

## Analysis of Pragmatic Abilities in Subcortical Aphasia

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### Abstract

**Need:** Pragmatic skills enable a person to use language socially. Any impairment in these skills can challenge the communication, which may be noticed in persons with brain damage.

**Aim:** To analyze the pragmatic impairment in individuals with subcortical aphasia.

**Materials and Method:** 30 participants with subcortical aphasia were selected. A custom made protocol in Malayalam was developed for the purpose of our study. The pragmatic skills of the selected participants were assessed and analyzed by the said protocol.

**Results and Discussion:** Participants exhibited marked impairments in all selected domains such as Topic, Purpose, abstraction & visual/gestural cues. The most significantly affected domain was Abstraction and Topic was the domain that was least affected.

**Conclusion:** Our study corroborates the finding that along with cortical structures subcortical structures also participate in governing pragmatic function, which in turn interferes with the communication and quality of life in individuals with subcortical lesion

**Keywords:** Aphasia; Pathologists; Language

### Introduction

The Pragmatics was introduced in to the field of speech language pathology by Elizabeth Bates (1976), defined as “the rules governing the use of language in context”. Pragmatics is the appropriate use of language in variety of social context and provides accurate interpretation of intentions [1]. It links the linguistic knowledge to communicative proficiencies. According to Leech (1983) the essentiality of pragmatics is that it differs from grammar as it is evaluative and goal-directed. That is, the pragmatic language depends on specific context and implicit rules. Hence pragmatic language problems are more difficult to detect [2].

Pragmatic impairment can exist due to congenital abnormalities or acquired pathologies. The major acquired condition stems from neurological causes with varying etiologies including right cerebrovascular accidents, traumatic brain injury, brain tumor, dementia, neurodegeneration, Left Hemisphere damage (LHD), Right-Hemisphere damage (RHD), Traumatic Brain injury (TBI), schizophrenia, and neurodegenerative disorders like Parkinson’s disease, Motor neuron disease, Multiple Sclerosis etc [3].

Many researchers have attempted to bridge the connection between cerebral lesions and pragmatic impairments. One of the earliest study done specifically in pragmatics of adult was by Chapman and colleagues (1997). They observed the understanding of proverbs in isolation as well as sentences for subjects with fluent aphasics. The results delineated that the aphasics could explain the proverb meaning in isolation [4]. However they could not select an appropriate pronoun from a closed set if it is presented in sentences. Another study was done by Coelho and Flewellyn (2003) who reported that in anomic aphasic’s in spite of improvement in microlinguistics, their global and local coherence doesn’t show much of a progress [5]. Yet another report by Eviatar and Just (2006) stated that tasks like reasoning, idioms, metaphors, sarcasm activated the left inferior frontal gyrus and bilateral inferior temporal cortex. Interestingly, the right superior and middle temporal gyri were highly activated during ironic statements [6]. Similarly, Booth, Wood, DongLu, Houk, and TaliBitan (2007)

analyzed the fMRI obtained during rhyming judgment task in adults using dynamic causal modeling. The images evidenced that the cerebellum has reciprocal connections with both left inferior frontal gyrus and left lateral temporal cortex, whereas the putamen has only unidirectional connections into the mentioned brain regions [7].

There is strong link between pragmatics and cognition as pragmatics exists on a higher plane of mental function. Processing pragmatics require not only basic cognitive functions like attention, concentration, perception, short term memory etc but also added influence of metacognitive aspects like judgement, thinking, analysis etc. Therefore, it can be implied that consequence of cognitive impairment can lead to dysfunction in pragmatics which in effect would hinder the communication including speech, language, gestures, eye contact, hearing, attention, which in turn implicate cognitive processing [8].

Majority of these studies focused on cortical involvement for pragmatic abilities. However, it has to be noted that subcortical involvement into same scenario is yet to be scrutinized in depth [9]. Therefore, our study aims at exploring the involvement of subcortical faculties in pragmatics in Malayalam language.

Malayalam is a complex Dravidian language spoken in southernmost state India namely ‘Kerala’. It is recognized as one of the classical languages of India. It follows Grice’s principles (Leech, 1983) of pragmatics (co-operative principle, politeness principle and Irony principle) similar to English. Malayalam language uses person, spatial

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and temporal deixis as well as their emphatic and social counterparts [10].

Subcomponents of pragmatics taken up for our study were - Topic, Purpose, Abstraction and Visual/Gestural cues. ‘Topic’ was mainly concerned with introduction, maintenance, shifting and overall content of a presented constituent. ‘Purpose’ included tasks like greeting, requesting, informing, verbal reasoning etc. ‘Abstraction’ used sarcasm, criticisms, idioms and other figurative language meanwhile visual/Gestural cues pertained appropriate eye contact, gestures and other nonverbal cues [11].

**Aim**

To analyze the involvement of faculties of cognition in pragmatics for individuals with subcortical aphasia.

**Materials and methods**

Thirty participants with subcortical aphasia, age ranges from 30-70 were included in the study. Diagnoses were made by collecting information from general history. To confirm the presence of subcortical lesion without any cortical involvement and atrophic changes, medical records and neuro imaging reports of each participant were reviewed. To confirm the presence of aphasia, Western Aphasia Battery in Malayalam (Philip,1992) were administered. Our study was conducted at post morbid period of six months to one year after the onset of stroke. Participants selected for the study were educated right hander (minimum of 10<sup>th</sup> standard) with normal/corrected vision and hearing who can read and write Malayalam language, without any history of traumatic brain injury and previous psychological issues. A protocol was developed to assess the pragmatics.

**Development of test material**

The test material was developed based on Raymond’s Pragmatic Skills Survey (DuCharme, 2006). The present assessment tool consists of 4 subtests- Topic, Purpose, Abstraction and Visual/Gestural cues. 15 items were selected under each subtest and given to 3 Speech Language Pathologists to evaluate the appropriateness of material. 3-point rating scale was used- highly appropriate, appropriate, and inappropriate. Highly appropriate 10 items were included under each subtest (appendix II). Standardized picture ‘The cookie theft’ (Kaplan, Goodglass & Weintraub, 1983) which depicts various real-life scenes was selected for picture description task (appendix I). The topic for free conversation was regarding family, job, hobbies etc [12].

A pilot study was carried out on ten healthy adults from each age group, to check the appropriateness of the test material. It was found that selected items could elicit the pragmatic skills [13].

**Test administration**

The administration of the test was initiated by obtaining the formal consent from the participants and care takers. The participants were informed about the purpose and nature of the assessment prior to testing. Informal screening was done to check for the presence of hearing loss.

The participants were seated in a quiet and comfortable room. Participants were instructed to narrate about any events or topics related to them such as family, job, hobbies, etc. They were also given picture description tasks to narrate. Approximately 30 minutes were taken for the participants [14]. Participants were encouraged to elicit the responses. The pragmatic skills of participants were assessed using

the above tasks.

**Scoring**

Each response was scored individually on a 3-point rating scale with ‘2’ points for correct response, ‘1’ point for partial response and ‘0’ for no response.

**Statistical analysis**

The raw scores of the participant’s performances in pragmatic assessment protocol were analyzed statistically using SPSS software version 18. Mean and standard deviations were obtained for each domain. Post hoc Bonferroni pair wise comparison test was used to compare different domains.

**Results**

(Table 1) indicates Mean and Standard deviation in pragmatic performance for each of the four domains including Topic, Purpose, Abstraction and Visual/Gestural cues. The values suggested that each of these domains were impaired in our selected participants. The degree with which each domain was impaired depended on its nature. (Figure 1) depicts the intercomparison of each domain. From the figure 1 it is quite clear that the domain ‘Topic’ obtained better scores followed by visual-gestural cues and purpose where as ‘Abstraction’ scores were the most severely impaired

(Table 2) represents the results of post Hoc Bonferroni pair wise comparison for the selected domains. The analysis proved that each domain was significantly different from the other. However, Topic and Visual/gestural cues were relatively less affected.

**Discussion**

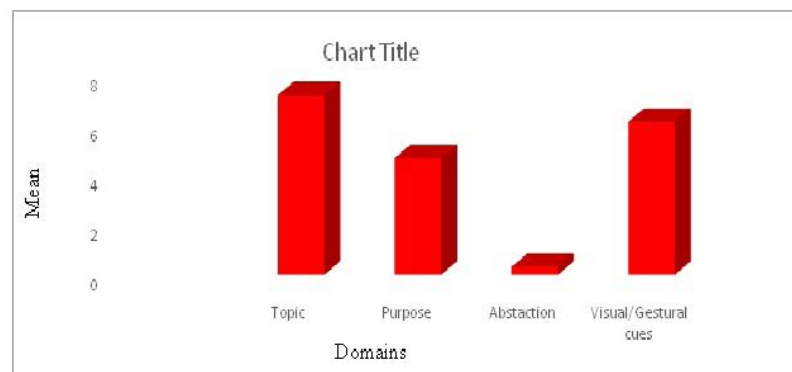
The performance of participants could be explained by the following factors. The domain Abstraction requires the activation of metacognitive abilities which are essential for the skills like reasoning, idioms, metaphors, sarcasm etc. The prefrontal cortex is thought to be responsible for the working memory and executive functions (O’Reilly and Frank, 2006). Along with the inferior frontal gyrus, bilateral inferior temporal cortex is also involved in these functions.

**Table 1:** Mean and Standard deviation in pragmatic performance for each of the four domains.

Domain	Mean	SD
Topic	7.233	1.5241
Purpose	4.700	1.0875
Abstraction	0.300	0.5960
Visual/gestural cues	6.167	1.9841

**Table 2:** Post Hoc Bonferroni pair wise comparison for comparing multiple tasks.

Topic	Purpose	.000
	Abstraction	.000
	Visual/gestural cues	.018
Purpose	Topic	.000
	abstraction	.000
	Visual/gestural cues	.002
Abstraction	Purpose	.000
	Abstraction	.000
	Visual/gestural cues	.000
Visual/gestural cues	Topic	.018
	Purpose	.002
	Abstraction	.000



**Figure 1:** Graphical representation of comparison of Mean of each domain in subcortical aphasia.

The subcortical structures like basal ganglia, amygdala has robust connections with frontal lobe and temporal lobe. Participants had lesion in basal ganglia, thalamus, capsuloganglionic region and corona radiata. So any disruption to cortico subcortical pathways can affect the pragmatic abilities of the participants.

In the domain Purpose, the features assessed were greeting, requesting, informing, regulating, expressing, unusual pauses, overlapping, verbal reasoning, demanding, presence of hesitations. All these features were found to be affected. This can be explained by the fact that the features like regulating, verbal reasoning, demanding involves the cognitive processes. Vascular alterations of subcortical structures, resulting in disconnection of fronto-striatal-thalamocortical loop can cause deficit of behavioral regulation in sorting or planning tasks, maintenance in representation of working memory and impaired manipulation of internal representation of visuospatial stimuli and self-elaboration of internal strategies (Dubois & Pillon, 1996). Unusual pauses could be mainly due to their deficit in allocating attention and presence of hesitation could be due to overall limited linguistic abilities.

The participants demonstrated deficits in visual/gestural cues. It can be rationalized that in the current study it was found that emotion and appropriate association of gestures are interrelated phenomena. Emotion and facial expressions are regulated by multiple neural circuits including head of caudate nucleus and fronto striatal connections. So, damage to these circuits results in difficulty in associating appropriate gestures and facial expressions. Apart from this, cognitive strategies are also essential component for using meaningful gestures and understanding symbolic messages.

Participants in the current study obtained better score in the domain Topic, could be due to the less taxing of cognitive abilities. This domain assessed the features like topic maintenance, cohesion, change of topic appropriately, content of topic, revision of messages, organization of themes and content. The participants were able to maintain the topic but unable to change topic appropriately. This inadequate shifting of topic is a characteristic feature of right hemisphere dysfunction. In this study this feature could be possibly due to the strong bilateral connections of basal ganglia with contralateral frontal cortex through medial pathways of claustrum (Milardi et al, 2013). Another factor attributed to this feature could be limited linguistic abilities which lead to the reluctance for communication. The features revision and organization of themes were affected because participants exhibited impairments in structuration and organization in the conceptual association. These features require active participation of cognitive linguistic abilities which are affected due to the impairment in fronto striatal circuit.

## Conclusion

Pragmatic abilities in individuals with subcortical aphasia were analyzed using Post Hoc Bonferroni pair wise comparison. The findings revealed that overall pragmatic abilities were affected. Among all the domains, Abstraction was most affected followed by Purpose, Visual/Gestural cues and Topic. To interpret abstraction, one would be required to actively exploit the full mechanization of metacognitive – linguistic abilities. It is widely accepted fact that prefrontal cortex plays the prime role in tackling these abilities. However, current study affirmed that subcortex has active participation in these areas through the robust centrifugal connections of cortical areas with subcortical regions. In the current study the decreased performance in the domains Purpose, Visual/Gestural cues could be due to vascular alterations of subcortical structures, resulting in disconnection of fronto-striatal-thalamocortical loop. Compared to other domains better scores in the domain Topic could be due to the less taxing of cognitive abilities. Another factor attributed to this feature could be a limited linguistic ability which leads to the reluctance for communication. The features revision and organization of themes were affected because participants exhibited impairments in structuration and organization in the conceptual association. So this current finding provides a novel insight in to the interaction between pragmatics and cognition. The areas that require more cognitive skills show severe impairment and the areas that require least cognitive skills scores better

## Ethical consideration

The study was approved by the Ethical counsel at Kerala University of Health sciences thereby ascertaining that all the subjects voluntarily participated in study and no harm were met by any of them whatsoever. Consent was obtained prior to conducting the study from each participant while ensuring full confidentiality and respectability of the thus obtained data.

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