, Joubert, Goulet, Ska, Joanette (2000) studied processing of 2 speech acts by 14 RHD subjects. Four control groups were taken. The two speech acts were direct (literally expressing communication intent of the speaker) and indirect (intention is not conveyed explicitly in the literal message). The three situations were- (1) Natural task- interview assessing general health of the subjects, (2). Non natural task- Interpretation of interaction of two individuals, (3). Pseudo-natural interview with clinician whose naturalness lies within (1) & (3). Results showed that RHD subjects process speech acts well in natural or pseudo-natural task & is worse in non natural task. In summary it can be stated that TBI individuals with moderate to severe brain injury present a variety of conversation problems. The difficulties may be in terms of Topic management, topic initiation, acknowledgement, turn taking, informativeness and coherence and others.

Much research on discourse explores whether microlinguistic and macrolinguistic abilities can be dissociated neurologically and psychologically. These abilities have been investigated between traumatic brain injury (TBI) and right-hemisphere brain-damaged patients (RHBD) (Joanette, Goulet, Ska, & Nespoulous, 1986; Mentis & Prutting, 1987; Glosser & Deser, 1990; Davis, O'Neil-Pirozzi, & Coon, 1997; Tucker & Hanlon, 1998; Togher & Hand, 1999; Coelho, 2002; Cannizzaro & Coelho, 2002). Research has explored the macrolinguistic and microlinguistic narrative discourse production abilities of TBI survivors. The literature suggests that, compared to non-brain-injured (NBI) controls, TBI survivors evidence impairment in macrolinguistic abilities, producing discourse that contains less output (Coelho, 2002) and contains deficits in coherence and

cohesion (Mentis & Prutting, 1987; Glosser & Deser, 1990; Cannizzaro & Coelho, 2002). Their discourse also contains fewer implied meanings and is more concrete (Tucker & Hanlon, 1998), with more pragmatic errors (Snow, Douglas, & Ponsford, 1999) than NBI controls. In terms of microlinguistic abilities, their discourse also contains a greater number of syntactic and lexical errors (Glosser & Deser, 1990) than NBI controls. Overall, TBI survivors demonstrate both microlinguistic and macrolinguistic deficits in discourse production.

The literature suggests that RHBD patients present primarily with macrolinguistic deficits. In terms of expressive language, McDonald (2000) describes RHBD patients as tangential, inefficient, and verbose, as well as impaired in inferencing skills. In addition, pragmatic impairments are often noted in RHBD patients, including inappropriate speech act use and interpretation, lack of sensitivity to situation and listener needs, and literal interpretation of figurative and implied meanings (Tompkins, 1995). In terms of discourse comprehension, lesion studies have produced considerable evidence suggesting that adults with RHBD have difficulty drawing inferences. It has been suggested that the right hemisphere specifically contributes to discourse comprehension more than to single word comprehension (Beeman, 1993).

The right hemisphere may also play a critical role in revising interpretations and building organized mental structures to form a mental representation of discourse (Beeman, 1993). Discourse impairments may be due, in part, to ineffective suppression of contextually irrelevant or inappropriate meanings (Tompkins, Baumgaertner, Lehman, &

Fossett, 1997). Therefore, impairment may also be related to difficulty combining information across sentences, despite preserved processing of individual sentences.

Wapner, Hamby, and Gardner (1981) found that some RHBD patients are poor at inferring motives and morals from story contexts. Some RHBD patients may also experience difficulty integrating the elements of a story into a coherent narrative. This process may be disrupted by the interjection of personal references, rationalization of foreign elements, and confabulation (Wapner et al., 1981; Moya, Benowitz, Levine, & Finklestein, 1986).

Overall, research suggests that RHBD patients experience deficits at the supra-sentential, or macro, level of discourse.

Much research describes RHBD as a unitary phenomenon, with little description of topographic representation within the hemisphere as related to its role in discourse processing. To state it differently, the right hemisphere is often described as a whole, without specifying distinct regions that may contribute to various aspects of discourse. This suggests that it is possible that regardless of the precise region of damage, impaired right hemisphere function contributes to discourse-related difficulties.

In TBI, frontal and temporal lobe injuries are most commonly reported, as these are the areas which are more vulnerable for the impacts. While temporal lobe pathology following TBI is associated with disorders of memory and new learning, frontal lobe

damage and diffuse axonal injuries have been associated with loss of regulatory control over cognitive processes and affective and social behaviors (Auberach, 1986). Owing to the presence of these difficulties, individuals with TBI display lack of social perception, poor self image, impaired self analysis and reduced ability to follow social rules and have effective communication (McDonald, 1993). Alternately other individuals with TBI may demonstrate impoverished communication because of their inability to formulate & initiate goal-directed behavior and reduced desire to express emotion or engage in social interaction (Auberach, 1986).

TBI typically results in diffuse axonal injury with a multi-focal lesion of temporal & frontal medial lobes (Pang, 1989).

Damage to either Broca's or Wernicke's areas is traditionally associated with drastic changes in language ability. In contrast, focal cortical damage and its interruption to subcortical pathways can also be associated with more subtle changes in language. One population of patients, namely those with prefrontal cortex damage (PFCD), often present with such subtle language deficits that nevertheless can have a profound effect on functional communication. The prefrontal cortex is that portion of the frontal lobe anterior to the motor strip, and can be subdivided into dorsolateral (Brodmann's areas 8, 9, 10, and 46), orbitofrontal (Brodmann's areas 10, 11-13, and 47), and medial frontal/cingulate [Brodmann's areas 6, 8-10, 12, and 23, 24, and 32 (anterior cingulate)] areas. Traditionally, the PFC is often described as mediating the cognitive processes of short-term and working memory, preparatory set, and inhibitory control (Fuster, 1997), as well as action planning (Alexander, 2002) and attention (Ferstl, Guthke, & Cramon,

1999). Classically thought to be non-specific to language use, some researchers suggest that many of the subtle language deficits exhibited following PFCD may in fact be a consequence or symptom of primary cognitive deficits (e.g., Ferstl et al., 1999). Specifically, these cognitive deficits may include action planning (Alexander, 2002), memory, and attention (Ferstl et al., 1999). However, Frattali and Grafman (in press) note that findings from neuroimaging studies suggest that attributing the full range of language deficits post-PFCD only to cognitive dysfunctions may be misguided. In fact, the PFC may have a specific role in context sensitive semantic processing and selection (Poldrack, Wagner, Prull, Desmond, Glover, & Gabrieli, 1999; Binder, Frost, Hammeke, Cox, Rao, & Prieto, 1997; Demb, Desmond, Wagner, Vaidya, Glover, & Gabrieli, 1995; Frattali & Grafman, in press; Kapur, Rose, Liddle, Zipursky, Brown, Stuss, Houle, Tulving, 1994). Showing a specific linguistic role for the PFC, Demb et al. (1995) and Kapur et al. (1994) both found greater activation in the left PFC in semantic tasks relative to non-semantic tasks. In addition, Poldrack et al. (1999) found evidence for functional specialization of semantic and phonological processing in the left inferior prefrontal cortex.

PFCD patients have also been described as having largely intact microlinguistic abilities of word- and sentence-level processes, with impaired suprasentential, "text level" function (Ferstl et al., 1999). Overall, there have been considerably fewer studies describing the effects of prefrontal cortex damage on discourse than damage to other cortical areas (Alexander, 2002). However, the literature suggests that characteristics associated with PFCD patients' discourse production include failure to stay within a

given topic, tangentiality, lack of cohesion, difficulties with temporal sequencing, and reduced or enhanced speech output (Ferstl et al., 1999).

McDonald (1993) describes striking similarities between the language impairments seen after RHBD to those seen after PFCD. These common discourse impairments include: verbosity, disorganization, tangentiality, concreteness, and an inability to interpret or utilize conversational inference (McDonald, 1993). However, overall, little exploration of these deficits has occurred to date.

An Indian study by Tanuja, (2004) concluded that TBI individuals have impairment in discourse when compared to normal subjects. LHD group showed less conversational output when compared with RHD, but the data was not sufficient to generalize the obtained findings.

METHOD

Investigators have reported that in TBI patients, impairment in communication, especially in discourse is evident as a sequelae of brain insult. These discourse disabilities are very subtle in nature and persist for a longer time even when other impairments are resolved. The study attempts to identify and quantify impairments in communication abilities of the TBI patients.

The aims of the study are:

1. To assess the discourse deficits in TBI patients and to compare with discourse of normal speakers.
2. To differentiate the discourse deficits across TBI patients with RHD and LHD, and to compare each of these with discourse of normal individuals.
3. To find out, specifically, which aspect of discourse- propositional/non propositional, are affected in LHD and RHD TBI patients.

Subjects

Experimental group comprised of fourteen male and six female adults with traumatic brain injury. Ten normal adults (seven males and three females) matched for age, sex and education were selected as control group. The experimental group was divided into two subgroups depending on the loci of brain insult viz. left hemisphere damage, right hemisphere damage. Demographic data of the subjects can be found in Table 6 and Table 7.

Sl. No	Patients name	Age/Sex	DAA	Type of trauma	Severity	DH	Lesion	GCS	PTA	Language know
1.	S.K	50Yrs/Male	5month	RTA	Severe	L	RTA with concussive head injury with fracture of left frontal bone with underlying fracture haematoma (small extra dural haematoma). Left frontal haemorrhagic contusion	6/15	+ve	K,E,H
2.	R.S	40Yrs/Female	3months	RTA	Severe	L	RTA with concussive head injury with deep lacerated wound on left side of occipital scalp	8/15	+ve	K,E
3.	Y	20Yrs/Male	3months	RTA	Severe	L	RTA with severe concussive head injury	8/15	+ve	K,H,E
4.	K	28Yrs/Male	5months	RTA	Severe	L	RTA with severe concussive head injury. Fracture of right temporal bone and right zygoma with multiple intra cerebral contusion in left frontal and temporal region with gross cerebral edema	6/15	+ve	K,H,E
5.	J	40Yrs/Female	3months	RTA	Severe	L	RTA with moderate head injury with left frontoparietal subdural haematoma with faciomaxillary injury	5/15	+ve	K,E

6.	M	38Yrs/Male	4months	RTA	Severe	L	RTA with severe head injury	8/15	+ve	K,E
7.	G.G.V	40Yrs/Male	5months	RTA	Severe	L	RTA with concussive head injury	8/15	+ve	K,E,H,T
8.	V	40Yrs/Male	5months	RTA	Severe	L	RTA with head injury with left temporomastoid bone fracture with left parietal bone fracture with underlying pneumozephalum	7/15	+ve	K,E
9.	L	45Yrs/Male	5months	RTA	Severe	L	RTA with severe head injury with large temporal contusion	7/15	+ve	K,E
10.	S.R	34Yrs/Male	4months	RTA	Severe	L	RTA with head injury with fracture post column left acetabulum with deep laceration of left frontal region	6/15	+ve	K,E,H

Table 6: Demographic data of TBI subjects with LHD

DAA- Duration after accident in months
RTA- Road traffic accident
DH- Damaged Hemisphere, R- Right side, L- Left side
GCS- Glasgow Coma Scale
PTA- Post Traumatic Amnesia

K- Kannada
E- English
H- Hindi
Ta- Tamil
T- Telugu

Sl. No	Patients name	Age/Sex	DAA	Type of trauma	Severity	DH	Lesion	GCS	PTA	Language known
1	M	26Yrs/Male	1month	RTA	Severe	R	RTA with closed head injury with right temporal bone fracture with underlying moderate sized extra dural haemorrhage	6/15	+ve	K,E,H,Ta
2	A	23Yrs/Male	4months	RTA	Severe	R	RTA with severe head injury with right temporal bone fracture	5/15	+ve	K,E,H,T,Ta
3	R.M	50Yrs/Male	5months	RTA	Severe	R	RTA with severe head injury	5/15	+ve	K,H,E
4	Y.P	21Yrs/Male	5months	RTA	Severe	R	RTA with concussive head injury with right temporal bone fracture with mild cerebral edema	7/15	+ve	K,H,E
5	S	45Yrs/Male	2months	RTA	Moderate	R	RTA with concussive head injury with hematoma in occipital region	8/15	+ve	K,E
6	R	28Yrs/Male	1month	RTA	Severe	R	RTA with severe head injury	5/15	+ve	K,E
7	L	50Yrs/Male	3months	RTA	Severe	R	RTA with concussive head injury with sof t tissue injury. Right parieto occipital scalp haematoma	6/15	+ve	K,E

8	R	23Yrs/Male	3months	RTA	Severe	R	RTA with severe concussive head injury with traumatic subarachonoid haemorrhage with extensive faciomaxillary injury	8/15	+ve	K,E
9	D.N	26Yrs/Male	3months	RTA	Severe	R	RTA with concussive head injury left temporal lobe small hyperdense area ? contusion	8/15	+ve	K,E
10	S	50Yrs/Male	4months	RTA	Severe	R	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	7/15	+ve	K,E,H

Table 7: Demographic data of TBI subjects with RHD

DAA- Duration after accident in months
RTA- Road traffic accident
DH- Damaged Hemisphere, R- Right side, L- Left side
GCS- Glasgow Coma Scale
PTA- Post Traumatic Amnesia

K- Kannada
E- English
H- Hindi
Ta- Tamil
T- Telugu

Selection criteria

Subjects with confirmed lesions in the brain based on the neurological evaluation (as reported in Table 6 & 7) and who were willing to participate in the study were selected. It was required that the subjects participate in 1 to 2 sessions of extended sampling session. All these individuals were having right handedness. Although Kannada mother tongue was the criteria, knowledge of other languages were noted. Generally bilinguals (Kannada & English) were obtained with a few multilinguals. None of the patients included in the study had Aphasia as confirmed by Western Aphasia Battery test (Kertesz, 1979). They all belonged to a middle/high socioeconomic status confirmed from NIMH Socioeconomic Status Scale by NIMH, (1997).

Only subjects with history of road traffic accidents as a cause of traumatic brain injury were included in the study. Subjects were also selected according to the severity of the trauma. Subjects who were identified as having moderate to severe injury on the basis of Glasgow Coma Scale (Jennette and Teasdale, 1975) were selected for the study. Subjects with any other type of trauma like open head injury and mild insult were not selected for the study. All subjects presented a history of posttraumatic amnesia and there was a gap of at least 1-5 months post accident.

Control group comprised of normal individuals 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 by Kertesz, 1982 (WAB), Mini Mental Status Examination by Kurlowicz and Wallace (1975)

(MMSE) (Appendix-D) and routine pure tone audiometry. They were matched for age and sex of the subjects in the experimental group.

Experimental setup

The target task was, one, free conversation between the subjects and investigator and the other was picture description task (Western Aphasia Battery by Kertesz, 1982). The conversation was carried out between the investigator and the subjects on various topics. A total of two sessions of conversation each varying from 10 to 20 minutes was carried out. The conversation was recorded using a computer software program. The subjects were aware that their speech was being recorded. All the recording were carried out in a quiet room with no distraction in between the recordings. Before recording, the subjects 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. First session was aimed to improve interaction between the investigator and the subjects to build rapport. Succeeding single session was recorded. Conversation sample centered on particular topic like family and other few general topics like job, hobbies, hospital etc in order to keep the topics of conversation constant across all the subjects.

Picture (Appendix-C) was given to the subjects for particular duration of time later they were asked to describe the picture in detail and tell the gist of information from the picture.

Instrumentation

A WaveSurfer 1.5.7, computer software recorder was used to record the conversation. During the transcription of the data by the investigator, the same software was used to record the initiation time taken by the subjects to start a turn and the time taken by the subjects to tell the gist of information from the given picture.

Procedure

Ten to twenty minutes' conversation was recorded for first session. During second session the subjects showed less inhibition in their conversation, since they became quite accustomed to the investigator, only ten to fifteen minutes speech sample of this session was selected for the final analysis. Duration of five minutes was given for picture description task and at the same time recording was done.

Transcription procedure

From the recorded audio sample, transcription was done using broad International Phonetic Alphabet, 2007.

Conversations between investigator (I) and subject (S) were transcribed. During transcription, initiation time, pause time, filled pauses, unfilled pauses and false start etc. were carefully noted, for each episode.

Using different source of literature and available scale (mainly Damico's Discourse Analysis Scale) for measurement of discourse impairment, the conversation sample was analyzed for two aspects.

I. Propositional aspects of communication.

II. Non-propositional aspects of communication. Each of these was further divided into different features.

Details of sub features of the parameters are shown in Appendix-A and Appendix-B.

Scoring

Each parameter was rated and recorded on a specific criteria as shown in Appendix A and B.

Individual scores were calculated and, Man Whitney test and Wilcoxon's Signed Rank test applied for the sub-parameter of the following parameters to measure the significance of the value obtained**.** Kruskal-Wallis test was applied for the percentage scores of the following parameters to find the significant difference between the TBI subjects with LHD, RHD group and normal speakers.

1. *Failure to Structure Discourse*
2. *Communication intent*
3. *Topic management*
4. *Information adequacy*
5. *Information content*
6. *Message inaccuracy*
7. *Use of non-specific vocabulary*

8. *Linguistic nonfluency*
9. *Inappropriate speech style*
10. *Inappropriate Intonation Contour*
11. *Turn taking*
12. *Conversational repair*
13. *Revision behavior*

A five point perceptual rating scale (Appendix-A and Appendix-B) was used to score two of the parameters, which included are as follows-

1. Coherence
2. Gaze Inefficiency

A four point perceptual rating scale (Appendix-A and Appendix-B) was used to score one of the parameters, which included is delay before responding.

The investigator repeated the process of transcription of discourse sample i.e., the conversation and picture description sample of two TBI and two normal subjects 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 AND DISCUSSION

Impairment in conversational discourse is one of the persisting, subtle and sub-clinical features reported in TBI individuals even after months of recovery from the medical ailments. An attempt is made in the study to describe the features impaired in the discourse mode of conversation in right hemisphere damaged TBI individuals and the left hemisphere damaged TBI individuals comparing the performance with that of normal control subjects.

Fourteen male and six female adults with TBI served as experimental subjects. Age, gender and education matched normal speakers served as subjects in the control group. From the corpus of speech recorded from the subjects, speech sample of duration of 20 minutes recorded in the second interaction session with the subjects was chosen for analysis. The data was transcribed verbatim and various features of propositional and non-propositional aspects in the speech of the subjects were tabulated and subjected to analysis.

The behaviors were graded using five point, four point and three point rating scales, which was specific to different parameters of discourse. The results are interpreted using suitable statistical procedures wherever possible. Non-parametric tests were applied to see the differences in features of propositional and non-propositional aspects of discourse. The significance of difference in performance of TBI subjects with left hemisphere damage (LHD), right hemisphere damage (RHD) as compared to normal speakers are discussed in detail under various sections.

Results are presented under the following sections:

I. Comparisons across LHD and RHD for conversation and picture description tasks.

II. Comparisons made between LHD, RHD and normal speakers for percentage scores.

III. Comparison within LHD group
   a. Comparison of propositional aspects and non-propositional aspects of discourse in percentage scores
   b. Comparison of conversation and picture description tasks in percentage scores
   c. Comparison across Languages
   d. Comparison across Gender
   e. Comparison across Socio-economic status

IV. Comparison within RHD group
   a. Comparison of propositional aspects and non-propositional aspects of discourse in percentage scores
   b. Comparison of conversation and picture description tasks in percentage scores
   c. Comparison across Languages
   d. Comparison across Gender
   e. Comparison across Socio-economic status

Comparisons across LHD and RHD for conversation and picture description tasks

In the present study, comparison was made between LHD and RHD groups for conversation and picture description tasks. Mann-Whitney test was administered to compare LHD and RHD groups. There was no significant difference between TBI subjects with LHD and RHD in most of the parameters at 0.05 level. Mean and Standard Deviation of each of the parameters of propositional and non-propositional aspects of discourse are tabulated as follow:

Conversation Task

I. Propositional aspects of discourse in conversation

(a). Failure to Structure Discourse

Table 8: Showing the mean, standard deviation and results of Mann-Whitney test for the feature (a) failure to structure discourse.

Serial No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Lacks forethoughts	LHD	1.70	0.48	NS
		RHD	1.60	0.51	
2.	Lacks organizational planning	LHD	1.70	0.48	NS
		RHD	1.80	0.42	
Failure to Structure Discourse		**LHD**	**3.40**	**0.69**	**NS**
		RHD	**3.40**	**0.84**	

(NS- Not significant at 0.05 level)

(a) Failure to Structure Discourse (DS)

Failure to structure discourse is a problematic behavior which is the most global one compared to other features of discourse. It occurs when the discourse of the speaker lacks forethought and organizational planning. Due to these characteristics, the discourse will be confusing--even if all of the propositional content is present. In the present study, this feature is assessed and scored indirectly by observing the presence or absence of behaviors like 'lacking forethought' and 'lacking organizational planning' in speech of experimental groups. Scoring was done using a three point perceptual rating scale (Appendix-A). In Table 8, the mean and standard deviation values are separately noted for 'lacks forethought' and 'lacks organizational planning' features of discourse structure. Between the TBI subject with LHD and RHD, there was no significant difference at 0.05 level. 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 Chantraine, Joanette, and Ska, (1998); Glosser, (1993); Myers, (2001), have listed few deviant characteristics of discourse produced by adults with RHD including the presence of egocentric or over personalized responses, irrelevant comments and digressions from the topic, a focus on tangential or irrelevant details, disorganized thoughts, and responses that seem impulsive and not well thought out.

Study by Martin and McDonald (2003) describe 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 (Tompkins, 1995).

In summary, both the TBI subjects with LHD and RHD exhibit this particular feature of disorganized discourse and poor planning of discourse. The mean value was same for both the groups and these results are depicted in Graph 1 very clearly.

(b) Communication Intent

Communication intent in speech of TBI subjects with LHD was compared with that of RHD. This particular feature was measured for its presence or absence using three point perceptual rating scale that is- completely present or partially present or absent (Appendix-A).

Table 9: Showing the mean, standard deviation and results of Mann-Whitney test for the feature (b)communication intent.

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Greets others: -By herself/himself	LHD	0.80	0.78	0.005
		RHD	0	0	
	-In response to other's greeting	LHD	2	0	NS
		RHD	2	0	
2.	Introduces self	LHD	1.50	0.52	0.003
		RHD	0.60	0.51	
3.	Starts a conversation	LHD	1.10	0.73	NS
		RHD	1.10	0.56	

4.	Asks for information	LHD	1	0.81	
		RHD	1.10	0.56	NS
5.	Asks for assistance in understanding conversation	LHD	1	0.66	
		RHD	1.30	0.48	NS
6.	Criticizes the conversation by agreeing or disagreeing to a part in the conversation	LHD	1.20	0.78	
		RHD	1.50	0.52	NS
7.	Fabricates/ imagines events	LHD	1.60	0.69	
		RHD	1	0.81	NS
8.	Understands advancers and blockers in the conversation	LHD	1.40	0.69	
		RHD	1.50	0.52	NS
Communication Intent		**LHD**	**11.60**	**3.27**	**NS**
		RHD	**10**	**1.76**	

(NS- Not significant at 0.05 level)

Mann-Whitney test was administered to compare LHD and RHD groups. As shown in Table 9, significant difference is noted for the feature of communication intent for TBI subjects in the LHD and RHD groups and this was used to observe for any association between these two groups in each of the sub features of communication intent.

1. Greets others

Result suggests that there was a significant difference between the TBI subjects with LHD and RHD at 0.01 level. Few TBI subjects with LHD tend to greet by themselves, but none of the RHD subjects made an effort to greet by themselves. Both the groups did not show any difference in the second condition of greeting others, i.e.,

greeting in response to other's greeting. Both the groups were able to greet in response to other's greetings.

2. Introduces self

Here majority of subjects with LHD were able to introduce about themselves when compared to TBI subjects with RHD. Result suggests that there was a significant difference between these two groups at 0.01 level.

3. Starts a conversation

There was no significant difference at 0.05 level between the two groups. But when compared to normal speakers, these individuals were poor at starting a conversation.

4. Asks for information

There was no significant difference at 0.05 level between TBI subjects with LHD and RHD for this particular feature. Both the groups asked for information, but the percentage occurrence of such instances was lesser in RHD group compared to LHD group.

5. Asking for assistance in understanding conversation

There was no significant difference at 0.05 level between TBI subjects with LHD and RHD for this particular feature. Both the groups asked for assistance in understanding conversation. However, in terms of occurrence percentage, it was more in RHD group than LHD.

6. Criticizes the conversation by agreeing or disagreeing to a part in the conversation

There was no significant difference at 0.05 level between TBI subjects with LHD and RHD for this particular feature. The RHD group was seen to use more of critical comments by agreeing or disagreeing to a part in the conversation than the LHD group.

7. Fabricates/ imagines events

There was no significant difference between TBI subjects with LHD and RHD for this particular feature. Although the difference was not significant at 0.05 level, LHD group showed more percentage scores than the RHD group.

8. Understands advancers and blockers in the conversation

There was no significant difference at 0.05 level between TBI subjects with LHD and RHD. But both the groups had little difficulty in understanding the advancers and blockers in the conversation.

In summary, there was a significant difference found between the TBI subjects with LHD and RHD for only two parameters, “greets others” and “introduces self”. TBI subjects with LHD performed quite similar to that of RHD subjects in all the other parameters except these two. Based on the results, conclusion cannot be made with respect to the extent of deviations in terms of communication intent in the two groups of TBI subjects. One of the major reasons for the similarity found between the two groups is that, only an excellent converser will follow all the manners in conversation, especially when the conversation is an informal one. If the speech acts would have been tested in a

very formal situation like enquiry in an office, then may be a difference would have been obvious. In an enquiry situation, a person would have "initiated the conversation" by "greetings". Second reason can be the personality factor. If a person does not like to contradict others, then he will not show the feelings by disagreement or criticism to the other person. In the study, more subjects from the LHD group adopted critical stand in their conversation than the RHD subjects. There is no literature available to support the finding. Both the group had little difficulty in understanding advancers and blockers in conversation. This fact is well supported by literature. According to Rehak, (1992), RHD patients have problem in understanding blockers in conversation. One important point noticed here was that in addition to RHD group, LHD group also showed difficulty in understanding blockers in conversation. Within the subgroups of TBI, no clear pattern emerged with regard to the site of lesion.

Finally it can be concluded that communication intent is present more in LHD group compared to RHD group as shown in Graph 1.

(c) Topic management

Topic can loosely be defined as "what is talked about through some series of turns at talk" (Lesser & Milroy, 1993). Topic coherence can be defined as something that is constructed across turns by the collaboration of participant. Speech of TBI subject with LHD and RHD group was analyzed for this aspect of conversation under eight different sub-features as shown in Table 10. Mann-Whitney test was applied to infer the significance of the obtained scores. Following results were obtained for each of the parameter under topic management.

1. Irrelevant introducing of topics

It was evaluated whether TBI subjects with LHD and RHD show this particular feature of irrelevant introducing of topics in a conversation. It was noted that none of the TBI subjects exhibited this particular abnormal behavior. This result is in contrast with the study by Mentis and Prutting, (1991) and Cohelo, Liles and Duffy, (1991) who found that TBI individuals produced unrelated topic changes. There was no significant difference at 0.05 level between LHD and RHD group according to Mann-Whitney test.

Table 10: Showing the mean, standard deviation and results of Mann-Whitney test for the feature (c) topic management.

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Irrelevantly introducing topics	LHD	2	0	NS
		RHD	2	0	
2.	Rapid topic shift	LHD	1.60	0.69	NS
		RHD	1.80	0.63	
3.	Non coherent topic changes/Inappropriate topic changes	LHD	1.60	0.69	NS
		RHD	1.90	0.31	
4.	Perseveration in the topics	LHD	1.90	0.31	NS
		RHD	1.90	0.31	
5.	Responses which expand topics	LHD	1.30	0.94	NS
		RHD	1.70	0.67	
6.	Minimal responses	LHD	1.50	0.84	NS
		RHD	1.90	0.31	
7.	Extra elaboration of topics	LHD	1.40	0.69	NS
		RHD	1	0.66	

8.	Minimal elaboration	LHD	1.40	0.96	NS
		RHD	1.70	0.67	
Topic management		**LHD**	**12.70**	**2.79**	**NS**
		RHD	**14**	**1.05**	

(NS- Not significant at 0.05 level)

2. Rapid topic change

It is reported in literature that some TBI patients change topics rapidly within few seconds. As seen from Table 10, although there was a mean difference between TBI subject with LHD and RHD for this feature, the difference was not statistically significant at 0.05 level. This finding does not support the findings by Ehrlich and Barry (1989) where they report of rapid topic shift in TBI subjects. The reason for this could be the individual differences in the subjects. Among the ten subjects of LHD, seven of them did not show any rapid topic shift, two of them showed this feature which was scored as 'partially present' and only one subject showed this particular feature which was scored as 'completely present' (Appendix-A). Similarly among the RHD subjects only one subject showed this particular feature which was scored as 'completely present'. Thus this behavior was more seen in LHD subjects than RHD subjects. In the following example we can see a rapid shift of topic.

Example:

I: *E ShTu nimiSha pragnE iralilla?* (For how many minutes you were not conscious?)

S: *ondhu ganTe irabeku anta na:nu andukonDidi:ni aShTe.. Illi nam mane alinda bandi manege bandi amele aspeTalge hogad mele gottagiddu. Nam mane viShweShwara nagar…..*. (I guess it was one hour that's it , here my home, from there we came to

home then later after going to hospital I came to know… My house is in Vishweshwara Nagar)

3. Non coherent topic changes/Inappropriate topic changes

There was no significant difference at 0.05 level between TBI subjects with LHD and RHD. The presence or absence of this particular feature in a conversation was noted using a three point perceptual rating scale (Appendix-A). In RHD group, only one subject showed the presence of non coherent topic changes/inappropriate topic changes and in LHD group, three subjects showed this feature which implies that LHD subjects produced more of non-coherent topic changes as compared to RHD subjects. Mentis and Prutting (1991) and Cohelo, Liles and Duffy (1991) observed that TBI subjects produced non-coherent topic changes compared to normal speakers. Results of this study thus support, to some extent, that TBI subjects, 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 subjects showed irrelevant and non-coherent topic changes when compared to normal speakers.

Example of one subject showing non-coherent topic change in conversation sample is shown below:

Example:

I: *Do you have any ear pain?*

S: *No I had before but……. Presently I don't have..*

I: *If u come across in future you can come to Speech and Hearing.*

S: *You use this laptop…. daily in your college……. How much did it cost for you……. Its*

good……..

4. Perseveration in the topics

Perseveration in speech is reported in TBI subjects. Here, an attempt was made to see if perseveration in terms of topic maintenance was observed even when the conversation partner changed the topic. In Table 10, it can be seen that the mean and standard deviation is same for the TBI subjects with LHD and RHD. Both the 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, few subjects kept talking about the same topic for a long time. One subject of RHD and one subject of LHD showed perseveration and rest of the subjects did not show any perseveration. Exhibited perseveratory behavior was scored as 'partially present' (Appendix-A). Thus, statistically there was no significant difference at 0.05 level between the two groups.

Example:

I: *Apollo dalli hege TriT maDidru?* (How was the treatment in Apollo?)

S: *T nagi NoDKonDru…..* (Treated well)

I: *ICU oLage eShTu dina Idri?* (How many days you were in ICU?)

S: *ICU nalli eraDu dina idde……..* (In ICU I was there for two days)

I: *Iga hegidira?* (How are you know?)

S: *ICU nalli eradu dina amele ICU tumba duDDu madam……..* (In ICU I was there for two days ICU too costly madam)

In the above example, in spite of change in the topic by investigator (I), the subject (S) continued to speak on the same topic.

5. Responses which expand topics

Normal speakers are seen to expand all the turns, unlike TBI subjects who expand very few turns, according to study done by Tanuja (2004). This finding is in support with the earlier study done by Coelho, Liles and Duffy (1991) 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. Individual scores of the experimental group revealed that the RHD group expanded more responses and LHD group elaborated very few turns in the topic. There was no significant difference at 0.05 level between the groups on this particular behavior.

Example:

I: *What are your hobbies?*

S: *My hobbies are playing cricket, chess and using computer.*

I: *Using computer, then tell me what all you do?*

S: *Actually its my profession, in that it can be technical, information science and hard ware and software.*

This is an example taken from RHD group who expanded more responses.

6. Minimal responses

Only one subject in RHD showed minimal response and three subjects in LHD showed minimal responses. The result in the Table 10, indicate no significant difference

at 0.05 level between TBI subjects with LHD and RHD group for the given feature, but the mean scores showed the difference between TBI groups. Coelho (1991b), in his study, has observed that more minimal responses are seen in TBI patients. The reason for lack of significant difference can be the fact that out of ten subjects in LHD group, only seven subjects were verbose and showed less minimal responses, while rest of the three subjects showed more of minimal responses. In case of RHD group, except one subject all were verbose. Following example shows how RHD subject showed more of minimal responses.

Example:
I: *Do you meet Doctor that day?*
S: *Ya*
I: *What did he say?*
S: *enuilla*
I: *Do you meet him regularly?*
S: *Ya, I do.*
I: *You don't have any problem like swelling or pain?*
S: no no……

7. Extra elaboration of topics

Usually, normal speakers give adequate elaboration to topics. They do not give more or less information. According to Hartley and Jensen, (1992), 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). No significant difference was

found at 0.05 level between the LHD group and the RHD group. Careful observation of mean value in Table 10, however, showed that more number of TBI subjects with RHD exhibited extra elaboration and only two LHD subjects exhibited extra elaboration.

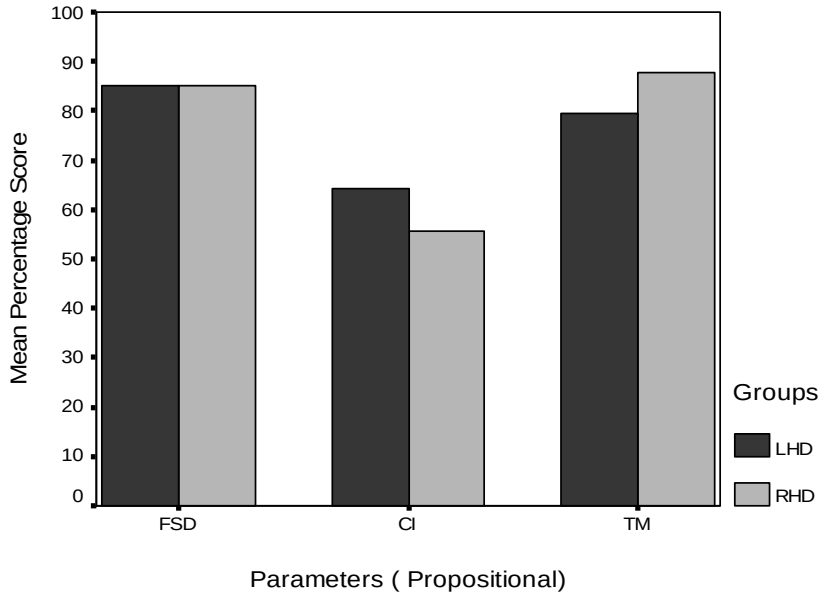
Example: When the investigator asked a question about how he met with an accident, the subject gave an answer which was very elaborated.

8. Minimal elaboration

Study done by Cohelo, Liles and Duffy (1991) found that TBI clients provide shorter, less elaboration of a topic, more often leaving it to the communication partner to introduce and develop. The results of the present study partially support this observation as minimal elaboration of topic was observed in the groups. However, significant difference was not found at 0.05 level between the TBI subjects with LHD and RHD. But the individual scoring of every subject showed that more number of TBI subjects with LHD showed minimal elaboration compared to only two subjects with RHD showing minimal elaboration.

In summary, it was seen that none of the parameters under topic management showed significant difference at 0.05 level between TBI subjects with LHD and RHD. But the mean scores and the individual scores indicated that LHD group was more affected than RHD group as shown in Graph 1.

Graph 1: Showing the difference in FSD, CI and TM across LHD and RHD



(Legend FSD- Failure to Structure Discourse, CI- Communication Intent, TM- Topic Management)

(d) Other propositional aspects of discourse

Table 11: Showing the mean, standard deviation and results of Mann-Whitney test for certain (d) other propositional aspects of discourse

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Information adequacy	LHD	2	0	
		RHD	2	0	NS
2.	Information content	LHD	2	0	
		RHD	1.90	0.31	NS
3.	Message Inaccuracy	LHD	1.90	0.31	
		RHD	1.80	0.42	NS
4a.	Global coherence	LHD	3.30	0.48	

		RHD	3.40	0.51	NS
4b.	Local coherence	LHD	3.20	0.42	
		RHD	3.50	0.52	NS
4.	Coherence	LHD	6.50	0.84	
		RHD	6.90	0.99	NS
5.	Use of Nonspecific Vocabulary	LHD	1.60	0.51	
		RHD	1.80	0.42	NS
6.	Linguistic Nonfluency	LHD	1	0.94	
		RHD	1.10	0.56	NS
7.	Inappropriate Speech Style	LHD	2	0	
		RHD	2	0	NS
8.	Inappropriate Intonation Contour	LHD	2	0	
		RHD	2	0	NS
9.	Gaze insufficiency	LHD	3.50	0.70	
		RHD	3.30	0.94	NS
10.	Delayed response	LHD	1.90	0.31	
		RHD	2	0.66	NS

(NS- Not significant at 0.05 level)

1. Information adequacy

A five point perceptual rating scale (Appendix-A) was used to rate for information adequacy in speech of the subjects. It was noted that whether the information 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. It is shown in Table 11, the mean value is same for TBI subjects with LHD and RHD subjects. Thus this feature did not show any significant difference at 0.05 level between the groups. These results are contradicting 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 (Coelho, Liles, & Duffy, 1991a; Mentis & Prutting, 1991; Parsons, Snow, Couch, & Mooney, 1989; Snow, Douglas, & Ponsford, 1997). Another contradicting study reported by Hartley and Jensen (1991), who reported that subjects with closed head injury produce only one half or two-thirds the amount of accurate content produced by normal subjects and have drastically reduced information. This was quoted in reference to the narrative discourse but same findings are seen in the present study on conversational discourse. The Graph 2 shows no difference between LHD and RHD group and that both perform equally.

2. Information content

Information content was assessed and scored using a five point perceptual rating scale (Appendix-A), specifically it was seen for the presence/absence of non-meaningful information or inadequate information in speech of the subjects. In Table 11, it is shown that there was no significant difference at 0.05 level between the TBI subjects with RHD and LHD. But from the individual subjects score it was found that only one subject with RHD showed the presence of non-meaningful content which was scored as 'partially present' and none of the subjects with LHD showed the presence of non-meaningful content. Thus a mild difference can be seen between LHD and RHD group in Graph 2. Thus it is suggested that none of the subjects showed any redundancy, incoherences and ambiguity in their speech. But studies have shown reduced informational content in TBI population (Chapman et al., 1992; Ehrlich, 1988; Mentis & Prutting, 1991). And another study done by Tanuja, (2004) say that information content was more affected in RHD group and was less affected in LHD and bilateral hemisphere damage (BHD) group.

3. Message Inaccuracy (MI)

Message inaccuracy was assessed by observing the presence or absence of incorrect answers to the question/confabulation within the same question frame. By definition message inaccuracy is an attempted communication which involves the relating of inaccurate/mis information. Results show that there was no significant difference at 0.05 level between the TBI subjects with LHD and RHD. But from individual scores, it is seen that one subject in LHD group showed the presence of message inaccuracy and in RHD group two subjects showed the presence with a rating as 'partially present'. Here also a very mild difference between LHD and RHD group can be seen in Graph 2.

4. Coherence

Hough & Barrow (2003) described coherence in terms of two cohesive ties, local coherence and global coherence. Ehrlich and Barry (1989), Glosser and Deser (1990), Haugh and Barrow (2003) indicated that global coherence is affected more than local coherence in TBI subjects. In an other study, one approach of discourse analysis involving examination of the cognitive functions distinguishing macrostructural and microstructural discourse processing have revealed that TBI participant demonstrates greater difficulty with global than local coherence and showed more performance variability among participants in global as compared to local coherence (Hough and Barrow, 2003; Glosser, 1993; Myers, 1999; Van Dijk & Kintsch, 1983). Local coherence is the relationship of meaning or context of verbalization with that in the immediately preceding utterance produced either by interviewer or subject. It includes relationship of continuation, repetition, elaboration, subordination, or co-ordination with the topic in the

immediate preceding utterance. Global coherence is the relationship of meaning or content of verbalization with respect to the general topic of conversation.

Individual scores were obtained for local and global coherence on the basis of five point rating scale (Appendix-A) and a comparison was made. Rating 4 denotes that the local or global coherence is present always. A rating of 3 denotes that the coherence is present most of the times but not always. Rating 2, 1 and 0 denotes that coherence was meaningful sometimes, rarely or never respectively. Table 11 shows no significant difference at 0.05 level between the TBI subjects with LHD and RHD for both local as well as for global coherence. All the normal speakers were scored with a rating of 4 indicating a good local as well as global coherence. Majority of TBI subjects with LHD showed a rating of 3 for both local as well as global coherence and among the RHD group five subjects showed a rating of 4 and five subjects showed a rating of 3 for both local as well as global coherence. Due to this reason the Graph 2 shows difference between LHD and RHD subjects performance.

In summary, both local and global coherence were affected to some extent in TBI subjects and form Table 11, it is seen that local coherence was affected slightly more than global coherence. But the difference was very subtle and so it can be concluded that local as well as global coherence was affected equally in both the groups, viz., LHD and RHD

5. The Use of Nonspecific Vocabulary (NSV)

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 referenced. Individuals displaying this difficulty also tend to overuse generic terms such as “thing” and “stuff” when more specific information is required. There are few reports which say that individuals with TBI exhibit this behavior. Here TBI subjects with LHD showed the presence of this particular behavior to a greater extent with a rating as ‘partially present’ when compared to RHD subjects which is shown in Graph 2. Statistical results showed no significant difference at 0.05 level between LHD subjects and RHD subjects.

Example:

I: Well then, what is your favorite toy?

S: *"My favorite thing is...oh, stuff"*

6. Linguistic Nonfluency (LNF)

Lingusitic nonfluency can be defined as the speaker's production disrupted by the presence of repetitions, unusual pauses, and hesitation phenomena. Both the groups have exhibited this particular behavior to a greater extent than normal speakers but there was no significant difference at 0.05 level between the LHD and RHD group. From Table 11, it is noticed that RHD group has exhibited it more compared to LHD group. This is in support with the study by Ratner (2004) in which he found that TBI individuals with pre frontal cortex damage showed the presence of dysfluencies in discourse analysis. In the present study among the many propositional aspects of discourse, linguistic nonfluency was present more in both the TBI subjects with LHD and RHD which can be observed in Graph 2.

Example:

I: When will your sister come?

S: *"sh...uh..she..um..she comes at dinner."*

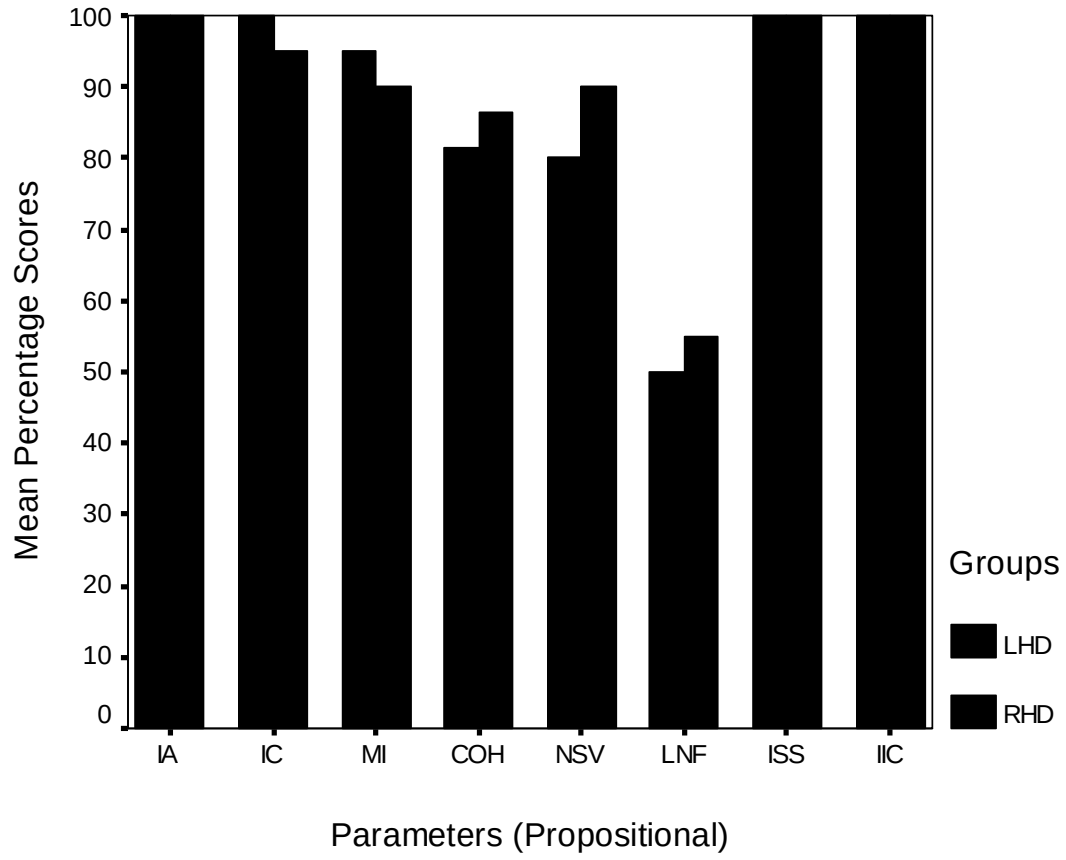
7. Inappropriate Speech Style

This 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 subjects with LHD and RHD did not show any difference in their mean and standard deviation as it is shown in Table 11. Thus between the two groups there was no significant difference at 0.05 level. Graph 2 shows very high mean value in both the group, which suggest that the subjects did not exhibit any inappropriate speech style in their conversation.

8. Inappropriate Intonational Contour

The LHD and RHD traumatic brain injured speaker's ability to embellish or contextualize his/her meaning through linguistic/tonal suprasegmentals such as pitch levels, vocal intensity and other inflectional contours was assessed and scored for the presence or absence of ineffective or inappropriate intonational contour. Both the groups did not show the presence of abnormal rising, falling, flat intonation contour with respect to a particular context as depicted in Graph 2. There was no difference in the mean and standard deviation, thus there was no significant difference between the two groups at 0.05 level.

Graph 2: Showing difference in IA, IC, MI, COH, NSV, LNF, ISS, and IIC across LHD and RHD.

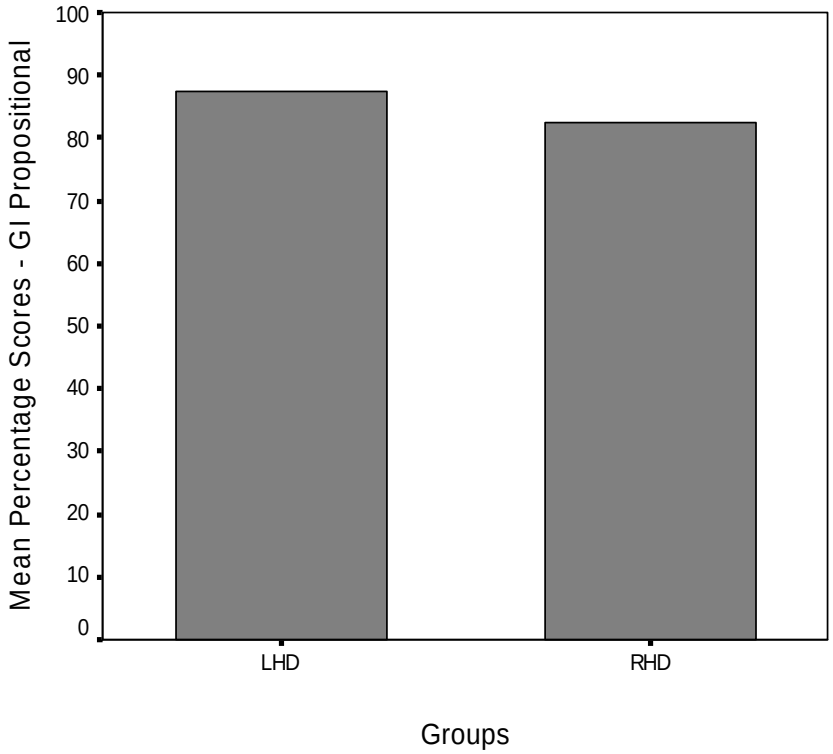


(Legend: IA- Information Adequacy, IC- Information Content, MI- Message Inaccuracy, COH- Coherence, NSV- Non Specific Vocabulary, LNF- Linguistic Nonfluency, ISS- Inappropriate Speech Style, IIC- Inappropriate Intonation Contour)

9. Gaze insufficiency

In Graph 3 the percentage score for this particular behavior in TBI subjects with LHD and RHD show no difference. According to non-parametric test there was no significant difference between the TBI subjects with LHD and RHD at 0.05 level.

Graph 3: Showing difference in GI across LHD and RHD

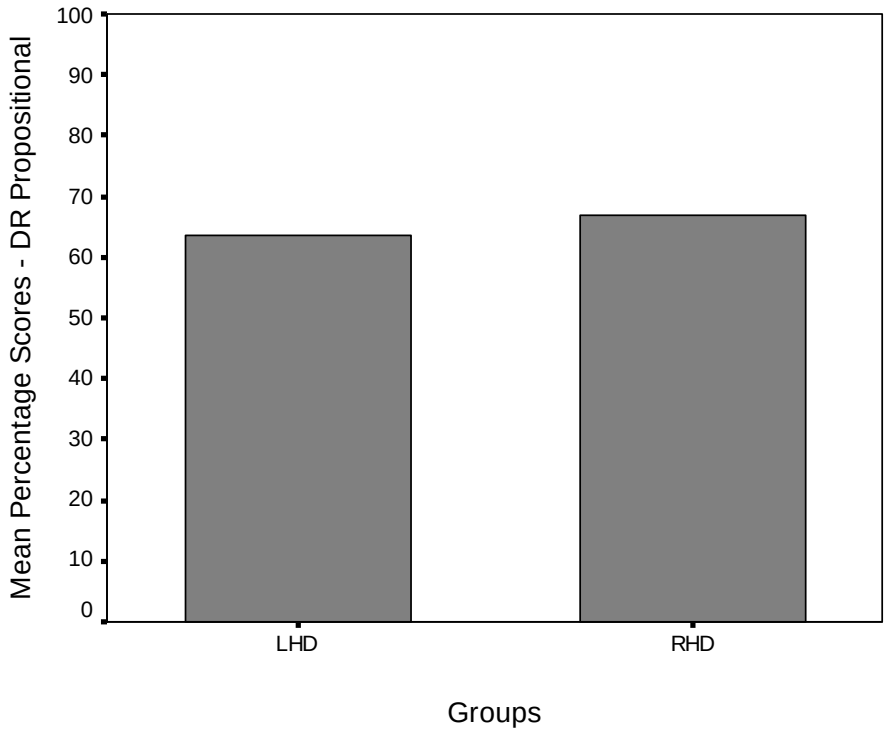


(Legend GI- Gaze Insufficiency)

10. Delayed response

Time taken by the TBI subjects with LHD and RHD in responding to any questions asked by investigator was noted using a four point rating scale (Appendix- A). The subjects in LHD group showed a delay of 2-4secs in responding to any question. In case of RHD group, two subjects showed a delay of 5-6secs and other two showed a delay of 7-8secs compared to rest of the subjects who showed similar delays as shown by LHD subjects. There was no significant difference between the TBI subjects with LHD and RHD at 0.05 level. This is clearly shown in Graph 4 where there was no difference between the two groups.

Graph 4: Showing difference in DR across LHD and RHD.



(Legend DR- Delayed Response)

II. Non propositional aspects of discourse

(e) Turn taking

Turn taking refers to sharing of time and sequencing of contributions evident in any conversation. It is an important feature of conversation, which is affected in TBI individuals. Under this section six features were considered and the presence or absence of these features were noted using a perceptual rating scale (Appendix-A). Performance of TBI subjects with LHD and RHD was compared and each one of them is listed in Table 12.

Table 12: Showing the mean, standard deviation and results of Mann-Whitney test for (e) turn taking

Sl No.	Parameters	Groups	Mean	Std. Deviation	Result of Mann-Whitney test (p)
1.	Initiation of turn	LHD	0.40	0.51	
		RHD	0	0	0.029
2.	Taking time to start a turn	LHD	0.40	0.51	
		RHD	0.60	0.51	NS
3.	Non contingent turn	LHD	1.30	0.94	
		RHD	1.70	0.48	NS
4	Unable to take prosodic cues	LHD	1.20	0.63	
		RHD	1.20	0.42	NS
5	Rapid shift in the mode	LHD	2	0	
		RHD	2	0	NS
6	Persistent in listeners or speakers mode	LHD	0.60	0.51	
		RHD	0.80	0.42	NS
Turn taking(TT)		**LHD**	**5.90**	**1.59**	
		RHD	**6.30**	**0.48**	**NS**

(NS- Not significant at 0.05 level)

1. Initiation of Turn

Normal subjects are seen to initiate many turns in a conversation. In contrast, TBI subjects are reported to take less initiation of turns. They initiate very few turns in conversation (Milton, Prutting and Binder, 1984). As seen in Table 12, there is a significant difference at 0.05 level with respect to the 'presence' of this particular behavior between the TBI subjects with LHD and RHD. This result is in support with the findings of Milton, Prutting and Binder (1984). RHD group failed completely to exhibit this feature. i.e. they were very reluctant to initiate the turns. But few subjects in LHD groups were able to initiate the turns.

2. Time taken to start the turn

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 subjects with LHD and RHD showed the presence of this particular feature. Subjects took little time to start the turn. However, statistically there was no significant difference at 0.05 level between the TBI subjects with LHD and RHD.

3. Non contingent turn

According to Schegloff (1987), normal individuals are reported to take contingent turns in conversation. A comparison was made between the TBI subjects with RHD and LHD for the given feature. Results suggest that there was no significant difference between the TBI subjects with LHD and RHD at 0.05 level, although the individual score or the mean value showed the presence of this particular feature. Among the LHD group three subjects showed the presence of this behavior and in RHD group three subjects showed the presence of this behavior with a rating as 'partially present'. This is supported by literature where, according to Milton et al. (1984) and Hartley (1994), 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, consequent to which they concentrated on one particular word and started speaking in relation to that word in a non-coherent way.

4. Unable to take prosodic cues

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 converser is able to understand the prosodic cues in a sentence to take over the turn. Results from Table 12 show that there was no significant difference at 0.05 level between the TBI group with LHD and RHD. However, both the groups failed to take prosodic cues from the conversation partner in order to take over the turn. This observation supports the proposition by Milton (1984) and Hartley (1995) who reported that TBI subjects had problem in understanding prosodic cues to take over the turn.

5. Rapid shift in the mode

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 none of the TBI subjects with LHD and RHD exhibited this particular behavior and there was no significant difference between the groups at 0.05 level.

6. Persistent in listeners or speakers mode

In normal conversation, it is expected that only when one communication partner stops, the other partner initiate the turn. Results showed that there was no significant difference at 0.05 level between the TBI subjects with LHD and RHD. But all subjects in both the groups showed the presence of this particular behavior in their conversation. In LHD group four subjects had a scoring as ‘completely present’ and six subjects had a

scoring as ‘partially present’. In case of RHD group except two with a scoring as ‘completely present’ all the other subjects had a scoring as ‘partially present’. These subjects 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 with a study by Mc Tear and Conti Ramsden (1992), who has found similar finding in TBI population where in they persist longer in either speaking or listening mode. This conversation behavior can be attributed to ‘shifting attention’ seen in TBI individuals. It seems like TBI individuals were unable to focus on a particular sentence and hence were unable to comprehend some meanings of the sentence and in the same state started speaking on the topic.

In summary, all the TBI subjects with LHD and RHD showed some amount of deviancy in turn taking when compared to normal speakers. This result is in support with the previous literature findings. But as seen in Table 12, there is no significant difference between TBI subjects with LHD and RHD at 0.05 level. From the mean score it is seen that TBI subjects with LHD showed poor turn taking behavior compared to RHD showing high mean value which suggested the better use of turn taking behavior. Graph 3 depicts that the two groups show use of turn taking behavior to some extent which is almost equal.

(f) Conversational repair

Conversation repair is a necessary strategy present in the conversation to convey a message in an effective manner. In the study, the presence or absence of too much use of

conversation repair was assessed and scored using a three point perceptual rating scale (Appendix-A). In this section an attempt was made to note the conversation repair under three different subcategories like 'self repair through repetition', 'revisions through clarification' and 'use of other initiated repairs'.

Table 13: Showing the mean, standard deviation and results of Mann-Whitney test for (f) conversation repair and (g) revision behaviors

Sl No.	Parameters	Groups	Mean	Std. Deviation	Result of Mann-Whitney test (p)
1.	Too much of self repair through repetition (CRA)	LHD	1.10	0.87	NS
		RHD	0.50	0.84	
2.	Too much of revisions through clarification (CRB)	LHD	1.10	0.87	NS
		RHD	1.00	0.66	
3.	Too much of other initiated repair (CRC)	LHD	1.40	0.69	0.03
		RHD	0.60	0.84	
Conversation Revision (CR)		**LHD**	**3.60**	**2.36**	**NS**
		RHD	**2.10**	**1.52**	
Revision Behavior (RB)		**LHD**	**1.40**	**0.84**	**NS**
		RHD	**1.20**	**0.42**	

(NS- Not significant at 0.05 level)

1. Too much of self repair through repetition

Results suggested no significant difference at 0.05 level between TBI subjects with LHD and RHD. But the individual scores in RHD group indicated that except four subjects all the other subjects used too much of self repair through repetition. In LHD group except four subjects all other subjects used too much of self repair through

repetition in their conversation. Thus subjects with RHD used more self repetition as a repair strategy compared to LHD. This result is in support with study by Tanuja (2004), who found that within TBI group, RHD subjects showed more of self repair than LHD subjects. The possible reasons for use of too much self repetition could be due to variability in terms of group features. Many subjects showed disfluencies, because of which there were many self corrections observed.

2. Too much of revisions through clarification

Results suggest no significant difference at 0.05 level between TBI subjects with LHD and RHD as seen in Table 13. But the individual scores in RHD group indicated that except two subjects all the other subjects used too much of revisions through clarification. In LHD group except four subjects all other subjects used too much of revisions through clarification in their conversation. Thus subjects with RHD used more revisions through clarification compared to LHD. This result contradicts the result 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 subjects made an effort to use clarifications given by the investigator and tried using the same as revisions.

3. Too much of other initiated repair

In the Table 13, it can be seen that there was a significant difference at <0.05 level between the TBI subjects with LHD and RHD. This particular behavior was seen when

subjects 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 less perception of their own speech and they do not try to self-initiate the repair. Another reason is because of 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 subject. Graph 3 show a very clear difference between the TBI subjects with LHD and RHD, where the LHD group show higher mean value which suggest that they use too much of conversation repair strategies compared to RHD group.

g) Revision Behaviors

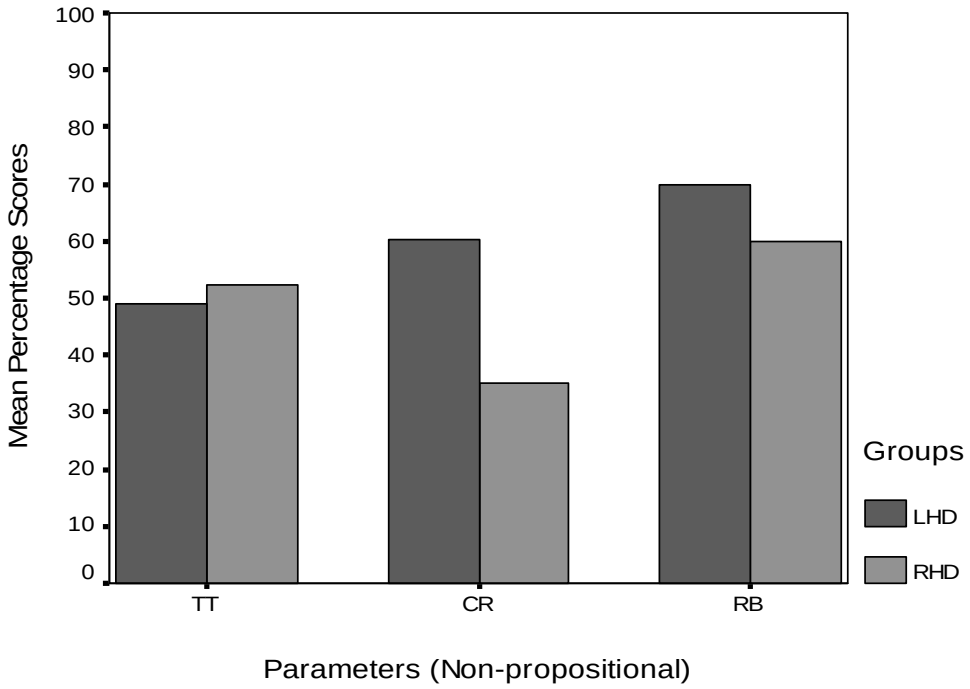
Revision behavior was observed and assessed based on the presence or absence of false starts and self-interruptions (Appendix-A). It was scored using a five point perceptual rating scale (Appendix-A). In Table 13, results show no significant difference at 0.05 level between the TBI subjects with LHD and RHD. From the individual scores it was seen that in the RHD group, all the subjects showed the presence of revision behavior except two subjects who did not show any revision behavior. In case of LHD group except four subjects all the others showed the presence of revision behaviors in terms of false start and self interruptions.

Example:

I: *I don’t have any partner to play.*

S: *"Well, you see...if you want-- sometimes when you ca-- a lot of times when you can't go out, you can just play with your twin brothers."*

Graph 5: Showing difference in TT, CR and RB across LHD and RHD



(Legend TT- Turn Taking, CR- Conversation Repair, RB- Revision Behavior)

Picture Description Task

I. Propositional aspects of discourse in picture description task

(a) Failure to Structure Discourse

Table 14: Showing the mean, standard deviation and results of Mann-Whitney test for the feature (a) failure to structure discourse.

Serial No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Lacks forethoughts	LHD	1.60	0.51	
		RHD	1.30	0.67	NS
2.	Lacks organizational planning	LHD	1.60	0.51	
		RHD	1.10	0.87	NS
Failure to Structure Discourse		**LHD**	**3.20**	**0.91**	
		RHD	**2.40**	**1.50**	**NS**

(NS- Not significant at 0.05 level)

(a) Failure to Structure Discourse

Failure to structure discourse occurs when the discourse of the speaker lacks forethought and organizational planning. Due to these characteristics, the discourse will be confusing--even if all of the propositional content is present. In the present study, this feature is assessed and scored indirectly by observing the presence or absence of behaviors like 'lacking forethought' and 'lacking organizational planning' in speech of experimental groups. There was no significant difference between the LHD group and the RHD group at 0.05 level. In LHD group few subjects had mild problem in structuring discourse. But in RHD group one subject showed poor forethought and organizational planning.

Example:

I: Show the picture (Western Aphasia Battery, Kertesz, 1979), of a picnic spot.

S: *ondhu samudra ide……… pakka uduga nintidane…. Ondu kuri ide…. alli ondu beTa ide mate ondu karu ide….illa ondu Shale tara makLu horagaDe a:Ta aDtidare.. Shantawada watavarna iro hange ide.. ondu hengasu kofi berastaidaLe…. Ondu adagu ide.. ivaru viShranti madtidare……ondu uDuga gaLi paTa arastaiddane…ellaru ondu picnic tara oragaDe bandidare.. ondu karu ide.. ondu doDa mara ide.. ondu mane ide…..*

(One ocean is there… next to it one boy is standing.. one goat is there. There is one hill and one car is there. No like one school children are playing outside. It seems to be a peaceful place. One lady is preparing coffee. One ship is there. These people are taking rest. One boy is playing with a kite. It seems like all have come out for a picnic.. One car is there.. One big tree is there, one house is there)

As seen in the example, the subject has not formulated his thought whether to interpret the presented picture as “picnic spot” or as “school setup”. The subject’s discourse looks confusing and there is no organization in describing the presented picture. There are no studies which support this particular finding which is mainly based on picture description task. However, the literature suggests that characteristics associated with Pre Frontal Cortex Damage (PFCD) patients’ discourse production, specifically in the context of story-telling, include: difficulty recalling narrative components of a story, processing inference and appreciating the story’s thematic aspects or gist (Frattali & Grafman, in press; Zalla et al., 2002); confabulation; embellishment;

topic stray; faulty anaphoric reference and links; faulty temporal sequencing of events and cause/effect relations (Craig & Frattali, 2000; Frattali & Grafman, in press; Ferstl et. al, 1999); loss of moralistic meaning (Zalla etal., 2002); misinterpreting abstract or implicit information; and producing story tell/retells that either contain intrusive detail or lack detail (Frattali & Grafman, in press).

Summing up, both the TBI subjects with LHD and RHD exhibit this particular feature of disorganized and poor planning of discourse. The mean value show RHD group performing poorer than LHD group and the same results is depicted in the Graph 6 very clearly.

(b) Communication Intent

Communication intent in speech of TBI subjects with LHD was compared with that of RHD. This particular feature was measured for its presence or absence using three point perceptual rating scale (Appendix-B).

Table 15: Showing the mean, standard deviation and results of Mann-Whitney test for (b) communication intent.

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Starts picture description (PCCA)	LHD	1.80	0.63	NS
		RHD	1.50	0.52	
2.	Asks for too much of assistance in understanding picture (PCCB)	LHD	0.70	0.82	NS
		RHD	0.80	1.03	
3.	Criticizes the picture by	LHD	0.80	0.78	

	agreeing/disagreeing to a part in the picture (PCCC)	RHD	0.80	0.91	NS
4.	Fabricates/ imagines events (PCCD)	LHD	1.80	0.42	0.025
		RHD	1.20	0.63	
Communication Intent (PCCI)		**LHD**	**5**	**1.69**	**NS**
		RHD	**4.30**	**2.11**	

(NS- Not significant at 0.05 level)

1. Starts picture description

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. In the Table 15 the mean value is almost same suggesting equal performance in both the groups.

2. Asks too much of assistance in understanding picture

Few subjects in both the group asked too much of assistance in understanding the given picture. And both asked at equal extent because of which there was no much difference in the mean value. The reason for this could be, poor ability to structure discourse because they lack forethought, disorganization and poor planning ability in their speech. There was no significant difference between the TBI subjects with LHD and RHD at 0.05 level.

3. Criticizes the picture by agreeing/disagreeing to a part in the picture

Here also, subjects of both the groups showed this particular feature during picture description task. And criticized the picture at equal extent thus the mean value is same for both the groups. Statistically there was no significant difference between the

TBI subjects with LHD and RHD at 0.05 level. Individuals' differential perception of concepts is probably the reason for the presence of this feature.

Example:

S: *piknik dzagadalli mane yake ide?*(In picnic spot why house is there?)

I: *adu gesT a:us agirbahudu*.. (It could be a guest house)

S: *piknik dzaga andre flag yake ide?* (If it's a picnic spot why this flag hoisted here?)

I: *irabardu adare I pichar alli ide* (It should not be there but in this particular picture its there)

S: K.. … *I agree with you*

4. Fabricates/ imagines events

There was significant difference between TBI subjects with LHD and RHD at <0.05 level for this particular feature. LHD group showed this feature more compared to RHD group, they imagined the picture to be a 'school setup' and 'wander'. This result is in contradiction with other literature finding where the discourse production deficits associated with RHD show difficulties in integrating information for generating some types of inferences (Myers & Brookshire, 1996; Rehak, Kaplan, Weylman, Kelly, & Brownell, 1992), revising interpretations (Brownell et al., 1986; Tompkins, Bloise, Timko, & Baumgaertner, 1994), or selecting the most plausible meaning of a passage (Tompkins, Baumgaertner, Lehman, & Fassbinder, 2000; Tompkins, Fassbinder, Blake, Baumgaertner, & Jayaram, 2004; Tompkins, Lehman-Blake, Baumgaertner, & Fassbinder, 2001).

Overall, there was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. But in Graph 6**,** LHD subjects are shown having better communication intent compared to RHD subjects. Among the sub-variables of communication intent, fabricating events/imaging events feature showed significant difference between the TBI subjects with LHD and RHD. However there are not many studies which are mainly based on picture description task to support the present findings.

(c) Topic management

Speech of TBI subject with LHD and RHD group was analyzed for this aspect of conversation under six different sub-features as shown in Table 16, Mann-Whitney test was applied to infer the significance of the obtained scores. Following results were obtained for each of the parameter under topic management.

Table 16: Showing the mean, standard deviation and results of Mann-Whitney test for (c) topic management

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Irrelevantly introducing topics	LHD	1.60	0.51	NS
		RHD	1.60	0.51	
2.	Rapid topic shift	LHD	1.60	0.84	NS
		RHD	1.60	0.69	
3.	Non coherent topic changes/Inappropriate topic changes	LHD	1.60	0.84	NS
		RHD	1.70	0.67	
4.	Perseveration in the topics	LHD	2.00	0	NS
		RHD	1.80	0.63	

5.	Extra elaboration of topics	LHD	1.50	0.84	NS
		RHD	1.90	0.31	
6.	Minimal elaboration	LHD	1.40	0.84	NS
		RHD	1.60	0.51	
Topic management		**LHD**	**9.70**	**2.71**	**NS**
		RHD	**10.20**	**2.25**	

(NS- Not significant at 0.05 level)

1. Irrelevantly introducing topics

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. In both the groups the similar mean value in Table 16, indicates the presence of this particular feature in speech of picture description task. However this result is in support with the study by Mentis and Prutting, (1991) and Cohelo, Liles and Duffy, (1991) who found that TBI individuals produced unrelated topic changes in their discourse.

2. Rapid topic shift

There was no significant difference between the TBI with LHD and RHD group at 0.05 level. But few subjects in both the group showed the presence of rapid topic shift, which could be due to poor ability in structuring discourse. In LHD group two subjects show complete shift in topic while in RHD group also, two subjects showed rapid shift in topic scored as 'partially present' (Appendix-B).

Example:

I: Show the picture (Western Aphasia Battery, Kertesz, 1979), of a picnic spot.

S: *ellaru ondu picnic tara oragaDe bandidare.. ondu karu ide.. ondu doDa mar aide..*

ondu mane ide….. ondhu samudra ide…..…. pakka uduga nintidane…. Ondu kuri ide…. alli ondu beTa ide mate ….illa ondu Shale tara makLu horagaDe a:Ta aDtidare..…. ondu uDuga gaLi paTa arastaiddane

In this example the subject moved form one particular topic to another very rapidly.

3. Non coherent topic changes/Inappropriate topic changes

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Both showed the presence of inappropriate topic shift / non-coherent topic shift.

Example:

I: Show the picture (Western Aphasia Battery, Kertesz, 1979), of a picnic spot.

S: *ondu karu ide.. ondu doDa mar aide.. ondu mane ide….. ondhu samudra ide…..…. pakka uduga nintidan.. ondu hengasu kofi berastaiddaLe. Kutidare…namma mane road alli chappal holita kutukonDu .. pakadali ondu Dabba iTirtare.. illi hobba chappali holiyavanu iddane…*(One car is there. One big tree is there. One house is there. One ocean is there……. Near by one boy is standing. One lady is preparing coffee… They are sitting. In my street road they stitch chappal. Next to them they keep one box. Here one cobbler is there)

In the above example one subject described the picture inappropriately and which was non-coherent with the topic of 'picnic spot'

4. Perseveration in the topics

There was no significant difference between the TBI group with LHD and RHD group at 0.05 level. From the individual scores it was seen that none of the subjects in LHD group showed perseveration in the topics. But the subjects in RHD group showed little amount of perseveration in the topic. There is no supporting study on picture description task which talk about the difference between the LHD and RHD group.

5. Extra elaboration of topics

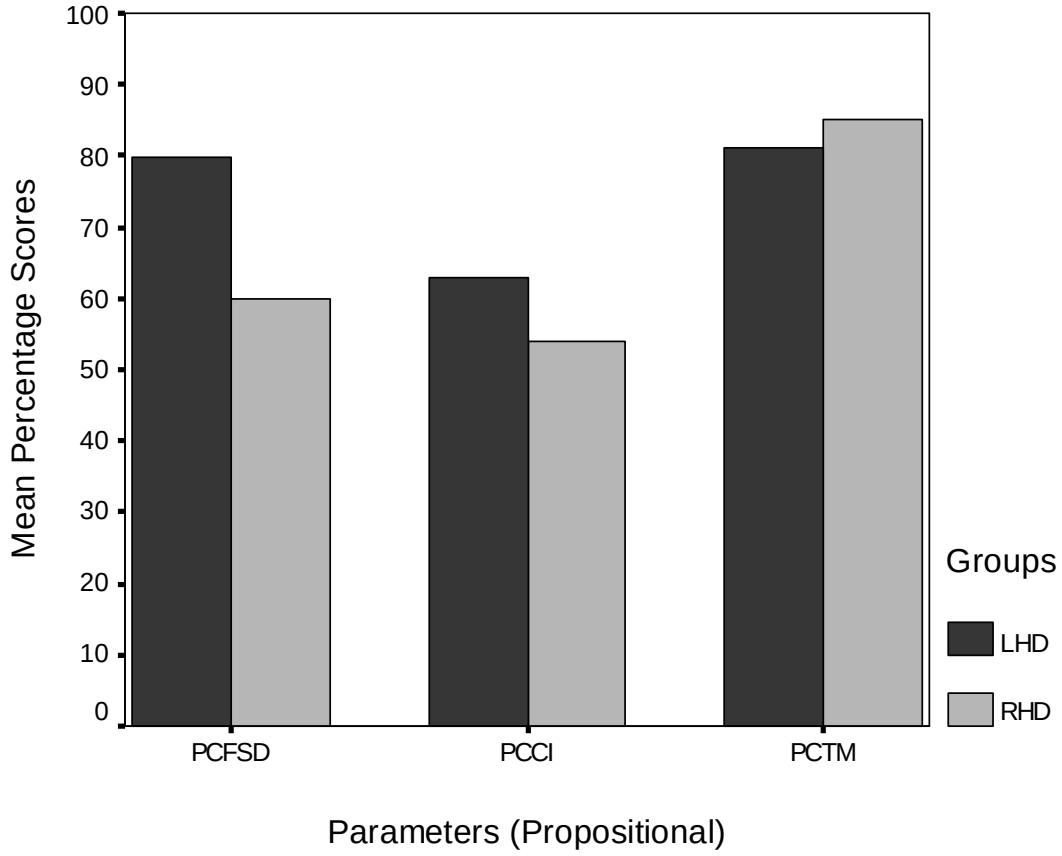
There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Few subjects in both the groups showed this particular behavior, because they showed the features of imaging events which may lead to extra elaboration of topics.

6. Minimal elaboration

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level.

In summary, it was seen that, none of the parameters under topic management showed significant difference at 0.05 level between TBI subjects with LHD and RHD, but the mean scores and the individual scores indicated that LHD group was more affected than RHD group for the feature ‘failure to structure discourse’ and for the feature ‘communication intent’ while for ‘topic management’ both the groups showed equal performance as it is shown in Graph 6.

Graph 6: Showing difference in PCFSD, PCCI and PCTM across LHD and RHD



(Legend PCFSD- Failure to Structure Discourse, PCCI- Communication Intent, PCTM- Topic Management)

(d) Other propositional aspects of discourse

Table 17: Showing the mean, standard deviation and results of Mann-Whitney on (d) other propositional aspects of discourse.

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Information adequacy	LHD	2	0	NS
		RHD	1.90	0.31	

2.	Information content	LHD	1.60	0.51	
		RHD	1.60	0.51	NS
3.	Message Inaccuracy	LHD	1.60	0.84	
		RHD	1.30	0.67	NS
4a.	Global coherence	LHD	3	0.94	
		RHD	3	0.94	NS
4b.	Local coherence	LHD	2.90	0.87	
		RHD	3.50	0.52	NS
4.	Coherence	LHD	5.90	1.79	
		RHD	6.50	1.35	NS
5.	Use of Nonspecific Vocabulary	LHD	1.40	0.51	
		RHD	1.30	0.82	NS
6.	Linguistic Nonfluency	LHD	1.10	0.73	
		RHD	0.90	0.56	NS
7.	Inappropriate Speech Style	LHD	2	0	
		RHD	2	0	NS
8.	Inappropriate Intonation Contour	LHD	2	0	
		RHD	2	0	NS
9.	Delayed response	LHD	2.10	0.31	0.04
		RHD	1.50	0.84	
10.	Gist of information (in secs)	LHD	85.10	59.48	NS
		RHD	115.66	78.27	

(NS- Not significant at 0.05 level)

1. Information adequacy

The presence or absence of information adequacy was assessed and scored using a five point rating scale (Appendix-B). There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Subjects in both the group showed sufficient amount of information adequacy in their speech as shown in Graph 7.

2. Information content

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. But few subjects showed poor information content because there was an inappropriate topic shift which was non-coherent with the main topic. The individual scores of both the group were equal as shown in Graph 7 and it is seen in Table 17, the mean value is also equal for both the group.

3. Message Inaccuracy

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Few subjects showed the presence of this feature, this could be because of poor forethought in their speech. On the basis of individual scores, message inaccuracy was found to be more present in few subjects with RHD compared to LHD which is depicted in Graph 7.

4. Coherence

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. In summary, both local and global coherence are affected to some extent in TBI subjects. Coherence at global level and local level both the subjects showed the presence of this feature with a rating 'present most of the time' (Appendix -B). At the level of mean value there is a difference as mentioned in Table 17, Coherence may be affected due to poor ability in structuring discourse. But the difference was very subtle so it can be concluded that local as well as global coherence was affected equally in both the groups viz LHD and RHD which is depicted in Graph 7.

5. Use of Nonspecific Vocabulary

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. In Table 17, the mean value suggests the use of nonspecific vocabulary by both the group at equal extent which is depicted in Graph 7. Example of one subject is shown below:

Example:

S: *ivaru kutidare.. ivaru kofi berastidare mate. Ivaru nitidare.mate Idu nintide.. mate amele illi ondu kar nintide.. amele ondu idu TeprecoDDar ide.. ondu idu… ide* (They are sitting.. She is preparing coffee.. He is standing.. This is standing.. then then here one car is standing.. then one this.. tape recorder is there. One this thing is there)

6. Linguistic Nonfluency

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Subjects in both the group show the presence of this particular feature in their discourse. In Table 17, there was no much difference in the mean value of both the groups. Example of one subject's speech showing linguistic nonfluency is below:

Example:

S: *o o o ondu manuShya pu.pu….pustaka odtidare… i.i.i.illi ondu k k karu ide…… o o o. ondu doDa mar aide.. ondu mane ide….. ondhu samudra ide……papa pakka uduga nintidan.. ondu hengasu kofi berastaiddaLe.*

In Graph 7, linguistic nonfluency is the one which is more affected compare to other aspects of discourse. Here little difference can be seen between the LHD group and

the RHD group. Subjects in LHD group show more linguistic nonfluencies compared to subjects in RHD group.

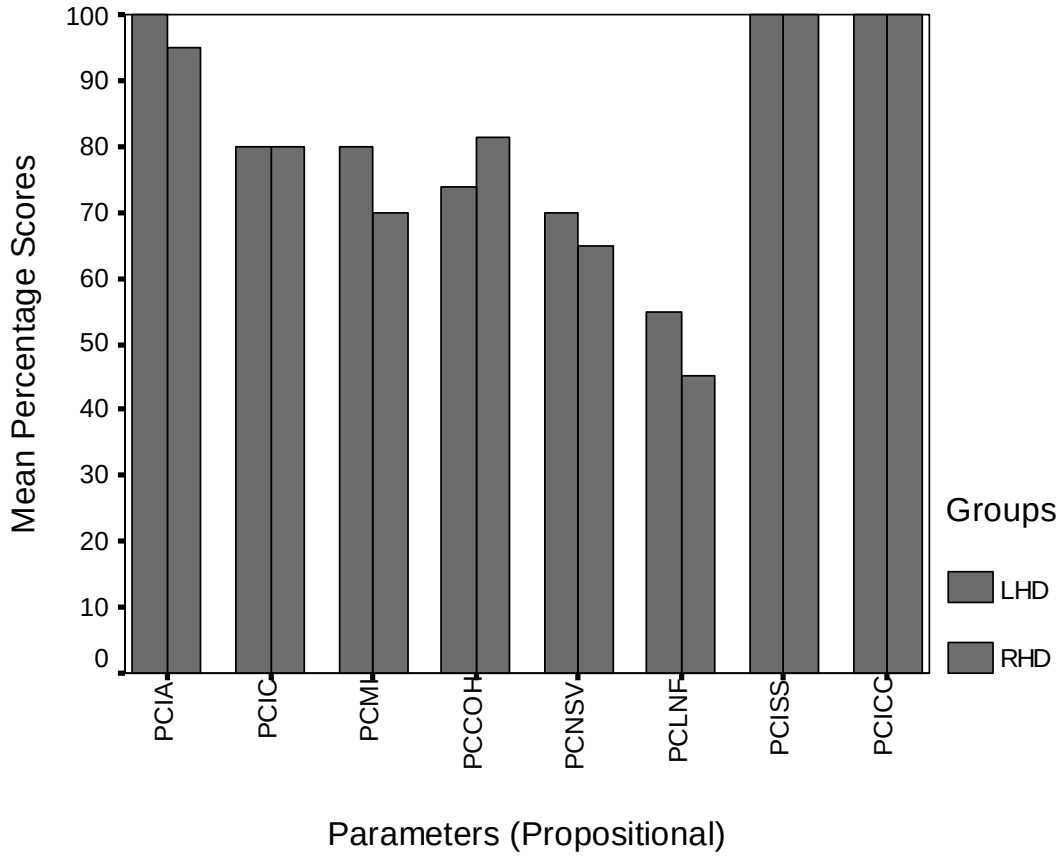
7. Inappropriate Speech Style

This particular feature was not present in both the groups. There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Graph 7 show very high mean percentage scores in both the groups, which suggest that the subjects did not exhibit any inappropriate speech style in their conversation.

8. Inappropriate Intonation Contour

Both the groups did not show the presence of abnormal rising, falling, flat intonation contour with respect to a particular context as it is shown in Graph 7. There was no difference in mean and standard deviation, thus there was no significant difference between the two groups at 0.05 level.

Graph 7: Showing difference in PCIA, PCIC, PCMI, PCCOH, PCNSV, PCLNV, PCISS and PCICC across LHD and RHD



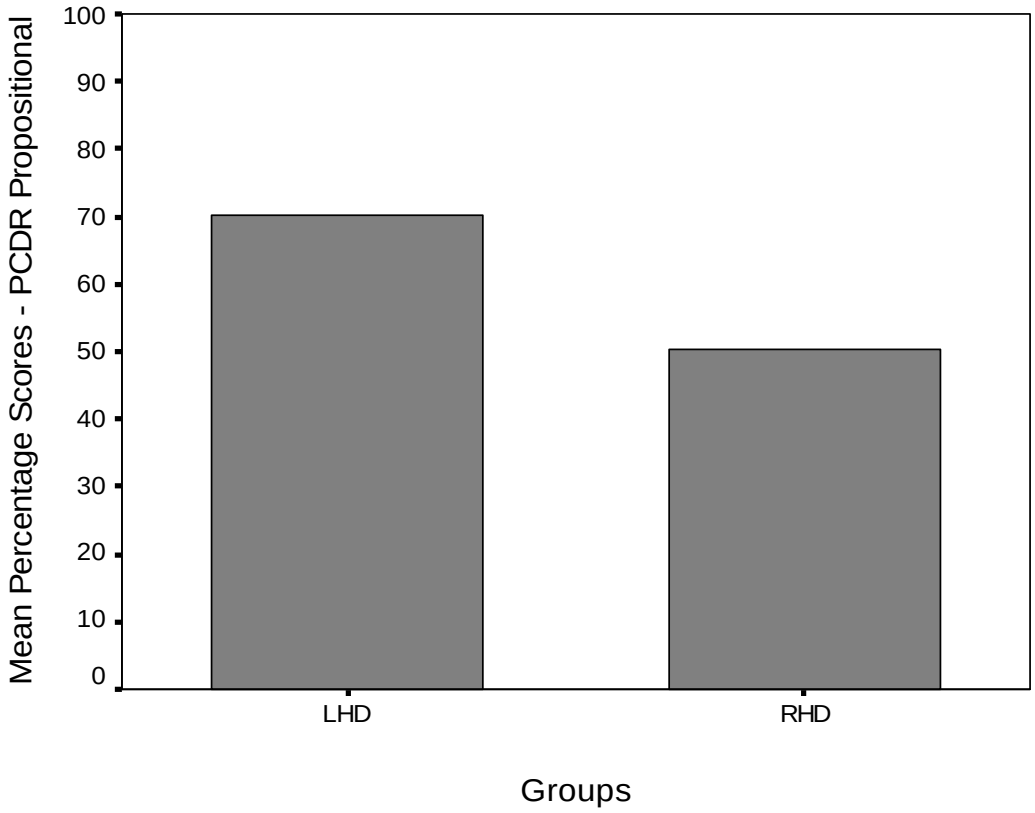
(Legend PCIA- Information Adequacy, PCIC- Information Content, PCMI- Message Inaccuracy, PCCOH- Coherence, PCNSV- Non Specific Vocabulary, PCLNF- Linguistic Nonfluency, PCISS- Inappropriate Speech Style, PCIIC- Inappropriate Intonation Contour)

9. Delayed response

Time taken by the TBI subjects with LHD and RHD in describing the picture was noted using a four point rating scale (Appendix- B). The subjects in LHD group showed a delay of 2-4secs. In case of RHD group, two subjects showed a delay of 7-8secs and rest all showed a delay of 2-4secs. Statistically there was significant difference between the

TBI subjects with LHD and RHD at <0.05 level. This is clearly shown in Graph 4 where there is difference between the two groups. Here the RHD group taking more time to describe the picture compared to LHD group.

Graph 8: Showing the difference in mean percentage scores of DR across LHD and RHD group



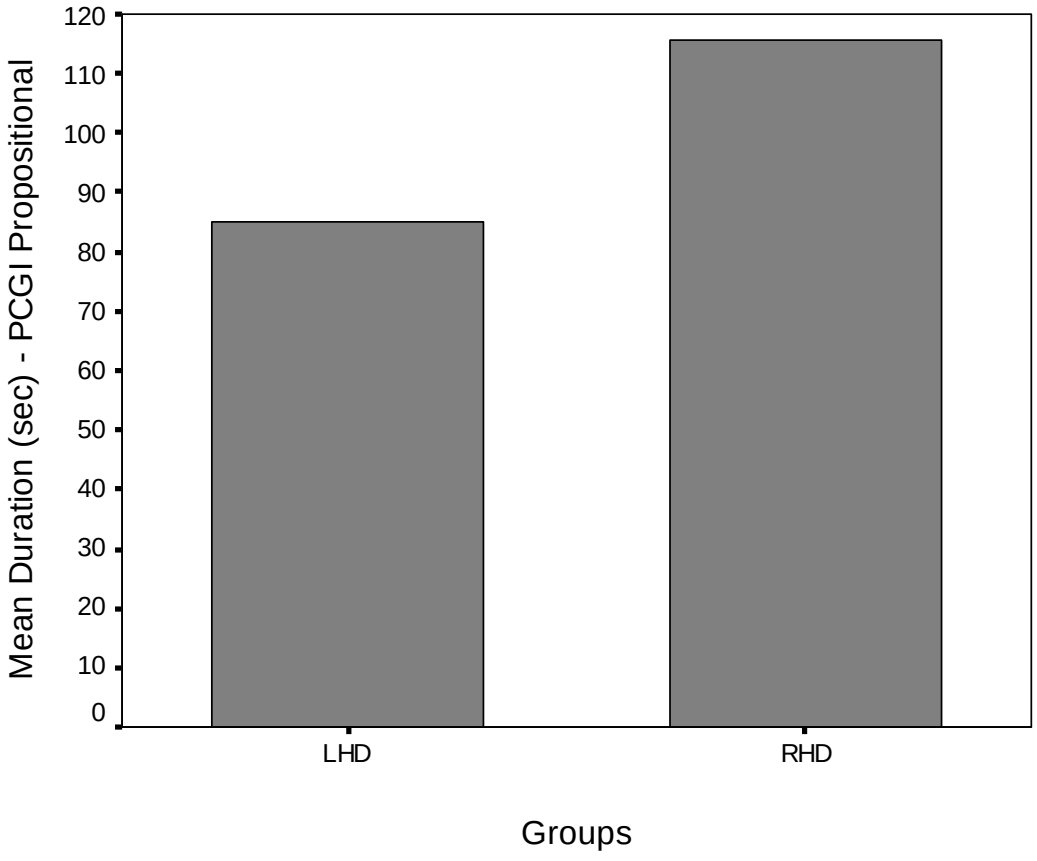
(Legend DR- Delayed Response)

10. Gist of Information

Time taken by every subject to give the gist of information was converted into percentage score and was statistically analyzed to see the significant difference between the two groups. Results showed no significant difference between the TBI subjects with

LHD and RHD at 0.05 level. But Graph 9 shows, the RHD group taking more time to give the gist of information compared to LHD group. This result is in support with the finding of Frattali & Grafman, in press; Zalla et al., (2002) who reported that subjects with RHD having difficulty in recalling narrative components of a story, processing inference and appreciating the story's thematic aspects or gist specifically in the context of story-telling task. There is no literature based on single picture description task which can support the present finding.

Graph 9: Showing the difference in mean duration (sec) of GI across LHD and RHD group



(Legend GI- Gist of Information)

(e) Repair Strategies

Repair strategies may be present in the discourse to convey a message in an effective manner. In the study, the presence or absence of too much use of repair strategies was assessed and scored using a three point perceptual rating scale (Appendix-B). In this section, an attempt was made to note the repair strategies under three different subcategories like 'self correction', 'revisions through repetition / clarification /revision', 'use of other initiated repairs' and 'request for clarification'.

Table 18: Showing the mean, standard deviation and results of Mann-Whitney test for (e) repair strategies and (f) revision behaviors

Sl No.	Parameters	Groups	Mean	Std. Deviation	Results of Mann-Whitney test (p)
1.	Too much of self correction (PCRA)	LHD	1.80	0.42	NS
		RHD	1.30	0.67	
2.	Too much of revisions through repetition /clarification / revision (PCRB)	LHD	1.50	0.52	NS
		RHD	1	0.81	
3.	Too much of other initiated repair (PCRC)	LHD	0.60	0.69	NS
		RHD	0.80	0.63	
4.	Too much of request for clarification (PCRD)	LHD	0.50	0.52	NS
		RHD	0.80	0.91	
Repair Strategies (PCRBS)		LHD	4.40	1.07	NS
		RHD	3.90	2.13	
5.	Revision Behavior (PCRS)	LHD	1.30	0.48	NS
		RHD	1.60	0.51	

(NS- Not significant at 0.05 level)

1. Too much of self correction

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. In Table 18, the mean value suggest the RHD group using too much of self correction as a repair strategy compared to LHD group. This result is in support with Tanuja, (2004), who found that within TBI group RHD subjects showed more of self repair than LHD subjects. The possible reasons for use of too much self correction could be due to confusion, which was the result of poor ability in structuring discourse.

2. Too much of revisions through repetition /clarification / revision

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. From the individual scores it was noticed that both the group use this particular feature in their discourse. In Table 18, RHD group use more repair strategies compared to LHD group. This result contradicts with the result found by Marsh and Knight, (1991) where the TBI individuals does not ask for clarification even if they do not understand the conversation. Literature on the basis of picture description task is not available. The reason for observation of too much use of repair strategies in the speech of experimental group in the present study can be reasoned on the basis of their inability to add on further information in speech in terms of giving clarification. Few subjects while using self correction as a repair strategy used more repetitions. And few subjects made an effort to use clarifications given by the investigator and tried using the same as revisions.

3. Too much of other initiated repair

There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. Subjects in both the group showed the presence of this particular

behavior to an equal extent but a very mild difference in mean can be noticed from Table 18, few subjects in both the groups were not able to give the gist of information from the presented picture even after the target time interval. But the subjects made an effort to give the gist of information by using too much of investigator initiated repairs.

4. Too much of request for clarification

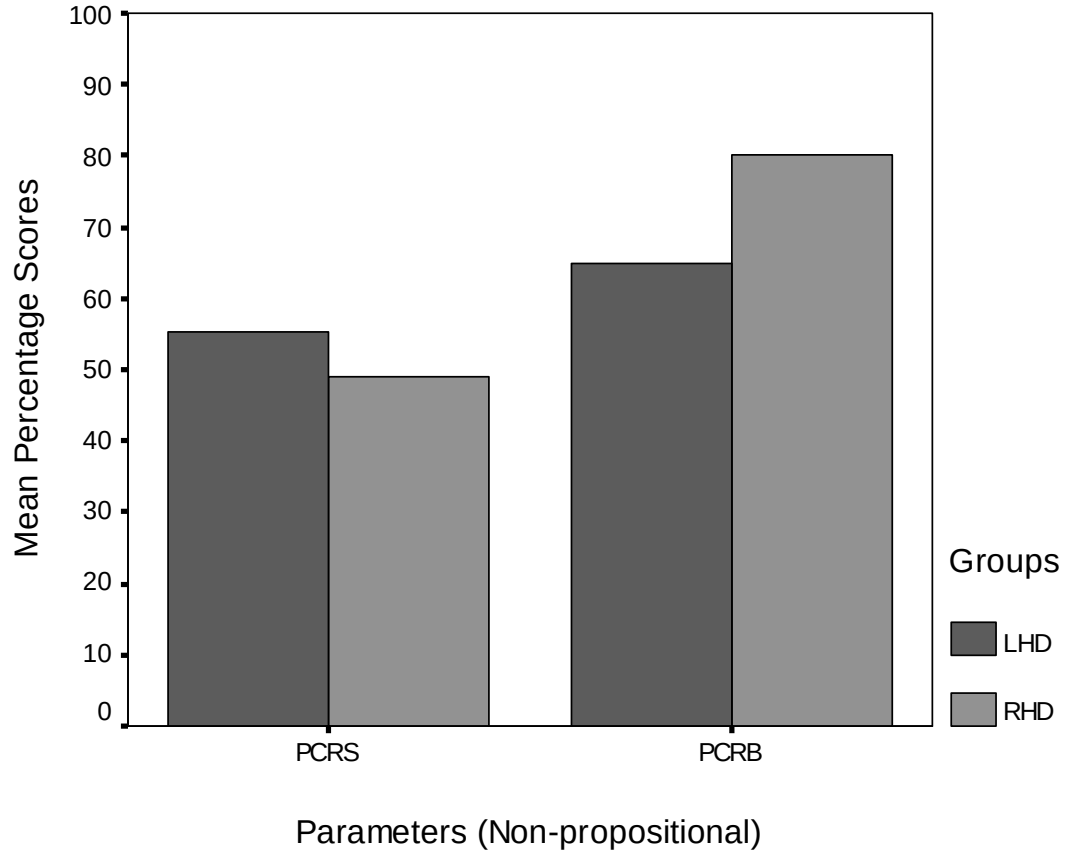
There was no significant difference between the TBI subjects with LHD and RHD group at 0.05 level. The reason for the presence of this particular behavior may be due to the confusion that occurred as a result of poor discourse structure. Very little difference in mean between LHD and RHD group can be noticed in Table 18.

Summing up, there was no significant difference between the TBI subjects with LHD and RHD groups w.r.t repair strategies at 0.05 level. The RHD group used too much of repair strategies compared to LHD group which is depicted in Graph 10. This result support an Indian study by Tanuja (2004), who reported that TBI subjects with RHD group use more repair strategies compared to LHD group.

(f) Revision Behavior

There was no significant difference between the TBI subjects with LHD and RHD at 0.05 level. Subjects in both the group showed the presence of revision behaviors. The LHD group showed more revision behavior compared to RHD group.

Graph 10: Showing difference in PCRS and PCRB across LHD and RHD group



(Legend PCRS- Repair Strategies, PCRB- Revision Behaviors)

Comparison made between LHD group, RHD group and normal speakers w.r.t non-propositional and propositional task in percentage

A comparison was made at the level of propositional and non-propositional aspects of discourse in communication and in picture description tasks among the three groups using Kruskal-Wallis test. The pair-wise comparisons were made with Mann-Whitney U test. Experimental group consisted of ten TBI subjects with LHD, ten TBI subjects with RHD and twenty normal speakers as control group. Here the normal speakers showed very good percentage of performance when compared to TBI group.

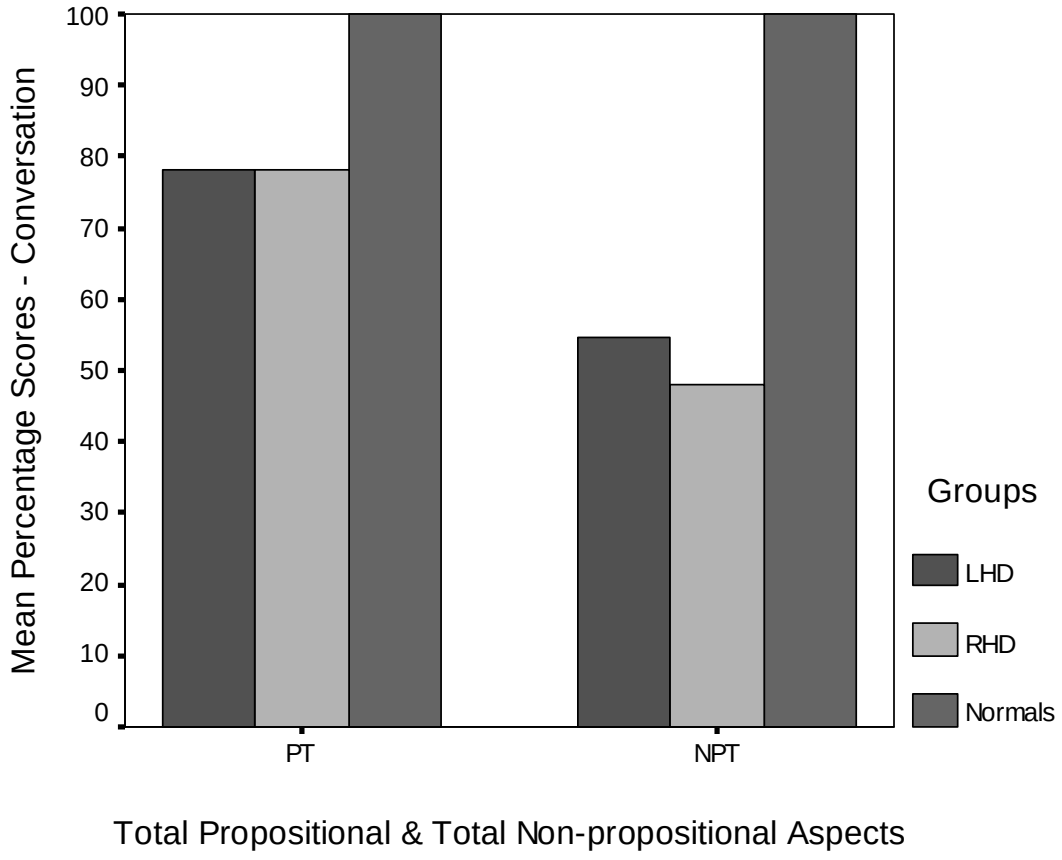
Table 19: Showing the mean, standard deviation and results of Kruskal-Wallis test for LHD, RHD and normal speakers and result of Mann-Whitney test for pair-wise comparisons.

Sl No.	Discourse aspects	Groups	Mean	Std. Deviation	Results of Kruskal-Wallis test (p)	Pair that are significant at 0.05 level from Mann-Whitney test
1.	Propositional aspect in conversation (NPT)	LHD	54.50	17.70	<0.001	LHD-Normal RHD-Normal
		RHD	48.0	11.35		
		Normals	100	0		
2.	Non-propositional aspects in conversation (PNPT)	LHD	73.30	9.15	<0.001	LHD-Normal RHD-Normal
		RHD	70.90	6.65		
		Normals	100	0		
3.	Propositional aspect in picture description (PCNPT)	LHD	57.00	13.37	<0.001	LHD-Normal RHD-Normal
		RHD	55.00	23.21		
		Normals	100	0		

4	Non-propositional aspects in picture description (PCPNPT)	LHD	73.70	15.10	<0.001	LHD-Normal RHD-Normal
		RHD	70.20	17.94		
		Normals	100	0		

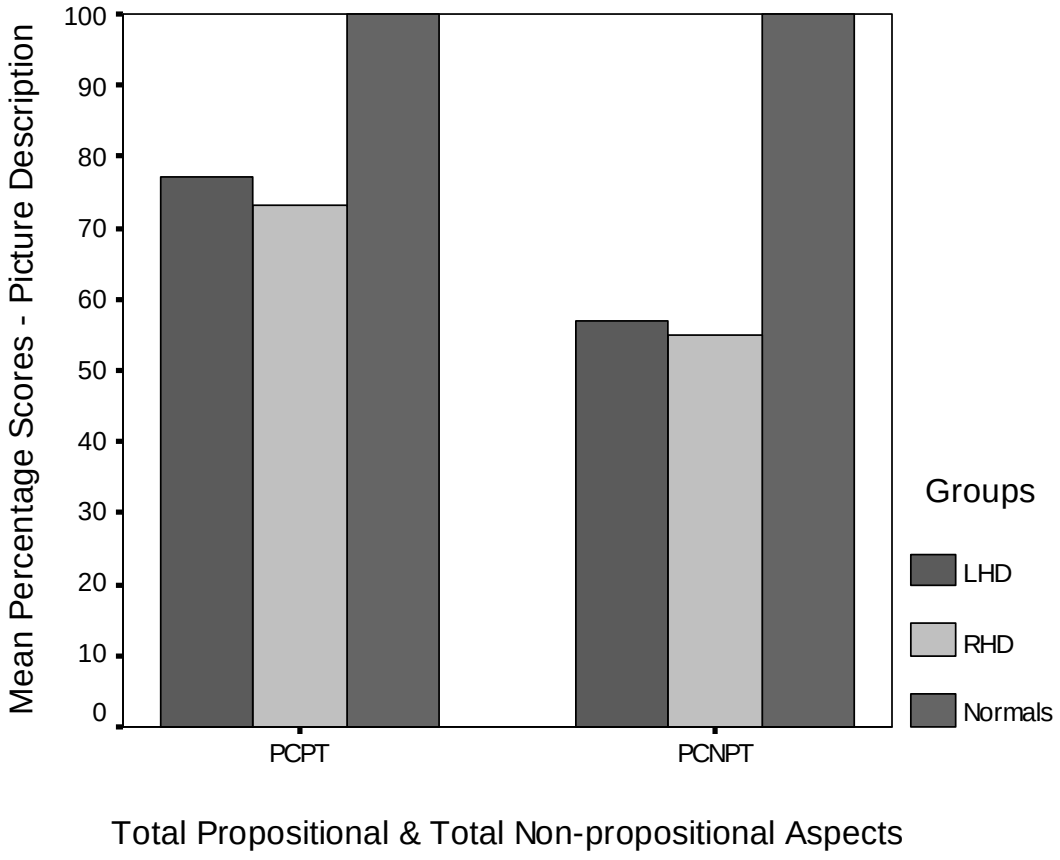
Among the TBI subjects with LHD and RHD, there was no significant difference in their performance. But still LHD group performance was better as the mean was higher for propositional and non-propositional aspects of discourse in both, the conversation and picture description task compared to RHD group. In Graph 11, the performance of both the group at propositional aspect in conversation task is equal whereas at non-propositional aspects the RHD group performance is poorer than the LHD and normal speakers. Whereas in Graph 12, there is no difference seen between the LHD and RHD group at both propositional and non-propositional aspects of picture description task, but a large difference can be seen when compared with normal speakers. This result supports the findings of Long, Baynes, & Prat, (2003), using lateralized item-priming-in-recognition paradigms they found that the left hemisphere and the right hemisphere were equally sensitive to discourse model relations.

Graph 11: Showing difference in PT and NPT across LHD, RHD and normal speakers



(Legend PT- Total Propositional aspects of conversation, NPT- Total Non-propositional aspects of conversation)

Graph 12: Showing difference in PCPT and PCNPT across LHD, RHD and normal speakers



(Legend PCPT- Total Propositional aspects of picture description, NPT- Total Non-propositional aspects of picture description)

Comparison within LHD group

a. Propositional aspects and non-propositional aspects of discourse comparison (in percentage)

A comparison was made at the level of propositional and non-propositional aspects of discourse in conversation and picture description tasks within the experimental group consisting of ten TBI subjects with LHD.

Table 20: Showing the results of Wilcoxon's Signed Rank test separately for conversation and picture description tasks

Aspects for two tasks	Z	Results of Wilcoxon's Signed Rank test (p)
PNPT – NPT	-2.803(a)	0.005
PCPNPT – PCNPT	-2.805(a)	0.005

(Legend PNPT- Propositional aspects of conversation, NPT- Non propositional aspects of conversation, PCPNPT- Propositional aspects of picture description, PCNPT- Non-propositional aspects of picture description)

Statistical analysis was done using Wilcoxon's Singed Ranks Test. Results showed that there was a significant difference at <0.01 level between propositional and non-propositional aspects of discourse. The difference between the propositional and non-propositional aspects of discourse in conversation and picture description tasks is depicted in Graph 11 and 12. Individual's percentage scores indicates, LHD subjects having more problem in non-propositional aspects compared to propositional aspects. There is no literature which finds difference between propositional and non-propositional

aspects of discourse. But a study by Allen and Brown (1976), Milton (1984), Mentis and Prutting (1991), TBI patients were found to be lacking in many areas of conversation discourse like interactional aspects and propositional aspects of conversation.

b. Comparison of conversation and picture description tasks (in percentage)

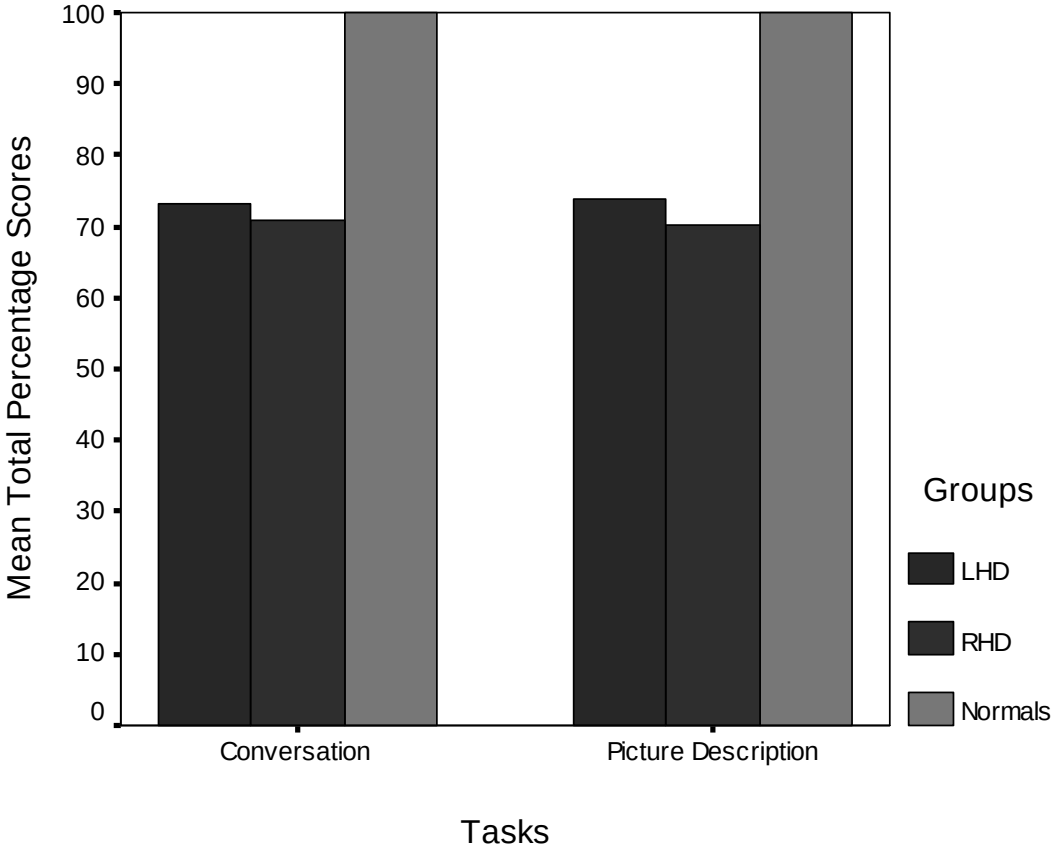
The grand total of propositional and non-propositional aspects of conversation and picture description task was taken separately and was analyzed using Wilcoxon's Signed Rank Test to find the difference between the tasks. The results showed no significant difference between the conversation task and picture description task at 0.05 level. Table 21 shows no difference even at mean value across two instances. Similarly Graph 13 show no difference between the two instances in TBI subjects with LHD.

Table 21: Showing the mean, standard deviation and results of Wilcoxon's Signed Rank Test for conversation and picture description tasks

Tasks	Mean	Std. Deviation	Results of Wilcoxon's Signed Rank test (p)
Conversation	73.30	9.15	NS
Picture Description	73.70	15.10	

The same is represented graphically in Graph 13.

Graph 13: Showing difference in conversation and picture description tasks across LHD, RHD and normal speakers



c. Language difference

Within the LHD group, the comparison was done with respect to language usage i.e., five subjects with bilingualism and five with multilingualism. It should be noted that, this finding was apart from the main objectives of the study. In Table 22, subjects showed significant difference at 0.01 level for only few parameters of discourse of conversation and picture description tasks.

Table 22: Parameters of discourse showing significant difference at 0.01 level in LHD group specifically with respect to language usage.

Parameters	(p) value
Lacks forethought (FSD-a)	0.050
Nonspecific Vocabulary (NSV)	0.014
Taking (some amount of) time to start a turn (TT b)	0.014
Persistent in listeners or speakers mode (TT f)	0.014
Revision Behavior (RB)	0.018
In response to other's greeting (CI –Picture description{PC})	0.014
Failure to Structure Discourse (FSD-PC)	0.041
Introducing self (CI b-PC)	0.005
Irrelevantly introducing topic (TMa-PC)	0.014
Topic Maintenance (TM-PC)	0.013
Information Content (IC-PC)	0.014
Global Coherence (COHG-PC)	0.044
Local Coherence (COHL-PC)	0.011
Coherence (COH- PC)	0.021
Linguistic Nonfluency (LNF-PC)	0.031
Propositional aspects (PT-PC)	0.016
Revision behaviors (RB-PC)	0.050
Propositional and non-propositional aspects (PNPT-PC)	0.016

d. Gender difference

The comparison with respect to gender revealed partial difference, males performed better in conversation and picture description tasks compared to females. It should be noted that, this finding was apart from the main objectives of the study. In Table 23, subjects showed significant difference at 0.01 level for only few parameters of discourse of conversation and picture description tasks. It should be noted that, this finding was apart from the main objectives of the study. All subjects in the group performed better on propositional aspects compared to non-propositional aspects of discourse. Significant difference between the genders was found only on few features of propositional aspects of conversation. But in picture description task, along with few features of propositional aspects, one feature of non-propositional aspect also showed significant difference between the genders. Thus in picture description task, both propositional and non-propositional aspects showed differences across the gender.

Table 23: Parameters of discourse showing significant difference at 0.01 level in LHD group specifically with respect to gender.

Parameters	(p) value
Lacks forethought (FSD-a)	0.003
Failure to Structure Discourse (FSD)	0.032
Introducing self (CI b)	0.050
Asks for assistance in understanding conversation (CI e)	0.038
Lacks organizational planning (FSD b-PC)	0.016
Failure to Structure Discourse (FSD-PC)	0.048

Fabricate/ imagines event(CI d-PC)	0.022
Minimal elaborations (TM f-PC)	0.010
Too much of repair through repetition / clarification / revisions (RS b-PC)	0.050

e. Socio Economic Status difference

The comparison within the LHD group with respect to socio economic status that is high, low and middle was made but, there was no significant difference at 0.01 level among any of the parameters of discourse. It should be noted that, this finding was again apart from the main objectives of the study.

Comparison within RHD group

a. Propositional aspects and non-propositional aspects of discourse comparison (in percentage)

A comparison was made at the level of propositional and non-propositional aspects of discourse in communication and in picture description tasks within the experimental group consisting of ten TBI subjects with RHD.

Table 24: Showing the results of Wilcoxon's Signed Rank test separately for conversation and picture description tasks

Aspects for two tasks	Z	Results of Wilcoxon's Signed Rank test (p)
PNPT – NPT	-2.807(a)	0.005
PCPNPT – PCNPT	-2.805(a)	0.005

(Legend PNPT- Propositional aspects of conversation, NPT- Non propositional aspects of conversation, PCPNPT- Propositional aspects of picture description, PCNPT- Non-propositional aspects of picture description)

Statistical analysis was done using Wilcoxon Signed Ranks Test. Results showed that there was significant difference at <0.01 level between propositional and non-propositional aspects of discourse of conversation and picture description tasks. Difference between the propositional and non-propositional aspects of discourse in conversation and picture description tasks is depicted in Graph 11 and 12. Individual's percentage scores indicates, LHD subjects having more problem in non-propositional aspects compared to propositional aspects. There is no literature which finds difference

between propositional and non-propositional aspects of discourse. But a study by Allen and Brown (1976), Milton (1984), Mentis and Prutting (1991), TBI patients were found to be lacking in many areas of conversation discourse like interactional aspects and propositional aspects of conversation.

b. Comparison of conversation and picture description tasks (in percentage)

The grant total of propositional and non-propositional aspects of conversation and picture description task was taken separately and was analyzed using Wilcoxon's Signed Ranks Test to find the significant difference between the tasks.

Table 25: Showing the mean, standard deviation and results of Wilcoxon's Signed Rank test for conversation and picture description tasks

Tasks	Mean	Std. Deviation	Results of Wilcoxon's Signed Rank test (p)
Conversation	70.90	6.65	NS
Picture Description	70.20	17.94	

The results showed no significant difference between the conversation task and picture description task at 0.05 level. Difference can be seen only in terms of mean value as shown in Table 25. But the Graph 13 shows no difference between the two instances in TBI subjects with RHD.

c. Language difference

Within the RHD group, the comparison is done with respect to language usage i.e., five subjects with bilingualism and five with multilingualism. It should be noted that, this finding was apart from the main objectives of the study. In Table 26, subjects showed significant difference at 0.01 level for only few parameters of discourse of picture description task. There was no significant difference at 0.01 level in any of the discourse parameters of conversation task.

Table 26: Parameters of discourse showing significant difference at 0.01 level in RHD group specifically with respect to language usage.

Parameters	**(p) value**
Communication Intent (CI-PC)	0.026
Minimal elaborations (TM f-PC)	0.046
Topic management (TM-PC)	0.019
Information Content (IC-PC)	0.046
Global Coherence (COHG-PC)	0.040
Propositional aspects (PT-PC)	0.032
Propositional and non-propositional(PNPT-PC)	0.032

d. Gender difference

The comparison with respect to gender revealed partial difference, females performed better in conversation task and poor at picture description task compared to

males. It should be noted that, this finding was apart from the main objectives of the study. In Table 27, subjects show significant difference at 0.01 level for only few parameters of discourse of conversation task and picture description task. All subjects in the group performed better on propositional aspects compared to non-propositional aspects of discourse. Significant difference between the genders was found on few features of propositional and one feature of non-propositional aspects of conversation. But in picture description task, only few features of propositional aspects showed significant difference between the genders. Thus in picture description task, across genders only difference was seen in propositional aspects and no difference was seen in non-propositional aspects.

Table 27: Parameters of discourse showing significant difference at 0.01 level in LHD group specifically with respect to gender.

Parameters	(p) value
Criticizes the conversation by agreeing/disagreeing to a part in the conversation (CI f)	0.050
Linguistic Nonfluency (LNF)	0.035
Delayed Response (DR)	0.038
Revision Behaviors (RB)	0.022
Starts picture description (CI a-PC)	0.050
Communication Intent (CI-PC)	0.043
Minimal Elaboration (TM f-PC)	0.016

Information Content (IC-PC)	0.016
Global Coherence (COHG-PC)	0.028
Local Coherence (COHL-PC)	0.050
Coherence (COH-PC)	0.011
Delayed Response (DR-PC)	0.003

e. Socio Economic Status difference

The comparison within the RHD group with respect to socio economic status that is high, low and middle was made but there was no significant difference at 0.01 level among any of the parameters of discourse of conversation and picture description. It should be noted that, this finding was apart from the main objectives of the study.

Inter-rater reliability

To check for inter-rater reliability, ten percent of the data was considered and statistically it was found to be within good range i.e. 98% with alpha co-efficient for both the TBI subjects with LHD and RHD.

SUMMARY AND CONCLUSION

Everyday use of language underlies a complex system of cognitive and linguistic processes. Language can be viewed and analyzed on many levels, one of which is "language in use" (Frattali & Grafman, in press), 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.

For the study, experimental group comprised of 20 TBI subjects with moderayte to severe injury according to Glassgow Coma Scale and without any aphasia (confirmed by Western Aphasia Battery). Within TBI group there were 2 subgroups-viz Left Hemisphere Damage (LHD), and Right Hemisphere Damage (RHD). Age, sex and education matched normal subjects were selected as a control group. A discourse sample was elicited between the investigator and the subjects on preset topics for two sessions. A 10-20 minutes sample thus obtained was considered for analysis. A sample of picture description task was also considered. Transcription of the recorded sample using broad International Phonetic Alphabet was done. Various speech discourse parameters under the propositional and non-propositional aspects of conversation and picture description tasks were analyzed. The details are given in Appendix-A and Appendix-B.

Three five point, four point and three point perceptual rating scales were used to assess all the parameters. The results were statistically verified for significant difference in performance between the TBI subjects with LHD, RHD group and normal speakers. A non parametric test was used to note if there was any significant difference between the three groups in terms of discourse. Discourse analysis procedure was used to assess the discourse ability in individuals with TBI and normal speakers. All the parameters of discourse were significantly different between the TBI subjects and normal speakers. Comparison across TBI subjects with LHD and RHD group showed a significant difference only in the following parameters.

Conversation task

* Propositional aspects of discourse

1. Communication Intent
    - Greets others by himself/herself
    - Introduces self

* Non-propositional aspects of discourse

1. Turn Taking
    - Initiation of turn

2. Conversational repair
    - Too much of other initiated repair

Picture Description

* Propositional aspects of discourse

1. Communication Intent
    -Fabricates/ imagines events

2. Delayed response

An effort was put to combine all parameters taken from many discourse analysis tests and use as a "Discourse Analysis Scale". This will help the clinicians to tap the severity of discourse impairment in TBI subjects.

It is concluded that TBI subjects have impairment in discourse when compared to normal speakers because of sustained injury. In summary, there was no significant difference between the TBI subjects with LHD and RHD for all the parameters. As an overview LHD group performed better compared to RHD group in all the aspects of discourse. Both the groups had better performance on propositional aspects of discourse compared to non-propositional aspects of discourse. There was no significant difference between the tasks. Apart from the main objectives difference across bilinguals Vs multilingual subjects, male Vs female subjects and high Vs middle socio economic status conditions, was seen on a few parameters of discourse. Although difference is seen, this cannot be generalized, because in spite of strict selection criteria, still there could be individual variations among the subjects selected in this group.

Limitations of the study

- Sample size considered is less comparatively therefore it cannot be generalized to the entire TBI population in terms of differentiating between LHD vs RHD.
- A better discourse sample could have been obtained in an informal day to day situation rather than a semistructured conversation.
- Subject variability in terms of site of lesion was not controlled and post morbid duration of post TBI cases was restricted one month to five months.

Implications

This procedure will help in assessment of discourse deficits in individuals with TBI. It would further help in formulation of prognosis and development of appropriate treatment strategies for such population.

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APPENDIX- A

Discourse Analysis Scale for Conversation Task

Points considered while using Discourse Analysis Scale were as follows:

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 which has 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, the total score on propositional and non-propositional aspects of communication should be divided by total features of propositional and non-propositional aspects of communication and multiplied with hundred to get in percentage.

Propositional aspects of communication.

1) Failure to Structure Discourse (DS)

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 forethoughts————————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

b) Lacks organizational planning————————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

2) Communication intent

Key: Presence or absence

a) Greets others:
-By themselves——————————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

-In response to other's greeting——————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

b) Introduces self-——————————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

c) Starts a conversation——————————————————————-^ ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

d) Asks for information——————————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

e) Asks for assistance in understanding conversation————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

f) Criticizes the conversation by agreeing or disagreeing to a part in the conversation
————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

g) Fabricates/ imagines events——————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

h) Understands advancers and blockers in the conversation————————-> ( )

[Score: 2-Completely present, 1-Partially present, O-Absent]

3) Topic management

Key: Presence or absence

a) Irrelevantly introducing topics——————————————————-> ( )
[Score: O-Completely present, 1 -Partially present, 2-Absent]
b) Rapid topic shift——————————————————————-> ( )
[Score: O-Completely present, 1 -Partially present, 2-Absent]

c) Non coherent topic changes/Inappropriate topic changes————————-> ( )
[Score: O-Completely present, 1 -Partially present, 2-Absent]

d) Perseveration in the topics————————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

e) Responses which expand topics————————————————————-> ( )
[Score: 2-Completely present, 1 -Partially present, O-Absent]

f) Minimal responses(Giving only Yes/No responses)————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

g) Extra elaboration of topics————————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

h) Minimal elaboration————————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

4) Information adequacy

Key: Answer to any question during conversation at word level/ single sentence level/multiple sentence level, underline the level at which the patient is at.

- Word level/ Single Sentence level/ Multiple sentence level————————( )
[Score: 2-Completely present, 1-Partially present, O-Absent]

5) Information content

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: O-Completely present, 1-Partially 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: O-Completely present, 1-Partially present, 2-Absent]

7) **Coherence**

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

- Global coherence——————————————————————->( )

[Score: 4- present always, 3- present most of the times, 2- present sometimes only, 1- present rarely, 0- Never present]

Key: Presence of relationship between the meaning or context of verbalization with that of the immediately preceding utterance produced either by interviewer or subject.

- Local coherence——————————————————————-> ( )

[Score: 4- present always, 3- present most of the times, 2- present sometimes only, 1- present rarely, 0- Never present]

8) Use of Nonspecific Vocabulary (NSV)——————————————————-> ( )

Key: Overuse of generic terms such as "thing" and "stuff when more specific information is required.

[Score: O-Completely present, 1 -Partially present, 2-Absent]

9) **Linguistic Nonfluency** (LNF)——————————————————————-> ( )

Key: Presence of repetition, unusual pauses, hesitations

[Score: O-Completely present, 1-Partially present, 2-Absent]

10) Inappropriate Speech Style (ISS)——————————————————» ( )

Key: Presence of dialectal structural forms, code switching, style-shifting.

[Score: O-Completely present, 1-Partially present, 2-Absent]

11) Inappropriate Intonational Contour (IIC)——————————————-> ( )

Key: Presence of abnormal rising, falling, flat intonation contour with respect to a particular context.

[Score: O-Completely present, 1-Partially 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.

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

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

Key: Presence or absence

a) Initiation of turn——————————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, 0-Absent]

b) Taking (some amount of) time to start a turn——————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

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.

[Score: O-Completely present, 1-Partially present, 2-Absent]

d) Unable to take prosodic cues———————————————-> ( )
[Score: O-Completely present, 1 -Partially present, 2-Absent]

e) Rapid shift in the mode———————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

f) Persistent in listeners or speakers mode———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

2) Conversation repair

Key: Presence or absence

a) Too much of self repair through repetition———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

b) Too much of revisions through clarification———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

c) Too much of other initiated repair———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

3) Revision behaviors———————————————-> ( )

Key: Presence of false starts and self-interruptions

[Score: O-Completely present, 1-Partially present, 2-Absent]

APPENDIX- B

Discourse Analysis Scale for Picture Description Task

The parameters of propositional and non-propositional aspect of picture description were quantified with few general instructions to the evaluator as:

1. The 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 which has 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 can find discourse quotient, the total score on propositional and non propositional aspects of communication should be divided by total features of propositional and non propositional aspects of communication and multiplied with hundred to get in percentage.

Propositional aspects of communication.

I) Failure** to **Structure** Discourse **(DS)

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 forethoughts———————————————————> ( )
   [Score: O-Completely present, 1-Partially present, 2-Absent]

b) Lacks organizational planning———————————————> ( )
   [Score: O-Completely present, 1-Partially present, 2-Absent]

2) Communication intent

Key: Presence or absence

a) Starts picture description———————————————————-> ( )
[Score: 2-Completely present, 1-Partially present, 0-Absent]

b) Asks for too much of assistance in understanding picture———————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

c) Criticizes the picture by agreeing/disagreeing to a part in the picture -> ( )
[Score: 2-Completely present, 1-Partially present, 0-Absent]

d) Fabricates/ imagines events———————————————————-> ( )

[Score: 2-Completely present, 1-Partially present, 0-Absent]

3) Topic management

Key: Presence or absence

a) Irrelevantly introducing topics———————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]
b) Rapid topic shift———————————————————————> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

c) Non coherent topic changes/Inappropriate topic changes———————->( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

d) Perseveration in the topics———————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

e) Extra elaboration of topics———————————————————-> ( )
[Score: O-Completely present, 1-Partially present, 2-Absent]

f) Minimal elaboration———————————————————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

4) Information adequacy

Key: Adequate amount of picture description in terms of word level/single

sentence/multiple sentence level, underline the level at which the patient is at.

- Word level/ Single Sentence level/ Multiple sentence level.———————-> ( )
[Score: 2-Completely present, 1-Partially present, 0-Absent]

5) Information content

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

- Non-meaningful and inadequate information———————————-> ( )

[Score: O-Completely present, 1 -Partially present, 2-Absent]

6) Message Inaccuracy (MI)

Key: An attempted picture description involving inaccurate/misinformation.

- Incorrect answers to the question/Confabulation within the same question frame

[Score: O-Completely present, 1-Partially present, 2-Absent]

7) Coherence

Key: Presence of relationship between the meaning or content of verbalization with respect to the general topic of picture description.

a) Global coherence———————————————————————-> ( )

[Score: 4- present always, 3- present most of the times, 2- present sometimes only, 1- present rarely, 0- Never present]

Key: Presence of relationship between the meaning or context of verbalization with that of the immediately preceding utterance produced by the subject.

b) Local coherence———————————————————————-^ ( )

[Score: 4- present always, 3- present most of the times, 2- present sometimes only, 1 - present rarely, 0- Never present]

8) Use of Nonspecific Vocabulary (NSV)——————————————-> ( )

Key: Overuse of generic terms such as "thing" and "stuff when more specific information is required.

[Score: O-Completely present, 1 -Partially present, 2-Absent]

9) Linguistic Nonfluency (LNF)——————————————————-> ( )

Key: Presence of repetition, unusual pauses, hesitations

[Score: O-Completely present, 1-Partially present, 2-Absent]

10) Inappropriate Speech Style (ISS)——————————————————-> ( )

Key: Presence of dialectal structural forms, code switching, style-shifting.

[Score: O-Completely present, 1-Partially present, 2-Absent]

11) Inappropriate Intonational Contour (IIC)——————————————-^ ( )

Key: Presence of abnormal rising, falling, flat intonation contour with respect to a particular context.

[Score: O-Completely present, 1-Partially present, 2-Absent]

12) Delay in describing picture (DR)——————————————————-> ( )

Key: Time taken to describe the picture, measured in terms of seconds.

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

13) Gist of information——————————————————————--> ( )

Key: What does the whole picture represent as, time taken for this particular task should be noted in terms of seconds.

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. *(Note: In picture description it is only from subjects 'point of view)*
The following subcategories are considered:

1) Repair strategy

Key: Presence or absence

a) Too much of self correction———————————————-> ( )

[Score: O-Completely present, 1 -Partially present, 2-Absent]

b) Too much of repair through repetition/clarification/ revision———-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

c) Too much of other initiated correction———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

d) Too much of request for clarification———————————-> ( )

[Score: O-Completely present, 1-Partially present, 2-Absent]

2) Revision Behaviors———————————————————--^ ( )

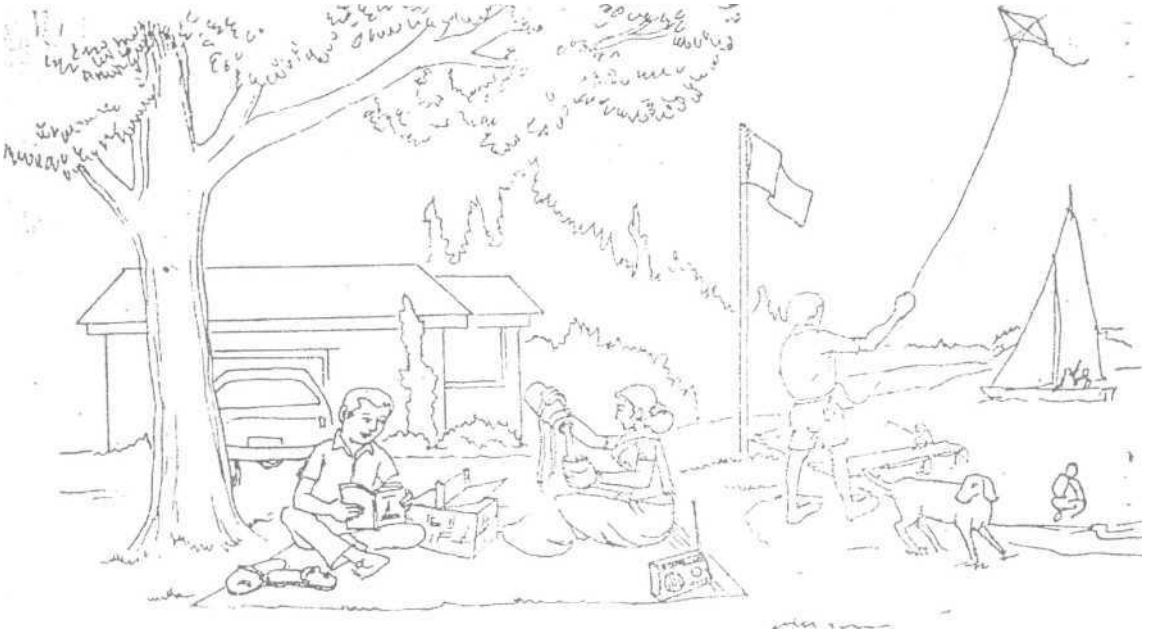
Key: Presence of false starts and self-interruptions

[Score: O-Completely present, 1-Partially present, 2-Absent]

APPENDIX-C

Picture description task

Picture card from Western Aphasia Battery, Kertesz (1979)



APPENDIX- D

The Mini-Mental State Exam

Patient _____ Examiner

Date _____

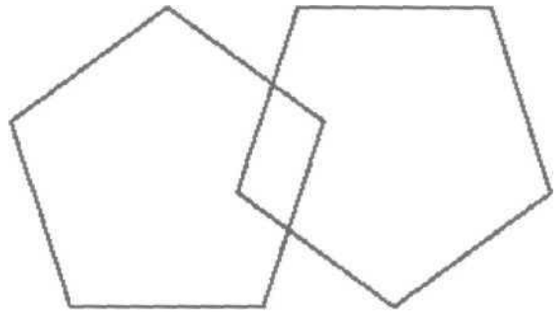
Maximum	Score	
5	( )	**Orientation** What is the (year) (season) (date) (day) (month)?
5	( )	Where are we (state) (country) (town) (hospital) (floor)?
3	( )	**Registration** Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record. Trials _____
5	( )	**Attention and Calculation** Serial 7's. 1 point for each correct answer. Stop after 5 answers. Alternatively spell "world" backward.
3	( )	**Recall** Ask for the 3 objects repeated above. Give 1 point for each correct answer.
2	( )	**Language** Name a pencil and watch.
1	( )	Repeat the following "No ifs, ands, or buts"
3	( )	Follow a 3-stage command:

"Take a paper in your hand, fold it in half, and put it on the floor."

( ) Read and obey the following: CLOSE YOUR EYES

( ) Write a sentence.

( ) Copy the design shown.



Total Score

ASSESS level of consciousness along a continuum__

Alert ***Drowsy*** ***Stupor*** ***Coma***