

**Confrontation Naming versus Picture-to-Word Matching in  
Bilingual (Malayalam and English) Persons with Aphasia**

Register No: 06SLP017

A dissertation submitted in part fulfillment for the degree of  
Master of Science (Speech - Language Pathology),  
University of Mysore, Mysore

ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTHRI

MYSORE-570006

April 2008

## Certificate

This is to certify that this dissertation entitled "**Confrontation Naming versus Picture-to-Word Matching in Bilingual (Malayalam and English) Persons with Aphasia**" is a bonafide work in part fulfillment for the degree of Master of Science (Speech Language Pathology) of the student Registration No. 06SLP017. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysore  
April, 2008

  
**Dr. Vijayalakshmi Basavaraj**  
**Director**

All India Institute of Speech and Hearing  
Manasagangothri, Mysore -570006

## **Certificate**

This is to certify that this dissertation entitled "**Confrontation Naming versus Picture-to-Word Matching in Bilingual (Malayalam and English) Persons with Aphasia**" has been prepared under my guidance and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysore  
April, 2008



**Dr. S. P. Goswami**  
**Guide**

Reader & Head  
Department of Speech Language Pathology  
All India Institute of Speech and Hearing  
Manasagangothri, Mysore -570006

## **Declaration**

This Dissertation entitled "**Confrontation Naming versus Picture-to-Word Matching in Bilingual (Malayalam and English) Persons with Aphasia**" is the result of my own study under the guidance of Dr. S. P. Goswami, Reader and Head, Department of Speech Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

Mysore  
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*Dedicated to*

*Mummy, Daddy*

*and my beloved twin*

*without whom life would have been*

*incomplete.....*

## Acknowledgements

*"There are many different languages in the world, yet none of them is without meaning."*

- I Corinthians 13:14

**Thank You** a word so simple, yet sometimes so inexpressible, no matter what the language.

*"To be wise you must first have reverence for the Lord. If you know the Holy One, you have understanding."*

- Proverbs 9:10

*I thank the Almighty God for the love and grace He has bestowed upon me. As a singer has once sung: 'To express God's love, words are not enough;*

*To give thanks to Him, this life is not enough."*

*So my gratitude to you would always remain incomplete my Friend.....*

*"Plan carefully what you do, and whatever you do will turn out right."*

- Proverbs 4:26

*I am thankful to my teachers who have shaped my thoughts in the positive way and helped me plan well.*

*My sincere thanks to the Director, Dr. Vijayalakshmi Basavaraj, for permitting me to carry out this study.*

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*Thanks to my parents and my dearest twin sister, Somy....*

*Mum-Dad....you held me firm to help me take those first steps in the right way and till now you haven't stopped holding me.*

*And Som.... What do I tell you? You just know it all.....*

*There are many who have helped me during the journey of my research...*

*Name-by-name, I can quote none....And so short and sweet, I'll have it done.....*

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## CHAPTER 1

### INTRODUCTION

Word-finding difficulty is one of the most common features in aphasia. This has been extensively studied using picture confrontation naming task. This may be due to the fact that the target word that the patient is looking for, i.e., the name of the presented picture, is known to the examiner without any ambiguity, which is not the case when studying word-finding difficulties in the spontaneous speech of persons with aphasia (Kremin, 1988). But, since pictures can generally elicit more than one name, there is no absolute certainty as regards which particular lexical entry the patient is searching for (Snodgrass, & Vanderwart, 1980; Kremin et al., 1991).

Alternatively, picture-to-word matching tasks have been used to study semantic-processing by the use of semantic distractors. Several authors have also used such tasks to treat word finding difficulties and, thus, facilitate naming in persons with aphasia (Marshall, Pound, White-Thomson, & Pring, 1990).

Confrontation naming and picture-to-word matching have been found to be influenced by an array of variables, which affect the accuracy of responses. Likewise, orthographic variables like regularity of a language can also influence naming tasks (Deloche et al., 1997).

Orthography defines the set of graphemes used in the language and the rules about how to use them in writing. The two types of orthographic nature can be:

- shallow or transparent or regular
- deep or opaque or irregular

### **\*Shallow/Transparent/Regular Orthography**

In ‘shallow’ alphabetic orthographies, the correspondences between graphemes and phonemes are entirely consistent or regular. In other words, a regular (transparent/shallow) language is a formal language which follows the phoneme-to-grapheme correspondence rules having a finite sequence of symbols from a finite alphabet. Eg. German, Spanish, Italian, Welsh, Serbo-Croatian, Malayalam, Hindi, etc.

### **\*Deep/Opaque/Irregular Orthography**

In some languages (such as English), the relationship between graphemes and phonemes are inconsistent, i.e., not one-to-one. The same sound can be represented in different ways. Such languages are said to be having a deep orthography. E.g., consider the sound /i/ in the words ‘*read*’ and ‘*freed*’. Conversely, a given letter string can be pronounced in different ways such as, the rime ‘-alk’ in ‘*balk*’ and ‘*talk*’, or the different pronunciations of the words ‘*wind*’ and ‘*tear*’. Thus, an irregular (opaque/ deep) language is a formal language which does not always follow the phoneme-to-grapheme correspondence rules using the finite set of alphabets. Eg. Hebrew, Chinese, English, etc.

Different reading strategies are used at different stages of development by persons

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\* The terminologies orthographically regular and irregular languages are used as alternatives to shallow or transparent and deep or opaque languages, respectively

who learn English. Ehri (1999); Frith (1985); Marsh, Friedman, Welch, and Desberg (1981) reports that these stages are pursued in a sequence as follows:

- Recognize whole words (logographic reading),
- Begin to apply sound—symbol correspondences (alphabetic reading),
- Skilled reading that predominantly involves direct lexical access through orthography, at least for high-frequency words (orthographic reading)

Readers of regular orthographies are more likely to succeed in reading by means of alphabetic reading strategies than readers of irregular orthographies. The success or failure during reading may determine the strategies used by readers.

The orthographic depth hypothesis (Katz, & Frost, 1992) postulates that regular orthographies should be easier to read using word-recognition processes that involve the language's phonology. Moreover, it suggests that there are different routes to fluent reading that are dependent on the nature of a particular orthography. Therefore, there are two sides to the orthographic depth hypothesis (Katz, & Frost, 1992):

- Regular orthographies support word recognition involving phonology
- Irregular orthographies encourage a reader to process words by accessing the lexicon and meaning via the word's visual orthographic structure

Various studies have been carried out using confrontation naming and picture-to-written word matching in persons with aphasia. Most of these studies have tried to highlight the differences in number of errors and types of errors in a single language in case of confrontation naming tasks or the influence of one language over the other for treatment. Studies on picture-to written word matching tasks reveal that such a task can

enhance confrontation naming in persons with aphasia. Thus, the use of such task mainly as a treatment modality has been addressed and limited number of comparisons made across languages.

Moreover, there are only few studies correlating oral responses of confrontation naming task with a picture-to-word matching task. Further, the influence of orthographic variables across regular and irregular languages for these tasks has not been studied. Limited attempts have also been made in the Indian context.

Thus, this study was undertaken with the need to compare the oral responses of a confrontation naming task with that of a picture-word matching task in the Indian context in an orthographically regular language (Malayalam) and an irregular language (English) in persons with aphasia. Further, this has also been carried out to provide corroborative evidence to the earlier researches conducted in the Western context.

### **Aim**

- To study confrontation naming across orthographically regular language (Malayalam) and irregular language (English) in bilingual persons with aphasia.
- To compare these results with picture to-word matching across these languages.
- To compare responses across two categories, viz., animals and objects, for the two tasks in both languages.
- To analyze the type and accuracy of responses in the verbal and graphic modalities.

## CHAPTER 2

### REVIEW OF LITERATURE

Naming deficits in persons with aphasia has been investigated in several ways. Researchers have employed confrontation naming and lexical generative naming or verbal fluency tasks to tap such deficits.

#### **Confrontation Naming**

Confrontation naming has been studied widely in persons with aphasia in comparison with normal participants and other disorders to assess their naming abilities. Stimuli are presented either in the form of pictures or objects, where the task is to name the presented stimuli. Information processing models generally distinguish three main steps in picture naming task. Inability to name may occur at any of these three levels as reported by Morton and Patterson (1980); Howard and Orchard-Lisle (1984); Kirshner, Webb, and Kelly (1984); Morton (1985); Riddoch and Humphreys (1987); Hillis and Caramazza (1991); Semenza, Bisiacchi, and Romani (1992):

- Perceptual
- Semantic
- Lexical

**Perceptual:** Lack of ability to analyze the picture for extracting a pre-semantic structural description

**Semantic:** Lack of ability to access the stored semantic information from the earlier structural knowledge

**Lexical** : Lack of ability in selection of the output verbal representation to be named



Studies pertaining to the use of confrontation naming tasks using pictures have been broadly classified as:

- Oral naming
- Written naming
- Confrontation naming in bilinguals
- Semantic naming treatment in persons with aphasia

### **Studies on Oral Naming**

In order to determine the extent to which the major aphasia syndromes could be differentiated based on the performances of a picture-naming test in English, Kohn and Goodglass (1985) conducted a study on forty three participants with different kinds of aphasia, viz., Broca's, Wernicke's, conduction and anomic aphasias. The persons with anomic aphasia were further divided into those with anterior lesions (frontal anomia) and those with temporo-parietal lesions (posterior anomia). A set of eighty five line-drawings of objects from the Boston Naming Test (Kaplan, Goodglass, & Weintraub, 1976) were administered to each subject and the types of error were analyzed.

Participants with Broca's aphasia exhibited negated responses, participants with Wernicke's aphasia showed poor phonemic cueing, and those with frontal anomia had whole-part errors. Semantic errors, phonemic errors and multiword circumlocutions were found to be the three most prominent types of picture naming errors across the types of aphasia. The relative distribution of these errors tended to distinguish the two sub-groups

with anomia from the other sub-groups. There was also a similarity in the picture naming performance across the groups.

Watanabe, Fukusako, Monoi, and Sasanuma (1991) compared confrontation naming of fifty two persons with Alzheimer-type dementia and fifty two stroke persons with aphasia (anomic, Broca's, conduction, Wernicke's and others) in English. They used fifty black and white line drawings as stimuli, except for colored paper and photographs of categories of colored names and proper nouns, respectively. Results revealed no significant difference between number of errors produced in both groups. The error-type analyses, however, showed both similarities and differences between the two groups. The most frequent type of error for both the groups was identical- *semantically related errors*. Most of the participants in the two groups did not make any errors in three specific word categories, viz.:

- colors
- spatial terms
- numbers and shapes

The differences in the less frequently occurring errors between the two groups highlighted the different mechanisms of naming difficulty in both groups of persons. In persons with dementia, the naming errors were attributed to a deficit at the semantic and/or label retrieval stage. But in persons with aphasia, these errors were related to a deficit in stages after the label retrieval. These differences in responses were attributed to the fact that in persons with aphasia, naming errors were mainly confined to the linguistic

sphere, whereas in persons with dementia, naming errors reflected an interaction between both linguistic and cognitive difficulties.

The analysis of error types in these studies reveal that semantic errors are the most prominent type of errors exhibited by persons with aphasia during confrontation naming in the oral modality.

Picture naming performances in normal participants and persons with aphasia can be influenced by a number of variables. Some of these variables that have been addressed in various studies include visual complexity, image agreement and familiarity of the concept (Whitehouse, Caramazza, & Zurif, 1978; Snodgrass & Vanderwart, 1980), operativity (Gardner, 1973; Feyereisen, Van der Brought, & Seron, 1988), name frequency (Newcombe, Oldfield, & Wingfield, 1965; Goodglass, Theurkauf, & Wingfield, 1984; Kay & Ellis, 1987), word length (Howard, Patterson, Franklin, Morton, & Orchard-Lisle, 1984), and age of acquisition (Snodgrass, & Vanderwart, 1980).

Deloche et al. (1996) compared oral confrontation naming in English across 108 normal participants and eighteen persons with aphasia using 115 line drawings. Responses varied with familiarity of pictures and image agreement in case of normal participants, while word frequency, diversity of non-dominant responses, and number of phonemes affected naming in persons with aphasia. Moreover, demographic variables like age, education and gender influenced the performance of both normal participants and persons with aphasia.

Picture-naming tasks in the oral modality have been mainly used to tap the types of naming errors and the variables affecting the naming responses in persons with aphasia. But from all these studies, it is evident that the influence of orthographic variables such as the regularity of languages, i.e., comparison of performances in naming across languages of varied orthographic regularity has not been given much attention.

### **Studies on Written Naming**

More recently, even the written responses in naming have been used to study the naming deficits in persons with aphasia (Geschwind, 1967; Hier, & Mohr, 1977; Bub, & Kertesz, 1982; Deloche, Dordain, & Kremin, 1993).

Deloche et al. (1997) compared written responses to picture naming in 360 normal participants divided into three age groups of sixty participants each (20-39 years, 40-59 years, and 60-75 years) and a group of eighteen persons with aphasia. 113 pictures were used as stimuli and considered written responses in French language, which is an orthographically irregular language. The effects of variables related to either the pictures or to their names and the types of errors in naming were analyzed. Influence of factors such as name frequency, age of acquisition of written word forms, number of letters in a word and the degree of orthographic ambiguity was seen during naming. The effect was more marked in persons with aphasia for these linguistic variables than in normal participants. Types of naming errors were differentially related to the characteristics of pictures, concepts and their names.

This study attempted to highlight the importance of considering orthographic variables in naming task. But it was limited only to a single language and no comparisons across languages of different orthographies (regular and irregular) were made.

### **Confrontation Naming in Bilinguals**

Confrontation naming in bilinguals have received much attention over the years. Lexical access in fluent bilinguals are said to be mediated through both the dominant language (L1), as well as the non-dominant language (L2) (de Groot, 1992; Kroll, & Stewart, 1994; Sholl, Sankaranarayanan, & Kroll, 1995). Moreover, connections between L1 and the semantic system are reported to be stronger than connections between L2 and the semantic system in late bilinguals (Potter, So, von Eckardt, & Feldman, 1984; Kroll, & Stewart, 1994; Sholl et al., 1995).

Several models have proposed the differences in bilingual access (de Groot, 1992; Kroll, & Stewart, 1994). According to these models, variables including word frequency, word familiarity, word length, cognate status, and word imageability affect the ease and accuracy of lexical access (de Groot, Borgwaldt, Bos, & van den Eijnden, 2002; de Groot, Dannenburg, & Van Hell, 1994; Costa, Caramazza, & Sebastian-Galles, 2000).

Roberts and Deslauriers (1999) studied the effect of one of these variables, cognate status, on the confrontation naming performance in thirty French-English bilingual persons (fifteen persons with aphasia and fifteen normal participants). The stimuli consisted of color photographs of twenty five cognates, twenty five non-cognates

and ten ambiguous stimuli, which were neither fully cognate nor completely dissimilar. The participants had to name all the sixty pictures in both the languages (French and English). The number of errors and type of errors were analyzed. Results revealed that the cognate pictures were named more correctly in both the languages than the non-cognates. The three most frequently occurring error types were found to be semantic, no response, and wrong language. The semantic errors were more common than the no response errors in case of normal participants, while the reverse was seen in case of persons with aphasia. This study suggested that the breakdown in naming ability was similar across monolingual and bilingual participants.

Several studies in monolingual participants have shown that semantic errors and no response errors were among the frequent error types found in this group. Similar types of errors were also reported in bilingual participants by these authors. But some types of errors such as wrong language were found to be unique to bilingual participants. Moreover, self-correction attempts are often successful in bilinguals. Usually, self-correction was seen in terms of producing the target first in the wrong language and then in the correct language.

The effect of imageability was investigated by Kiran and Tuchtenhagen (2005) in fifteen normal bilingual (English-Spanish) adults and one bilingual adult person with aphasia. The participants had to perform two tasks - naming to definition task and a semantic priming task in English and in Spanish. The stimuli consisted of 120 words for both these tasks, and they were either concrete or abstract nouns. Higher accuracy rates

on the naming to definition task and faster reaction times on the semantic priming task revealed better performance in English than in Spanish for the normal bilingual participants. But the bilingual person with aphasia showed equal performance across both languages.

It was also seen that responses were faster and were accurate for concrete words than abstract words across tasks and languages. Finally, abstract words were retrieved more easily during the semantic priming task, but no conclusive interpretations were made. The effect of imageability on semantic priming and lexical access across two languages (English and Spanish) were highlighted, but the effect of orthographic variables on these tasks was not taken into account.

Cross-linguistic differences in picture naming and identification in relation to the language use and proficiency of the participants were investigated by Muñoz and Marquardt (2003). Four persons with aphasia and twenty four normal participants were considered. All participants were bilingual speakers of Spanish and English. 100 out of 260 line drawings developed by Snodgrass and Vanderwart (1980) were used as stimuli for the two tasks, viz., picture naming and picture identification, in both languages.

Results revealed three patterns of improvement:

- Higher scores in English which was consistent with pre-morbid skill
- Higher scores in Spanish which was inconsistent with pre-morbid skill
- Variable performance which was inconsistent with pre-morbid skill

This indicated that the variability in the proficiency and use of the languages spoken within a bilingual community and the differential effects of proficiency on expressive and receptive language performance must be considered during interpretation of language impairment in adult bilingual speakers.

Although the effects of various variables across languages were considered in these studies, none of them commented on the influence of orthographic variables in different languages.

### **Semantic Naming Treatment in Persons with Aphasia**

Cross-linguistic generalization study on the effect of semantic naming treatment in two persons with aphasia, who were Spanish-English bilinguals, was carried out by Edmonds and Kiran (2005). 80% accuracy for trained items and a simultaneous improvement on semantically related items during English treatment was seen for participant-1 (English dominant). But no improvements were seen in Spanish. With Spanish treatment, participant-1 improved to 100% on trained items, but showed no within-language generalization in Spanish. Improvements in English were also observed. For participant-2 (balanced bilingual), 80% improvement was found on Spanish trained items and generalization to semantically related untrained items, as well as the English translations. Effects of pre-morbid proficiency levels on cross linguistic generalization were highlighted in this study.



Overall, limited attempts have been made to compare the number of errors and types of error patterns across languages. Moreover, the influence of orthographic variables on confrontation naming tasks has not been studied widely and needs further investigation.

### **Picture-to-Word Matching**

Picture-to-word matching tasks have also been used widely in persons with aphasia to assess their semantic processing. Both the spoken and written word-to-picture matching have been studied. Several components of the language processing system are involved in a picture matching task, which include:

- Visual and semantic processing of the picture stimuli
- Lexical (visual/auditory) and semantic processing of the word stimuli

Thus, the performances on such task can be affected due to an impairment in processing at any point from the early auditory or visual processing of the word or the visual perception of the pictures, or due to an impairment in the semantic processing of the picture or the word stimuli.

Various psycholinguistic variables that pertain to any of the levels of processing can also affect the performance on a picture-word matching task. These include imageability, word length, word frequency, and the relationship of the semantic distractors to the target word (Schuell, Jenkins, & Landis, 1961; Bishop, & Byng, 1984).

Thus, the review of literature on the use of picture-to-word matching tasks in persons with aphasia has been studied under the following headings:

- Effect of variables on picture-to-word matching
- Reading performances across languages of different orthographies (as reading is an important component during written word-to- picture matching)
- Use of picture-to-word (spoken or written) matching tasks to treat word finding difficulties in persons with aphasia.

### **Effect of Variables on Picture-to-Word Matching**

Cole-Virtue and Nickels (2004) evaluated the performance and error patterns in fifty four persons with aphasia and fifty one elderly control participants to study the factors affecting picture-word matching task. A spoken word-picture matching task in English involving the selection of the correct picture from a choice of the target and from distractor pictures on listening to a spoken word was employed. Forty target items along with a close semantic distractor, a more distant semantic distractor, a visually similar distractor, and an unrelated distractor taken from PALPA (Psycholinguistic Assessments of Language Processing in Aphasia) by Kay, Lesser, and Coltheart (1992) were used.

The seven psycholinguistic variables assessed were:

- Imageability
- Number of phonemes
- Target log frequency
- Semantic similarity
- Visual similarity
- Word association
- Target-close distractor frequency difference

Results revealed no significant effects of any of the variables on accuracy of responses for the normal participants. Performances of the group of persons with aphasia, on the other hand, were significantly affected by three variables, viz., semantic similarity, imageability, and word association. Moreover, at least one of the four variables, i.e., imageability, semantic similarity, frequency, and word association showed significant effects on performance in six persons with aphasia.

A number of variables affecting a picture-word matching task have been also investigated by researchers. However, as is the case of various confrontation naming tasks, no attempts to study any effects of orthographic variables were made in any of the studies involving the picture-word matching task.

### **Reading Performances across Languages of Different Orthographies**

A picture-to-written word matching task requires the subject to initially read the written word, and then the lexical and semantic processing of the word should take place in order to match with the correct picture stimuli. The process of normal reading has been explained by several investigators (Coltheart, Patterson, & Marshall, 1980; Patterson, Marshall, & Coltheart, 1985) using the dual route model. This model assumes two processing routes:

- Lexical route, where the words are read as a whole
- Non-lexical or sub-lexical route based on the grapheme-to-phoneme conversion (GPC) rules

The lexical route is used to read irregular words like 'know', which do not follow the GPC rules of the language. Non-words are read through the non-lexical route. Thus, for a language, like English, that have words with both an irregular orthography and a regular orthography, both the routes in the model get activated. But in languages with a regular orthography, such as Italian, the use of the two routes for reading words have been questioned (Ardila, 1991). Some general reasons suggest the need for two routes. For instance, the GPC route allows a variety of words to be read, but does not provide direct access to its meaning. Thus, rapid reading of a text can only be achieved using the lexical route. Therefore, reading through the GPC route implies a heavier computational load.

Reading and spelling procedures in normal participants can be influenced by how a written language has been acquired during the early phases of literacy acquisition. Written language is acquired predominantly through the use of the GPC route in case of languages having a regular orthography. On the other hand, it is through the lexical route in those languages with an irregular orthography. Therefore, in a regular language in which the early acquisition of reading and writing is through the GPC route, secondary acquisition of the orthographic lexicon can only be achieved through later practice.

Lexical and sub-lexical variables can affect reading performances. Efforts to study the influence of few of these variables like lexical category, lexical frequency, syllabic structure, and word length in the acquisition of reading in children in a regular language such as Spanish was made by Defior, Justicia, and Martos (1996). In their study, they also compared the effect of these variables in normal and poor Spanish

readers. 140 children in the age range of six and twelve years were taken for the study. Out of these, twenty of them were poor readers.

All these children were tested using a reading test of 306 items in which all the variables were balanced and the percentage of correct responses in the word reading test were obtained. The results showed that all the four variables considered had produced a significant effect on the number of errors made by the children. The pattern of results suggested that there was no difference between the processes involved in the reading acquisition of Spanish and those implicated in irregular orthographies such as English. The results also revealed no qualitative differences between normal and poor readers.

All the variables showed the same behavior in their effect on reading performance for both normal and poor readers, which indicated that poor readers also use both the lexical and the phonological route during reading. Their data also suggested that there is universality in the dual route model which is independent of the regularity or irregularity of the different alphabetical languages. But these results were confined to the effect of these variables in normal children.

Study by Toraldo, Cattani, Zonca, Saletta, and Luzzatti (2006) aimed at finding the possibility of a difference in the reading performance in Italian persons with aphasia. Italian is considered to be a language with regular orthography, i.e., a language in which the majority of written words is read through the GPC route. It also has an irregular condition, in that it is not possible to predict whether the stress in tri-syllabic or longer

words falls on the penultimate or on the antepenultimate position. Thus, the position of the major word stress is the only irregular variable in the Italian reading system. Eg., the stress on the Italian word 'gondola' falls on the first syllable - /ˈgondola/, and not on the second - /gon`dola/, whereas in the word 'mentolo', the stress falls on the second syllable - /men`tolo/, and not on the first - /ˈmentolo/.

The effects of word frequency, concreteness, grammatical class and age of acquisition on word naming were also studied. Ninety Italian persons with aphasia (fluent and non-fluent) were considered and two reading tasks were employed in the study. The first task involved reading of sixty one words and fifteen legal non-words chosen from different lexical categories, while the second task involved the use of forty tri-syllabic words with unpredictable stress position. Affected reading scores were found for all the persons and the reading impairments could be differentiated into phonological, surface, undifferentiated, and letter-by-letter dyslexia types.

One of the persons with phonological dyslexia showed semantic errors, thus revealing the features of deep dyslexia. Majority of the persons with Broca's aphasia suffered from phonological dyslexia, while persons with fluent aphasia had more evenly distributed dyslexia types. The performance of persons with phonological and undifferentiated dyslexia was affected by grammatical class and concreteness. However, persons with surface dyslexia were not affected by these variables.

Moreover, the age of acquisition had only a marginal effect on the performance of the person with deep dyslexia. But in case of other persons, especially persons with phonological and undifferentiated dyslexia types, age of acquisition proved to be the best predictor of performances.

Beaton and Davies (2007) studied the effects of orthographic variables on a picture-naming task and oral reading of the corresponding words in both languages in three bilingual persons with brain-damage. These persons, prior to their stroke, were fluent in both English, an orthographically irregular language, and Welsh, an orthographically regular language. The authors assumed that semantic errors of oral reading by persons with aphasia should be comparatively rare in languages with a regular orthography. Results showed that each patient made a similar proportion of semantic errors in the two languages for the picture-naming task.

During oral reading of the corresponding words in both the languages, no patient was found to produce proportionally more semantic paralexias in English than in Welsh. They attributed these findings to the \*summation hypothesis as cited by Miceli, Capasso, and Caramazza (1994), to explain the differences in frequency of semantic errors of reading in languages differing in orthographic depth. This study did not reveal any differences in frequency of semantic errors between these two languages of varied

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\* According to the summation hypothesis, for normal reading and spelling to take place, integration of both semantic information and knowledge of direct orthography–phonology correspondences is required.

orthographies for two tasks-picture-naming and oral reading tasks. But they did not consider the differences between the languages for any other possible types of errors.

All these studies suggest that though there is universality in the dual route model across languages of varied orthography, or in other words, though reading is achieved through similar means across languages, errors on reading performances may vary with the language considered in the study.

Picture- word matching tasks have also been used to treat word finding difficulties in persons with aphasia as reported in the literature.

Marshall, Pound, White-Thomson, and Pring (1990) reported the effects of using picture-to-word (spoken or written) matching tasks in English to treat the word finding difficulties in three single case studies of persons with aphasia, where they had to distinguish the correct word from others that acted as semantic distractors. 120 pictures were used in the task. A significant improvement was found for the naming of treated pictures but not for untreated controls in two of the cases. These improvements were also maintained at subsequent follow-up assessments. In the third case, significant improvement was found for both treated and untreated pictures.

Later, a small group study of seven cases underwent only picture-written word matching task at their homes without supervision. There was a significant improvement



reported for the treated pictures and a small, but significant, improvement for the semantically related untreated pictures, which were maintained for a month.

A further one-year follow-up study, by Pring, White-Thomson, Pound, Marshall, and Davis (1990), of six of these cases, with no further exposure to these pictures, revealed an extended period of improved naming only for the pictures used in therapy, i.e., the earlier treated pictures. This study considered multiple assessments of cases up to a period of one year to assess the effects of therapy using two tasks. These included the semantic task, i.e., the matching of written and spoken words to pictures, as well as phonological task, i.e., seeing the picture while repeating its name. Results suggested that both tasks may be important components in therapy for improving naming.

But all such investigations were also confined to the use of a single language and not addressed much across different languages, as would be needed in the case of bilingual persons with aphasia.

To summarize, the review of literature on confrontation naming and picture-to-word matching in persons with aphasia across orthographically regular and irregular languages highlight the type of errors seen and variables affecting these tasks.

Studies on an orthographically irregular language, English in persons with aphasia has shown that semantic errors dominate the types of errors seen during confrontation naming task. Semantic errors, phonemic errors and multiword circumlocutions were

found to be the three most prominent types of picture naming errors across Broca's, Wernicke's, conduction and anomic types of aphasia. Participants with Alzheimer-type dementia also exhibited semantically related errors as the most frequent type of errors during confrontation naming. Word frequency, diversity of non-dominant responses, and number of phonemes were seen to affect oral naming performances in English for persons with aphasia.

On the other hand, written picture naming in an irregular language, French in persons with aphasia were affected by factors like semanticity, age of acquisition of written word forms, length of a word and the degree of orthographic ambiguity. This was true across monolingual and bilingual persons with aphasia. Moreover, semantic errors and no response errors were found in both monolinguals and bilinguals. But wrong language errors and self-corrections were found only in the bilingual participants.

Study on an irregular language, English in comparison with a regular language, Spanish revealed better performance in English than in Spanish for normal bilingual persons on a naming to definition task and semantic priming task. But equal performance across both languages was seen for a bilingual person with aphasia.

Unlike confrontation naming, study on spoken word-picture matching task in English, an orthographically irregular language, showed that semantic similarity, imageability, and word association significantly affected the performances of persons with aphasia.

Reading is also an important aspect to be considered for picture-to-word matching tasks. Review of literature on acquisition of reading in children across languages of different orthographies (English and Spanish) suggested no difference in the processes involved in the reading acquisition across the two languages.

For persons with aphasia, a language with a regular orthography, Italian, revealed impairments in reading and differentiated these persons into phonological, surface, undifferentiated, and letter-by-letter dyslexia types. But, no differences in frequency of semantic errors were seen between English, an orthographically irregular language and Welsh, an orthographically regular language during picture-naming and oral reading.

Thus, studies on confrontation naming and picture-to-word matching tasks, in general, reveal no significant differences across languages of varied orthographies in persons with aphasia. But there are no conclusive results on the number and type of errors across such languages.

## **CHAPTER 3**

### **METHOD**

The present study was undertaken to investigate the differences in performances between confrontation naming and picture-to-word matching tasks across two languages. English, an orthographically regular language and Malayalam, an orthographically irregular language were employed in the present study. Performances in different categories (animals and objects), type of errors exhibited by the participants and accuracy of responses were also examined.

#### **Ethical standards used in the study**

- The persons with aphasia and/or their guardians, as well as the normal participants were briefed about the study, its aims, method and duration of testing.
- Each of them was invited to voluntarily participate in the study.
- An informed verbal and written consent was taken from each person before carrying out the testing.

#### **Participants**

##### **Persons with Aphasia**

Thirteen persons with aphasia (one female and twelve males) in the age range of 34-78 years (mean age of 52.84 years) were taken for the study. These participants had their education ranging from Pre-University College (P.U.C.) to post-graduation. They

were divided into four groups: six persons with transcortical motor aphasia, five persons with Broca's aphasia, one person with transcortical sensory aphasia and one person with anomia. The demographic details of the persons with aphasia are shown in table-1.

### **Inclusionary Criteria for Persons with Aphasia**

- All participants were diagnosed as having aphasia by a Speech Language Pathologist and/or Neurologist.
- Participants also underwent MRI/CT scan and the Western Aphasia Battery in Malayalam (Philip, 1992) was administered.
- Duration of stroke varied from three months to one year.
- Participants had no history of pre-morbid neurological, psychological or any known organic deficit as assessed through history
- None of them had any sensory deficits such as visual (e.g., visual neglect, visual agnosia) and/or auditory deficit as assessed informally.
- Pre-morbidly all participants were right-handed.
- All persons with aphasia were bilinguals with Malayalam as their mother tongue (first language, L1) and English as their second language (L2). The participants were screened for their proficiency of use of both languages based on Part-A of the Bilingual Aphasia Test (Paradis, 1987).
- Pre-morbidly, they had undergone formal training, including reading and writing, in both the languages (Malayalam and English) for more than ten years.
- They were also using both these languages effectively prior to their stroke

Table 1: Demographic data of persons with aphasia.

S.No.	Age /sex	Education	Site of lesion	Post stroke duration	Diagnosis
1	37/Male	*P.U.C.	Subacute infarct involving frontal caudate, head and centrum semi ovale and temporal lobe	4 months	*TMA
2	55/Male	*P.G.	Left inferior capsule, posterior frontal subcortical, posterior parietal subcortical infarct	1 year	TMA
3	36/Female	Graduate	Left *MCA infarct	1 year	TMA
4	73/Male	P.G.	Left MCA infarct	1 year	TMA
5	40/Male	Graduate	Left *ICA total occlusion	1 year	TMA
6	62/Male	Graduate	Left MCA total ischemic attack	1 year	TMA
7	53/Male	Graduate	Left MCA infarct	8 months	*BA
8	78/Male	Graduate	Left MCA infarct	4 months	BA
9	63/Male	P.U.C.	Left MCA infarct	4 months	BA
10	34/Male	P.U.C.	Left MCA territory infarct	1 year	BA
11	43/Male	P.U.C.	Left MCA and *PCA territory infarct	1 year	BA
12	48/Male	Graduate	Cardio-embolic stroke	8 months	*TSA
13	65/ Male	P.G.	Left thalamic hemorrhage	9 months	Anomia

\*MCA- Middle Cerebral Artery, ICA- Internal Carotid Artery, PCA- Posterior Cerebral Artery, P.U.C.- Pre-University College, P.G.- Post Graduate, TMA- Trans-cortical Motor Aphasia, BA- Broca's Aphasia, TSA- Trans-cortical Sensory Aphasia.

## **Normal Participants**

Thirteen normal participants were taken as controls in the study and were matched for age, gender, handedness and education with persons with aphasia. The participants had no history of any speech/language or sensory abnormalities. Absence of history of any neurological insult was ensured. The normal participants were bilinguals with Malayalam as their mother tongue (first language, L1) and English as the second language (L2). The proficiency of the use of both the languages was assessed using Part-A of the Bilingual Aphasia Test (Paradis, 1987) (Appendix-IV).

## **Tests Administered**

- Western Aphasic Battery in Malayalam (Philip, 1992): To differentially diagnose the type of aphasia.
- Part-A of the Bilingual Aphasia Test (Paradis, 1987): To assess the proficiency of usage of both the languages- Malayalam and English in persons with aphasia.

The following stimuli were considered for testing:

1. Twelve picture cards of size 4" x 6" [black and white line drawings (Appendix-I)] were used to elicit responses from the participants. These included pictures from Manual for Adult Non-Fluent Aphasia Therapy- In Kannada (Venugopal, 2005) and Word Retrieval Manual: Hindi Aphasics (Shinde, 2006). Six of these pictures were animals and the rest six were objects. The same pictures were used across all the four tasks.

2. A total of forty eight black and white [twenty four each in English (Appendix-II) and Malayalam (Appendix-III)] printed word cards of size 4” x 6” were used in the picture-to-word matching tasks. The printed word was written in bold upper case letters with a font size seventy two. The length of each word was maintained, i.e., the length of each word was within one-three syllables in both the languages. Twenty four of these word cards included the target words of the picture cards with twelve cards in English and twelve in Malayalam. The remaining twenty four word cards had semantically related words to each of the target words which again consisted of twelve cards in English and twelve in Malayalam.

### **Procedure**

**General:** Each participant was seated comfortably in a quiet environment and tested individually. They were asked to either name the picture shown or match it with the written form according to the task that was administered. Instructions were given to the participants at the beginning of each task. Testing was temporarily stopped for participants who reported of fatigue and was continued later.

**Specific:** The following four tasks were carried out while testing:

- Confrontation naming across orthographically irregular language (i.e., English)
- Confrontation naming across orthographically regular language (i.e., Malayalam)
- Picture-to-word matching in orthographically irregular language
- Picture-to-word matching in orthographically regular language



The four tasks were carried out in two sessions:

- **Session I**
  1. Confrontation naming in Malayalam (Task 1)
  2. Confrontation naming in English (Task 2)
- **Session II**
  1. Picture-to-word matching in Malayalam (Task 3)
  2. Picture-to-word matching in English (Task 4)

For each task, the pictures were randomized and each task lasted for a duration of five minutes. Time gap of half an hour was given between each session.

**Confrontation Naming Tasks:** Twelve sets of picture cards were used in this task, where three pictures, at a time, were placed in front of the participants. They were instructed to name each picture. Responses were recorded in an audio recorder and these recorded samples were analyzed. The number of pictures named correctly at the end of each minute was calculated. The same was carried out for both the languages.

**Picture-to-Word Matching Tasks:** The following items were used in this task:

- Twelve sets of picture cards used in the above tasks
- Printed word form of each picture in both the languages
- Semantically related printed words of each picture in both the languages

Three pictures were placed in front of the participants along with six printed options to be matched with the three given pictures. The six given printed word options included the correct word form of each picture and its semantically related word, i.e., three target

stimuli and three printed words which were semantically related to the target. Thus, the twelve pictures were presented as four sets, i.e., three at a time. Participants were asked to match the pictures with their orthography (written form) as fast as they could. The same procedure was carried out for both the languages.

**Scoring:** The scores for all the tasks were calculated as follows:

- For each correct response (in confrontation naming tasks and picture-to-word matching tasks), a score of one was given.
- A score of zero was given for each incorrect response.

The following measures were considered for each of the tasks:

#### **Confrontation Naming Task**

- Total number of correct responses in:
  1. Orthographically regular language (Malayalam)
  2. Orthographically irregular language (English)
- Number of correct responses at the end of each minute in:
  1. Orthographically regular language
  2. Orthographically irregular language

#### **Picture- Word Matching Task**

Total number of correctly matched responses in:

1. Orthographically regular language (Malayalam)
2. Orthographically irregular language (English)

## **Data Analysis**

The raw data was tabulated and further subjected to both quantitative and qualitative analyses. SPSS 10.0 version was used for the detailed analyses. The quantitative analysis included calculation of number of errors in each of four groups of persons with aphasia and normal participants. Statistical means for all the five groups of participants were computed. A parametric test, i.e., independent t-test was used to find the overall differences in performance between the group of persons with aphasia and the group of normal participants. Out of the thirteen persons with aphasia, only two groups - six persons with trans-cortical motor aphasia and five persons with Broca's aphasia - as well as the group of normal participants were subjected to non-parametric statistical analysis. This was due to the reason that only one participant each in the trans-cortical sensory and anomic types of aphasia were available.

Initially, Kruskal-Wallis test was carried out to find differences in performances of the three groups of participants across four tasks, viz., confrontation naming in English, picture-to-word matching in English, confrontation naming in Malayalam and picture-to-word matching in Malayalam. Additionally, a pair-wise comparison of these three groups of participants was made based on the Mann-Whitney test. Friedman test was used to check for significant differences within each of these groups individually across all the tasks in both languages. Further data was subjected to Wilcoxon Signed Ranks test to compare the performance of participants across these tasks.

The twelve stimuli were divided into six animals and six objects. So the number of correct responses in each of these categories was calculated separately for all the four tasks in English and Malayalam. Moreover, the number of correct responses produced in one minute was also computed for the confrontation naming tasks in both languages. Similar statistical analyses were applied to compute differences across these tasks.

On the other hand, qualitative analysis was carried out to find the types of errors present across the tasks. However, this was done only for the persons with aphasia as none of the normal participants had exhibited any type of errors. Graphs were plotted to highlight the percentage of persons exhibiting these types of errors. For this, only the six persons with trans-cortical motor aphasia and five persons with Broca's aphasia were considered. The types of errors found in persons with aphasia were classified as semantic errors, self-corrections, no response errors and incorrect responses.

- **Semantic errors** – Any response that was semantically related to the target stimulus was grouped as a semantic error.
- **Self-corrections** – Any response that was corrected by the subject himself/herself within the given time limit of one minute was classified as a self-correction.
- **No response error** – Any target stimulus that did not yield any response from the subject was grouped under no response error.
- **Incorrect responses** – Any other response not semantically related to the target stimulus was taken as an incorrect response.

## CHAPTER 4

### RESULTS AND DISCUSSION

The aim of the study was to compare the confrontation naming and picture-to-word matching in a regular and irregular language. Comparisons were made across normal participants and bilingual persons with aphasia. Further, the types of errors were also analyzed.

The results and discussion on confrontation naming and picture-to-word matching tasks in English and Malayalam for persons with aphasia (trans-cortical motor aphasia, Broca's aphasia, trans-cortical sensory aphasia and anomia) and for the normal participants have been presented and discussed as listed below:

- a. Performances in confrontation naming and picture-to-word matching across English and Malayalam in persons with aphasia and normal participants
- b. Performances in confrontation naming and picture-to-word matching across both languages in two categories, viz., animals and objects, for persons with aphasia and normal participants
- c. Comparison of number of correct responses produced in one minute
- d. Qualitative analysis in terms of different types of errors

**a. Performances in confrontation naming and picture-to-word matching across English and Malayalam in persons with aphasia and normal participants**

**Performances of Normal Participants versus Persons with Aphasia**

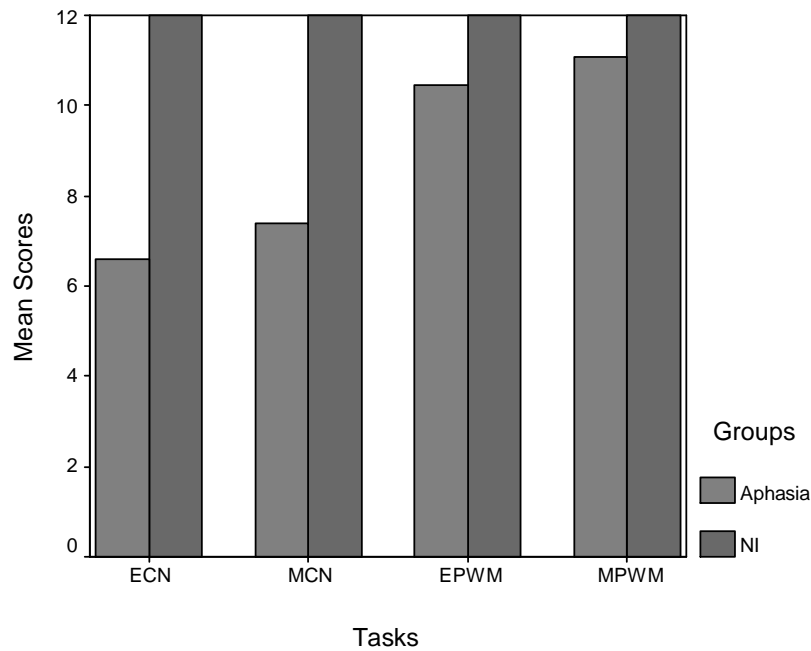
Differences in performances were compared across four tasks as shown below:

- Confrontation naming in English (ECN)
- Confrontation naming in Malayalam (MCN)
- Picture-to-word matching in English (EPWM)
- Picture-to-word matching in Malayalam (MPWM)

Mean and standard deviations were extracted for the groups of persons with aphasia and normal participants for the confrontation naming and picture-to-word matching tasks in English and Malayalam as shown in table-2. It is apparent from table-2 that persons with aphasia obtained a mean score of 6.61 (S.D. =5.50) and 7.38 (S.D. =5.05) for confrontation naming in English and Malayalam, respectively. The normal participants on the other hand obtained a higher mean value of 12.00 (S.D. =0.00) for these two tasks. Similarly, on the picture-to-word matching tasks, persons with aphasia obtained a mean score of 10.46 (S.D. =2.25) and 11.07 (S.D. =1.32) in English and Malayalam, respectively. The mean score for the normal participants, in contrast, showed a higher value of 12.00 (S.D. =0.00) for both languages. Graph-1 plotted below also highlights the evident differences across the two groups.

Table-2: Mean scores and standard deviations for the groups of persons with aphasia and normal participants for the four tasks in two languages.

Tasks	Groups	
	Aphasia	*NI
	Mean (*S.D.)	Mean (S.D.)
*ECN	6.61 (5.50)	12.00 (0.00)
*MCN	7.38 (5.05)	12.00 (0.00)
*EPWM	10.46 (2.25)	12.00 (0.00)
*MPWM	11.07 (1.32)	12.00 (0.00)



Graph-1: Comparison between persons with aphasia and normal participants across the four tasks.

\* ECN= English Confrontation Naming, MCN= Malayalam Confrontation Naming, EPWM= English Picture-to-Word Matching, MPWM= Malayalam Picture-to-Word Matching, S.D.= Standard Deviation, NI= Normal participants.

Results reveal that brain damage can cause deficits in naming and matching a picture to its target written word. The breakdown in naming ability for the persons with aphasia when compared with the normal participants is evident in the present study and similar observations have been made by several authors (Watanabe et al., 1991; Deloche et al., 1996; Roberts, & Deslauriers, 1999). Watanabe et al. (1991) attributed these naming errors to deficits in stages after the label retrieval, while Deloche et al. (1996), and Roberts and Deslauriers (1999) reported that the errors exhibited were the result of influence of various demographic variables like age, education and gender and cognate status. As the demographic variables were controlled in this study, errors in naming responses cannot be recognized as the effect of any such variables.

In picture-to-word matching tasks, Morris (1997) highlighted the effects of semantic similarity and explained that the number of shared semantic features between items can help in measuring the amount of featural overlap between these items. Thus, any defect in the semantic processing can affect performance on items having more featural overlap than those that do not.

Likewise, Cole-Virtue and Nickels (2004) reported errors in picture-to-word matching tasks in persons with aphasia due to effects of imageability, semantic similarity, frequency, and word association. In the present study, the effect of semantic similarity could explain the errors produced on the picture-to-word matching tasks as semantic distractors were used in this study.



Further, independent t-test was administered to find differences between normal participants and persons with aphasia across the four tasks. On the confrontation naming task in English, a significant difference [ $t(24) = 3.53, p < 0.05$ ] was obtained across persons with aphasia and normal participants. Significant difference [ $t(24) = 3.29, p < 0.05$ ] was also observed in Malayalam for this task. Similarly, for the picture-to-word matching task in English, a significant difference [ $t(24) = 2.45, p < 0.05$ ] was evident. Further, for the same task in Malayalam a significant difference [ $t(24) = 2.52, p < 0.05$ ] was noted. Hence, comparison of performances across all the tasks between these two groups reveals poorer performance for the group of persons with aphasia than the normal participants.

It is evident from the results that while the normal participants exhibited no errors, the group of persons with aphasia had errors on all tasks. Among the tasks poorer performances were observed for the confrontation naming tasks than the picture-to-word matching tasks, irrespective of the language or its orthographic regularity. This could be attributed to the fact that both groups of participants selected for the study were equally proficient in the usage of both languages. Thus, no obvious differences in performances across languages were observed. Support for these results comes from the studies of de Groot (1992); Kroll and Stewart (1994); Sholl, Sankaranarayanan and Kroll (1995) where they propose that lexical access in fluent bilinguals are mediated through both the dominant (L1) the non-dominant (L2) languages.

van Hell and de Groot (1998) suggest that concrete words share conceptual nodes across both languages in bilingual persons. The similarity in performance across the two languages in the present study could also be accounted by the fact that concrete items were used as stimuli and hence share same conceptual nodes across languages. Kiran and Tuchtenhagen (2005) also reported that responses were faster and more accurate for concrete words than abstract words across naming to definition and semantic priming tasks.

Better scores on picture-to-word matching tasks can be due to the fact that such tasks involve the use of written semantic distractors. This would reinforce the associations between the semantics of the pictures and their phonologies. These semantics are said to be activated by the discrimination task and their phonologies are activated in the output lexicon (Marshall et al., 1990). There are no such associations occurring for a naming task.

Moreover, sub-vocal rehearsals are more evident during the picture-to-word matching tasks. The importance of such sub-vocal rehearsals for confrontation naming has been indicated by Goswami (2004). A similar mechanism may be employed by the participants during the picture-to-word matching tasks for reading and comprehending the written word, which ultimately facilitates pointing to the correct choice. Thus, it is clear that confrontation naming can be facilitated by picture-to-word matching, which would otherwise result in a declination of performances.

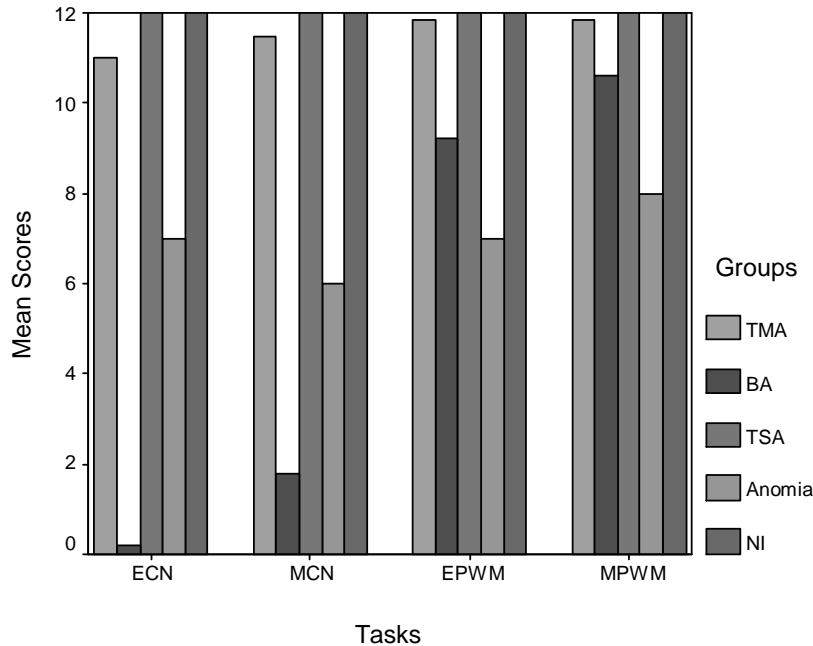
### Performances of Normal Participants versus Types of Aphasia

On computation of statistical means across the four groups of persons with aphasia (transcortical motor aphasia, Broca's aphasia, transcortical sensory aphasia and anomia) and the group of normal participants, the means and standard deviations, indicated in table-3, were derived for the four tasks. The differences in mean scores across all the five groups have also been depicted in graph-2.

Table-3: Mean and standard deviations across the five groups for the four tasks in both languages.

Tasks	Groups				
	TMA	BA	TSA	ANOMIA	NI
	Mean (S.D.)				
ECN	11.00 (1.54)	0.20 (0.44)	12.00	7.00	12.00 (0.00)
MCN	11.50 (0.54)	1.80 (2.49)	12.00	6.00	12.00 (0.00)
EPWM	11.83 (0.40)	9.20 (2.58)	12.00	7.00	12.00 (0.00)
MPWM	11.83 (0.40)	10.60 (1.14)	12.00	8.00	12.00 (0.00)

Persons with trans-cortical motor aphasia achieved a mean score of 11.00 (S.D. =1.54) in English confrontation naming, 11.50 (S.D. =0.54) in Malayalam confrontation naming and 11.83 (S.D. =0.40) in both English and Malayalam picture-to-word matching. On the other hand, persons with Broca's aphasia showed a mean value of 0.20 (S.D. =0.44) and 1.80 (S.D. =2.49) for English and Malayalam confrontation naming, respectively. Alternatively, on the picture-to-word matching, they showed a mean score of 9.20 (S.D. = 2.58) for English and 10.60 (S.D. =1.14) for Malayalam



Graph-2: Mean scores across all the four groups of persons with aphasia and the group of normal participants.

The single participant with trans-cortical sensory aphasia had a mean score of 12.00 for all tasks, while the single participant with anomia had mean scores of 7.00, 6.00, 7.00, and 8.00 for the English confrontation naming, Malayalam confrontation naming, English picture-to-word matching and Malayalam picture-to-word matching, respectively. Like the person with trans-cortical sensory aphasia, the normal participants also achieved a mean score of 12.00 (S.D. =0.00) on all tasks. Thus, table-3 and graph-2 reveal equal performances of the person (only one participant in this group) with trans-cortical sensory aphasia and normal participants for all tasks.

The performance of persons with trans-cortical motor aphasia is almost comparable with these two groups. Persons with Broca's aphasia showed the least performance across the confrontation naming tasks and slightly better performances for

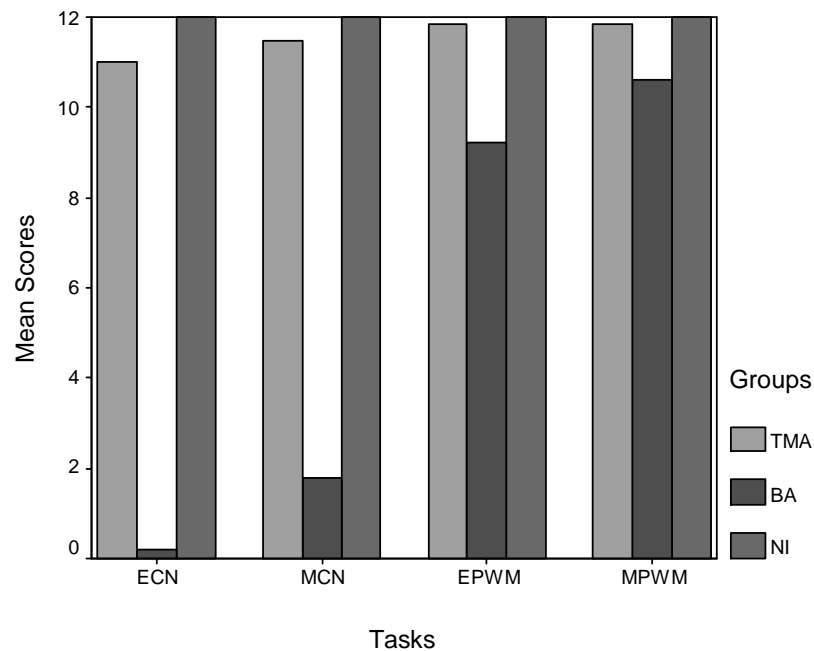
the picture-to-word matching tasks. The person with anomia (only one participant), on the other hand, exhibited almost similar performances across tasks.

Out of the four groups of persons with aphasia, only two groups- six persons with trans-cortical motor aphasia (TMA) and five persons with Broca's aphasia (BA) as well as the group of normal participants (NI) were subjected to non-parametric statistical analysis. Kruskal-Wallis test was carried out to compare the performances across the four tasks between these three groups. The confrontation naming tasks in English revealed a significant difference [ $X^2 (2) = 18.94, p < 0.001$ ] between the groups.

Similarly, in Malayalam a significant difference [ $X^2 (2) = 18.90, p < 0.001$ ] was noted. For the picture-to-word matching tasks, significant differences were found in English [ $X^2 (2) = 14.22, p < 0.001$ ] and Malayalam [ $X^2 (2) = 13.94, p < 0.001$ ]. Since a significant difference was found across the three groups on all the tasks, pair-wise comparisons of each of the groups were further made using the Mann-Whitney test. On comparison of groups of persons with trans-cortical motor aphasia with that of Broca's aphasia, significant difference was observed for the confrontation naming tasks in English ( $z = 2.83, p < 0.05$ ) and Malayalam ( $z = 2.81, p < 0.05$ ). Significant differences were also noted for the picture-to-word matching tasks in English ( $z = 2.19, p < 0.05$ ) and Malayalam ( $z = 2.11, p < 0.05$ ).

When persons with Broca's aphasia were compared with normal participants, similar results were obtained. Significant differences were derived for all tasks in both

languages, i.e. confrontation naming tasks in English ( $z = 4.08$ ,  $p < 0.001$ ) and Malayalam ( $z = 4.06$ ,  $p < 0.001$ ), and picture-to-word matching tasks in English ( $z = 3.51$ ,  $p < 0.001$ ) and Malayalam ( $z = 3.52$ ,  $p < 0.001$ ). In contrast, comparisons of persons with trans-cortical motor aphasia and normal participants showed a significant difference in English ( $z = 2.69$ ,  $p < 0.01$ ) and Malayalam only for the confrontation naming tasks, while there was no significant difference ( $z = 1.47$ ,  $p > 0.01$ ) for picture-to-word matching tasks in both languages. These differences are plotted in Graph-2.



Graph-3: Comparison of mean scores among the two groups of persons with aphasia and the group of normal participants.

The results highlight a hierarchy in the accuracy of performance among the three groups with the persons with Broca's aphasia exhibiting the least accurate performance compared to persons with transcortical motor aphasia and finally the normal participants having the highest level of accuracy with no errors in performance.

Thus, it can be assumed that the site of lesion in persons with Broca's aphasia causes additional damage as opposed to that of persons with trans-cortical motor aphasia. Hence, fluency, naming and picture-to-word matching skills are more affected in these persons as supported by Kertesz (1982) in Western Aphasia Battery (WAB) and Goodglass and Kaplan (1983) in Boston Diagnostic Aphasia Examination (BDAE).

Moreover, the recovery may also be more in persons with trans-cortical motor aphasia as opposed to persons with Broca's aphasia. Marshall et al. (1990) reported that the use of picture-to-word matching tasks involving written semantic distractors would reinforce the associations between the semantics of the pictures and their phonologies. This describes why performance of persons with transcortical motor aphasia was comparable with that of normal participants only on the picture-to-word matching tasks.

Upon administration of the Friedman test to compare performances across the four tasks within each group, significant difference [ $\chi^2 (3) = 14.18, p < 0.01$ ] was found only in the Broca's group, while the group of persons with trans-cortical motor aphasia [ $\chi^2 (3) = 0.12, p > 0.05$ ] and normal participants [ $\chi^2 (3) = 0.00, p > 0.05$ ] exhibited no significant difference.

Further analysis using the Wilcoxon Signed Ranks test for the group of persons with Broca's aphasia was employed, where pair-wise comparison of performances among the four tasks was carried out. No significant difference ( $z = 1.41, p > 0.05$ ) in performance on comparison of English and Malayalam confrontation naming tasks was found in this

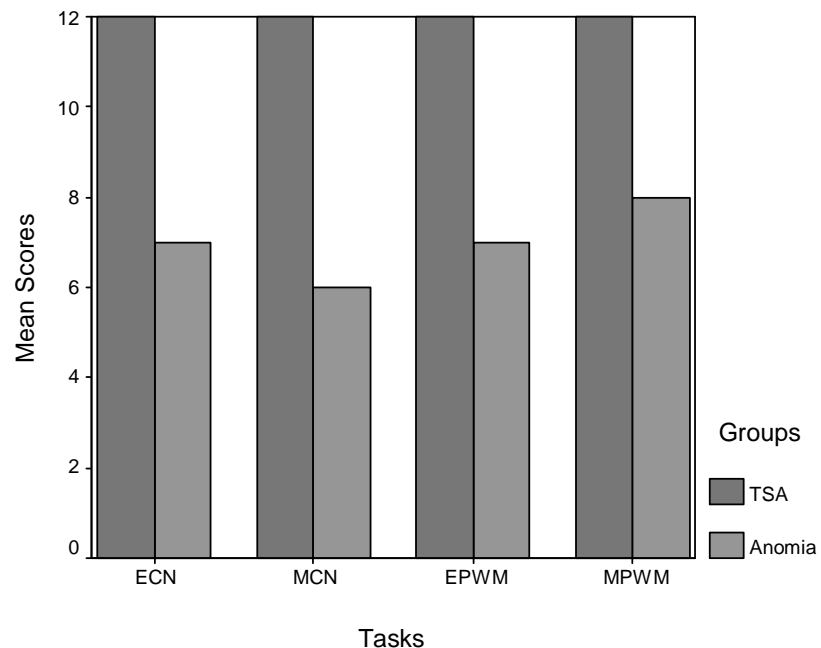
group. Likewise, on the picture-to-word matching tasks between the two languages, there was no significant difference ( $z = 1.34$ ,  $p > 0.05$ ). But a significant difference ( $z = 2.02$ ,  $p < 0.05$ ) was found across the confrontation naming and the picture-to-word matching tasks, where the performances in the picture-to-word matching tasks was superior to that of the confrontation naming tasks as depicted in graph-3. This pattern was consistent in both the studied languages.

It is generally assumed that the conceptual system in a bilingual individual is common for all languages (based on the revised hierarchical model proposed by Kroll & Stewart, 1994). Similar findings have been quoted by de Groot (1992); Sholl, Sankaranarayanan and Kroll (1995). These studies lead to a conclusion that since the same conceptual system is used for naming in both languages, performances across languages cannot vary. In the conceptual system, activation of several lexical nodes of the different languages occurs on presentation of a stimulus, regardless of the language in which the task is being performed. Therefore, an appropriate lexical selection in the target language is adopted as required.

Individual analyses of the other two persons with trans-cortical sensory and anomia types of aphasia also showed differences in performance. It is evident from graph-2 that the performance of the person with trans-cortical sensory aphasia was in par with that of the normal participants. Graph-4 illustrates that this person (person with trans-cortical sensory aphasia) made no errors across all the four tasks in both languages, while the subject with anomia showed varied performances.



The person with anomia showed a slightly higher performance in the Malayalam picture-to-word matching task than the picture-to-word matching in English and the confrontation naming tasks in both the languages. Confrontation naming in Malayalam was poorer than performance on the other three tasks. Moreover, in English, there was equal performance across the two tasks.



Graph-4: Mean scores of person with trans-cortical sensory aphasia in comparison to the person with anomia.

As the person with trans-cortical sensory aphasia performed similar to that of normal participants, it is evident that the skills in such persons are retained better or recover to a greater extent when compared to the other types of persons with aphasia. But it would be pre-mature to conclude from these results due to the limited number of participant (n=1).

The person with anomic aphasia performed poorly across all tasks. Kohn and Goodglass (1985) stated that in persons with anomic aphasia, confrontation naming is often affected due to the lack of phonological representations in these persons. They also propose a two-stage model of picture-naming and suggest that, according to this model, these persons have impaired word-finding rather than impaired word-production.

Thus, the results of confrontation naming and picture-to-word matching task can be summed up as:

- Confrontation naming and picture-to-word matching can be affected in persons with aphasia, irrespective of the type of aphasia.
- Results of the present study provide further corroborative evidence to the existing research, except in the single participant with trans-cortical sensory aphasia in the present study.
- Such findings need to be confirmed using larger sample sizes.
- Differences in performance across two tasks and not across two languages- English and Malayalam was evident.
- Results of the present study are indicative of the fact that orthographic regularity has no affect on the performances in both normal participants and all types of persons with aphasia.

**b. Performances in confrontation naming and picture-to-word matching across English and Malayalam in two categories- animals and objects- in persons with aphasia and normal participants**

**Performances of Normal Participants versus Persons with Aphasia**

The number of correct responses in each of the divided categories, viz., six animals and six objects, was calculated separately for all the tasks in English and Malayalam. The following tasks were considered to study the above mentioned performances:

**Confrontation naming for:**

- Animals in English (ECNA) versus Malayalam (MCNA)
- Objects in English (ECNO) versus Malayalam (MCNO)

**Picture-to-word matching for:**

- Animals in English (EPWMA) versus Malayalam (MPWMA)
- Objects in English (EPWMO) versus Malayalam (MPWMO)

Mean and standard deviations were derived to compare responses across group of persons with aphasia and group of normal participants for all the tasks, which is depicted in table-4. For the English confrontation naming involving animals and objects, a mean score of 3.23 (S.D. = 2.74) and 3.38 (S.D = 2.78), respectively, was observed for persons with aphasia. However, for Malayalam, the mean scores obtained were 3.53 (S.D. = 2.50) for animals and 3.76 (S.D. =2.68) for objects. Similarly, for the picture-to-word matching

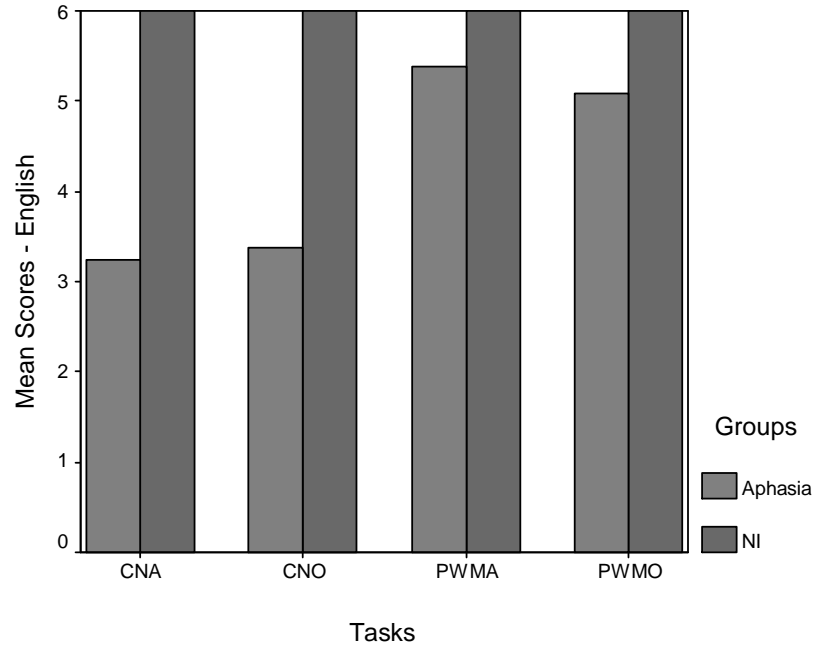
tasks including animals, persons with aphasia achieved a mean value of 5.38 (S.D. = 0.96) in English and 5.61 (S.D. = 0.65) in Malayalam. A mean score of 5.07 (S.D. = 1.44) in English and 5.46 (S.D. = 0.77) in Malayalam was noted for the same task including objects. The normal participants derived a mean score of 6.00 (S.D. = 0.00) across all tasks. Graphs-5 and 6 shows the mean scores across the confrontation naming and picture-to-word matching tasks within the two categories in English and Malayalam, respectively.

Table-4: Mean values and standard deviations for the groups of normal participants and persons with aphasia across two categories.

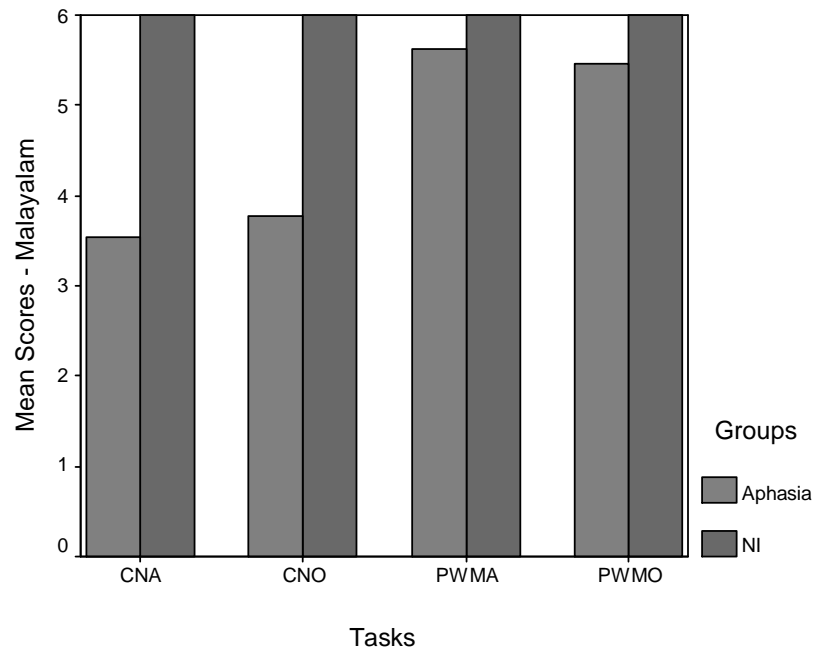
Tasks	Groups	
	Aphasia	NI
	Mean (S.D.)	
*ECNA	3.23 (2.74)	6.00 (0.00)
*ECNO	3.38 (2.78)	6.00 (0.00)
*MCNA	3.53 (2.50)	6.00 (0.00)
*MCNO	3.76 (2.68)	6.00 (0.00)
*EPWMA	5.38 (0.96)	6.00 (0.00)
*EPWMO	5.07 (1.44)	6.00 (0.00)
*MPWMA	5.61 (0.65)	6.00 (0.00)
*MPWMO	5.46 (0.77)	6.00 (0.00)

---

\* ECNA- English Confrontation Naming for Animals, ECNO- English Confrontation Naming for Objects. MCNA- Malayalam Confrontation Naming for Animals, MCNO- Malayalam Confrontation Naming for Objects, EPWMA- English Picture-to-Word Matching for Animals, EPWMO- English Picture-to-Word Matching for Objects, MPWMA- Malayalam Picture-to-Word Matching for Animals, MPWMO- Malayalam Picture-to-Word Matching for Objects.



Graph-5: Mean scores across the tasks for animals and objects in English for the group of persons with aphasia and group of normal participants.



Graph-6: Mean scores across the tasks for animals and objects in Malayalam for the group of persons with aphasia and group of normal participants.

There are marked differences in performances between normal participants and persons with aphasia across the two tasks, viz., confrontation naming and picture-to-word matching. But no category specific differences were prominent. The same results were evident across the two languages. Thus, the role of orthography regularity as a factor affecting performances across categories has been ruled out.

Moreover, variations in performance between categories depend on participants' familiarity or past experiences for items present within the categories (Goodglass, Wingfield, Hyde, & Therkauf, 1986). In other words, word frequency can influence performance of both groups of participants (Newcombe, Oldfield, & Wingfield, 1965; Wingfield, 1968; Newcombe, Oldfield, Ratcliff, & Wingfield, 1971; Goodglass, Therkauf, & Wingfield, 1984). The similarity in performances across the two categories of animals and objects in the present study could be attributed to the fact that all the items within the categories had more familiarity or were of high frequency.

### **Performances of Normal Participants versus Types of Aphasia**

Mean scores and standard deviations across all the tasks for the two categories, i.e., animals and objects, in each of the four groups of persons with aphasia in comparison to the normal participants are tabulated in Table-5. Trans-cortical motor aphasia, in the confrontation naming task for the category of animals obtained a mean score of 5.33 (S.D. = 0.81) and 5.50 (S.D. = 0.54) in English and Malayalam. Alternatively, the category of objects scored mean values of 5.66 (S.D. = 0.81) and 6.00 (S.D. = 0.00) in English and Malayalam, respectively. Graphs-7 and 8 also illustrate this in both

languages separately. Furthermore, on the English picture-to-word matching task, the mean score obtained was 5.83 (S.D. = 0.40) for the category of animals and 6.00 (S.D. = 0.00) for objects. In Malayalam, the scores were 5.83 (S.D. = 0.40) for animals and 6.00 (S.D. = 0.00) for objects.

The group of persons with Broca's aphasia revealed lower scores on all tasks. The mean values derived for the confrontation naming tasks for animals were 0.00 (S.D. = 0.00) in English and 8.00 (S.D. = 1.30) in Malayalam. For the category of objects, these scores were 0.20 (S.D. = 0.44) in English and 0.8(S.D. = 1.30) in Malayalam. In English, for the picture-to-word matching task, the mean scores were 4.80 (S.D. = 1.30) and 4.40 (S.D. = 1.34) for the categories of animals and objects, respectively. On the other hand, in Malayalam, the mean values were 5.60 (S.D. = 0.54) and 5.00 (S.D. = 0.70) for these two categories. A mean score of 6.00 was noted across all tasks for a single participant with trans-cortical sensory aphasia.

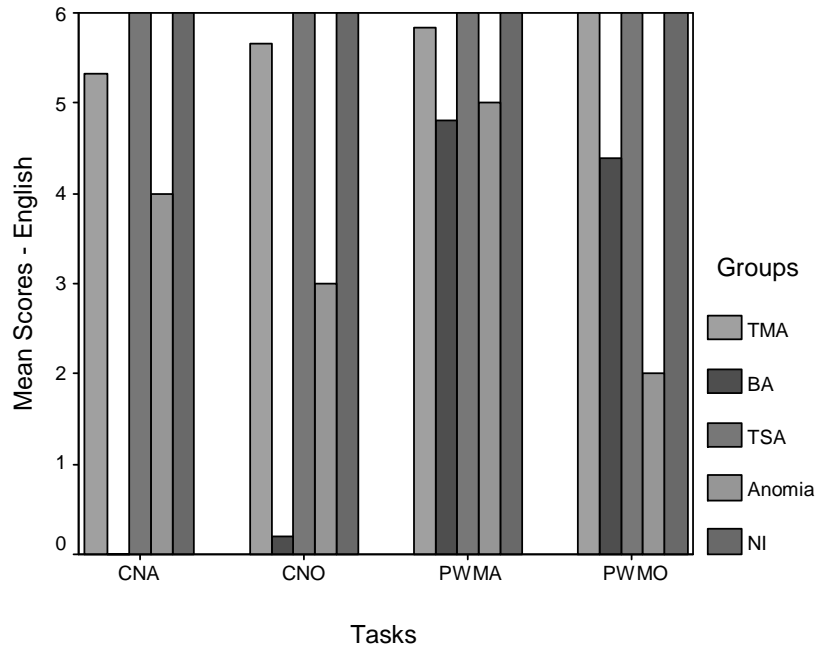
In contrast, the single participant with anomia derived a mean score of 4.00 for the animals category in English confrontation naming and Malayalam picture-to-word matching. The same score was obtained for the objects' category in Malayalam picture-to-word matching. The English confrontation naming including objects and the Malayalam confrontation naming including both animals and objects yielded a mean value of 3.00. The other two picture-to-word matching tasks in English, i.e., involving animals and objects showed a mean score of 5.00 and 2.00, respectively.

Normal participants obtained the highest mean score of 6.00 (S.D. = 0.00) on all tasks. The overall mean values suggest poor performance across all tasks in both languages for the group of persons with aphasia compared to the normal participants. Moreover, responses of picture-to-word matching tasks in both categories are superior to that of the confrontation naming tasks. This is seen in both English and Malayalam. This pattern is similar to that observed when the combined category responses were considered.

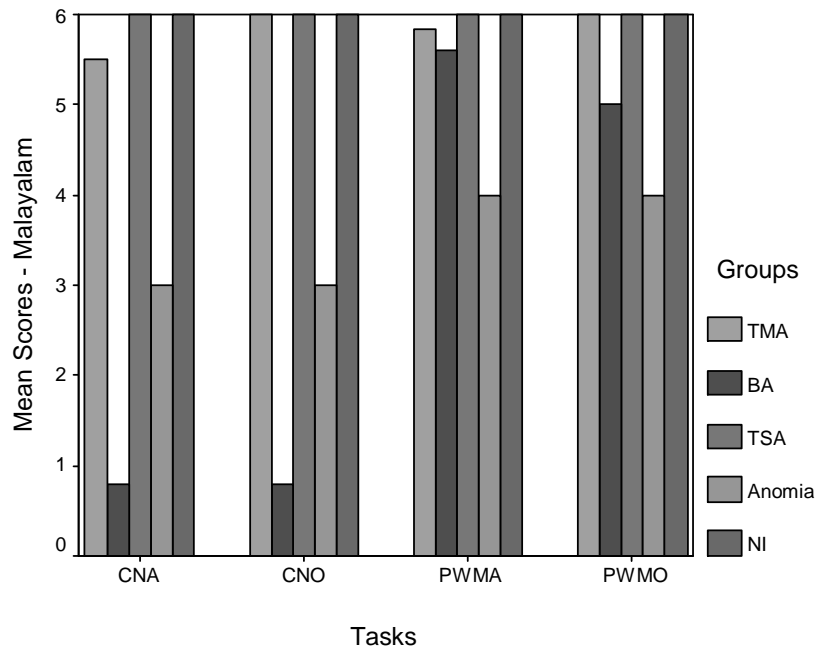
Table-5: Mean and standard deviations across the five groups across two categories.

Tasks	Groups				
	TMA	BA	TSA	Anomia	NI
	Mean				
<b>ECNA</b>	5.33 (0.81)	0.00 (0.00)	6.00	4.00	6.00 (0.00)
<b>ECNO</b>	5.67 (0.81)	0.20 (0.44)	6.00	3.00	6.00 (0.00)
<b>MCNA</b>	5.50 (0.54)	0.80 (1.30)	6.00	3.00	6.00 (0.00)
<b>MCNO</b>	6.00 (0.00)	0.80 (1.30)	6.00	3.00	6.00 (0.00)
<b>EPWMA</b>	5.83 (0.40)	4.80 (1.30)	6.00	5.00	6.00 (0.00)
<b>EPWMO</b>	6.00 (0.00)	4.40 (1.34)	6.00	2.00	6.00 (0.00)
<b>MPWMA</b>	5.83 (0.40)	5.60 (0.54)	6.00	4.00	6.00 (0.00)
<b>MPWMO</b>	6.00 (0.00)	5.00 (0.70)	6.00	4.00	6.00 (0.00)





Graph 7: Mean scores across the tasks for animals and objects in English for the four groups of persons with aphasia and the group of normal participants.



Graph-8: Mean scores across the tasks for animals and objects in Malayalam for the four groups of persons with aphasia and the group of normal participants.

On comparison across all the four groups of persons with aphasia and the group of normal participants, groups of persons with trans-cortical sensory aphasia were in par with that of normal participants across tasks in both languages. Persons with trans-cortical motor aphasia almost matched with normal participants and those with Broca's aphasia performed better in picture-to-word matching tasks than for the confrontation naming tasks across categories. Therefore, no differences were observed across categories.

Independent t-test was carried out, further, to find differences across the group of persons with aphasia and the group of normal participants on these tasks. Results of the English confrontation naming tasks reveal a significant difference across both groups for the category of animals [ $t(24) = 3.64, p < 0.05$ ] and objects [ $t(24) = 3.38, p < 0.05$ ]. In the same way, in Malayalam, the same task showed a significant difference for the categories of animals [ $t(24) = 3.54, p < 0.05$ ] and objects [ $t(24) = 2.99, p < 0.05$ ]. The results of the picture-to-word matching also yielded similar findings. Thus, a significant difference [ $t(24) = 2.30, p < 0.05$ ] was found for the stimuli including the two categories in English. Likewise, these categories of animals [ $t(24) = 2.13, p < 0.05$ ] and objects [ $t(24) = 2.50, p < 0.05$ ] showed significant difference in Malayalam picture-to-word matching. Therefore, a significant difference was observed across all tasks between the two groups.

Kruskal-Wallis test to compare responses across three groups- persons with trans-cortical motor aphasia, persons with Broca's aphasia and normal participants indicated a significant difference in English confrontation naming for both categories of animals [ $X^2$

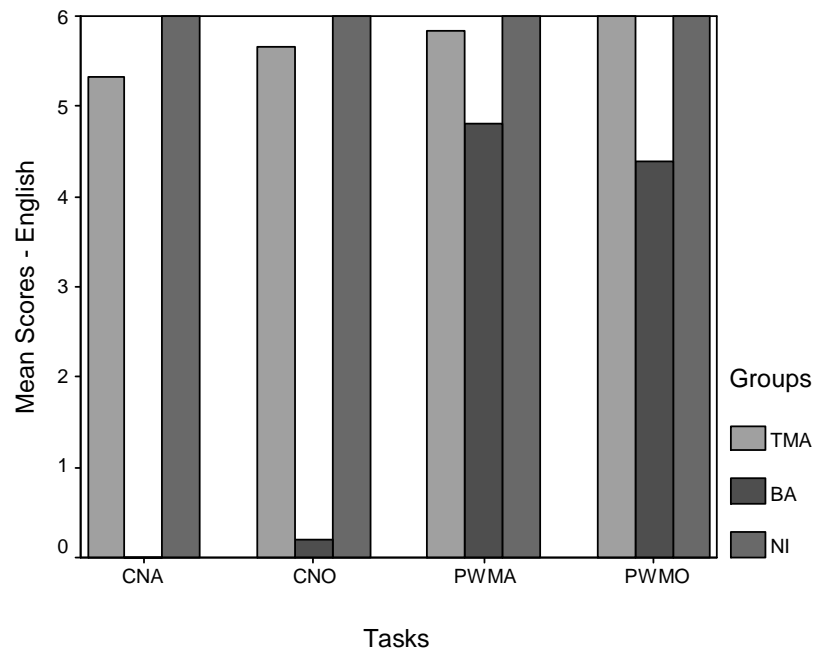
(2) =19.06,  $p<0.01$ ] and objects [ $X^2$  (2) =20.20,  $p<0.01$ ]. The stimuli consisting of animals showed a significant difference [ $X^2$  (2) =18.90,  $p<0.01$ ] in Malayalam. Findings were same for the category of objects [ $X^2$  (2) =22.68,  $p<0.01$ ]. In English, a significant difference was noted for the picture-to-word matching task using animals as stimuli [ $X^2$  (2) =9.39,  $p<0.01$ ] and objects as stimuli [ $X^2$  (2) =17.33,  $p<0.01$ ].

The same results were obtained for objects in Malayalam [ $X^2$  (2) =17.37,  $p<0.01$ ], but no significant result [ $X^2$  (2) =5.18,  $p>0.01$ ] was found for animals. Further the data was subjected to pair-wise analyses of the three groups and results showed varied patterns. When the groups of trans-cortical motor aphasia and Broca's aphasia were compared, a significant difference was observed across all confrontation naming tasks, i.e., in English for animals ( $z =2.90$ ,  $p<0.01$ ) and objects ( $z =2.94$ ,  $p<0.01$ ), and in Malayalam for animals ( $z =2.81$ ,  $p<0.01$ ) and objects ( $z =3.01$ ,  $p<0.01$ ). When the stimuli included objects, significant differences were obtained between the groups for the picture-to-word matching tasks in English ( $z = 2.55$ ,  $p<0.01$ ) and Malayalam ( $z = 2.56$ ,  $p<0.01$ ), but there was no significant result in English ( $z =1.59$ ,  $p>0.01$ ) and Malayalam ( $z =0.82$ ,  $p>0.01$ ) on using animals as stimuli.

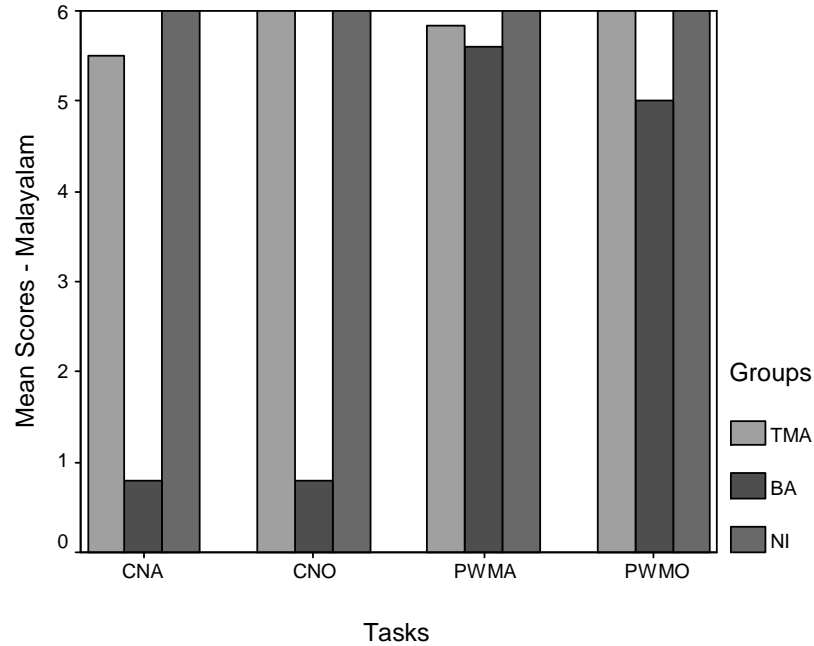
On comparison of group of persons with trans-cortical motor aphasia and normal participants, significant difference was found only across the English ( $z = 2.69$ ,  $p<0.01$ ) and Malayalam ( $z = 2.70$ ,  $p<0.01$ ) confrontation naming tasks for animals. There was no significant difference noted for the English confrontation naming using objects ( $z =1.47$ ,  $p>0.01$ ). Similarly, no significant difference ( $z =0.00$ ,  $p>0.01$ ) was found for the

Malayalam confrontation naming and the picture-to-word matching in the two languages for category of objects. Likewise, picture-to-word matching in both languages for category of animals yielded no significant difference ( $z = 1.47, p < 0.01$ ).

The group of persons with Broca’s aphasia revealed a significant difference in English confrontation naming on using both animals ( $z = 4.12, p < 0.01$ ) and objects ( $z = 4.08, p < 0.01$ ) as stimuli when compared with normal participants. In Malayalam, for the same task, similar results were observed for the two categories ( $z = 4.06, p < 0.01$ ). Moreover, for the picture-to-word matching tasks, significant difference was found on using animals in English ( $z = 2.95, p < 0.01$ ) and Malayalam ( $z = 2.35, p < 0.01$ ), and on using objects in English ( $z = 3.52, p < 0.01$ ) and Malayalam ( $z = 3.53, p < 0.01$ ). These results are clearly highlighted in graph-9 for English and graph-10 for Malayalam.



Graph-9: Comparison of performances across tasks of animals and objects categories for the groups of persons with trans-cortical motor aphasia, Broca’s aphasia and normal participants in English.



Graph-10: Comparison of performances across tasks of animals and objects categories for the groups of persons with transcortical motor aphasia, Broca's aphasia and normal participants in Malayalam.

Friedman test was carried out separately for the tasks related to each of the categories of animals and objects. Furthermore, individual analyses of the three groups - persons with trans-cortical motor aphasia, Broca's aphasia and normal participants were employed.

Within the group of persons with trans-cortical motor aphasia, there was no significant difference across tasks for the categories of animals [ $\chi^2(3) = 5.82, p > 0.50$ ] and objects ( $z = 3.00, p < 0.01$ ) as per Friedman test results. Pair-wise comparison using Wilcoxon Signed Ranks test yielded no significant difference ( $z = 1.41, p > 0.05$ ) between both categories for the English confrontation naming task. Similarly, in Malayalam, no significant difference ( $z = 1.73, p > 0.05$ ) was derived across categories. Picture-to-word

matching tasks also exhibited no significant difference ( $z = 1.00$ ,  $p > 0.05$ ) when compared across categories within the same language.

For the group of persons with Broca's aphasia, Friedman test across tasks within the category of animals revealed a significant difference [ $X^2(3) = 14.18$ ,  $p < 0.50$ ]. Hence, pair-wise analyses using Wilcoxon Signed Ranks test between tasks was used to find the significant pairs. Results showed that while there was a significant difference across the two tasks in English ( $z = 2.03$ ,  $p < 0.05$ ) and Malayalam ( $z = 2.04$ ,  $p < 0.05$ ), no such significant difference was noted when comparisons were made across the two languages in confrontation naming ( $z = 1.34$ ,  $p > 0.05$ ) and picture-to-word matching ( $z = 1.41$ ,  $p > 0.05$ ) tasks.

Similarly, for the category of objects, on Friedman test, significant difference [ $X^2(3) = 14.18$ ,  $p < 0.01$ ] was seen across tasks. Wilcoxon Signed Ranks test to make pair-wise comparisons also indicated a significant difference ( $z = 2.03$ ,  $p < 0.05$ ) across tasks, but not across languages ( $z = 1.34$ ,  $p > 0.05$ ). Further pair-wise comparisons within English confrontation naming across the categories exhibited no significant difference ( $z = 1.00$ ,  $p > 0.05$ ). The results were same in Malayalam ( $z = 0.00$ ,  $p > 0.05$ ). Likewise, picture-to-word matching tasks showed no significant results across categories in English ( $z = 1.41$ ,  $p > 0.05$ ) and Malayalam ( $z = 1.73$ ,  $p > 0.05$ ).

For the group of normal participants, Friedman test showed no significant difference [ $\chi^2(3) = 0.00, p > 0.05$ ] across tasks for both categories and the Wilcoxon Signed Ranks test also revealed equal performances ( $z = 0.00, p > 0.05$ ) across categories.

Unlike the studies by Warrington and McCarthy (1983); Goodglass et al. (1986), which account for differences in naming responses across categories, the results of the present study suggest no such differences in performance across categories. Warrington and McCarthy (1983) proposed that category specific comprehension deficit in persons with aphasia could arise due to a degraded semantic system or due to a faulty access to an intact semantic system. Goodglass et al. (1986) also suggested that a deficit in accessing the semantic information lead to category specific dissociations in naming and recognition. The fact that no differences were found across the two categories in this study could be attributed to the fact that the number of stimuli considered for these tasks were few, i.e., six in each category and were also highly semantic in nature. Thus, due to the semantic similarity in both the categories, equal activation of the semantic system takes place when responding to such tasks. Moreover, these persons with aphasia were not controlled for the duration for which they had undergone speech language intervention. Therefore, the intervention could have facilitated the use of semantic system equally for both categories leading to similar performances across categories.

Reports by Goodglass, Barton, & Kaplan (1978) reveal that persons with aphasia who are unable to name an item on command can often point to the correct item on listening to its name. Goodglass, Wingfield, Hyde, and Therkauf (1986) also reported of

such dissociations between naming and comprehension in persons with aphasia across categories. Superiority in name recognition over name production was found by these authors. Such dissociations were also evident in the present study, where performances in picture-to-word matching were better than confrontation naming in persons with aphasia.

The results for the confrontation naming and picture-to-word matching tasks in the category of animals and objects can be summarized as:

- Results on performance across these categories for the two tasks in English and Malayalam revealed significant differences only across tasks and not across languages.
- Results highlighted that orthographic regularity does not influence category specific performances.
- Differences in performances were observed within and across the types of persons with aphasia and normal participants.

### **c. Comparison of number of correct responses produced in one minute**

#### **Performances of Normal Participants versus Persons with Aphasia**

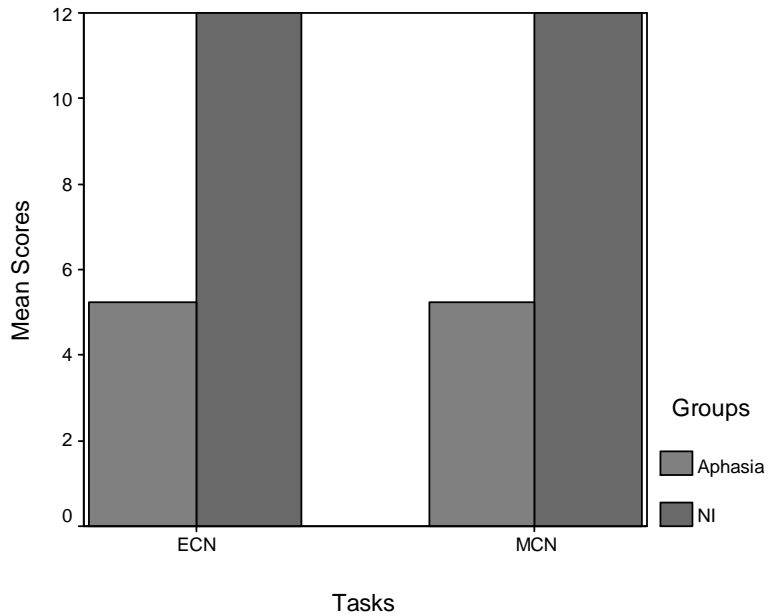
The number of correct responses produced within a minute for the confrontation naming tasks in English and Malayalam was computed across the groups of persons with aphasia and the group of normal participants. Mean and standard deviations were obtained for the same as shown in table-6 and highlighted in graph-11. The mean scores for the persons with aphasia was found to be 5.23 (S.D. =4.47) in English and



5.23 (S.D. =4.67) in Malayalam. In contrast, for the normal participants, a higher mean score of 12.00 (S.D. =0.00) was obtained in both languages.

Table-6: Mean scores and standard deviations across persons with aphasia and normal participants for number of responses produced in one minute for confrontation naming.

Tasks	Groups	
	Aphasia	NI
	Mean (S.D.)	
ECN	5.23 (4.47)	12.00 (0.00)
MCN	5.23 (4.67)	12.00 (0.00)



Graph-11: Comparison of mean scores across persons with aphasia and normal participants for correct responses produced in one minute in the confrontation naming task .

Significant difference was found on independent t-test when the group of persons with aphasia was compared with the group of normal participants in English [ $t(24) = 5.45, p < 0.001$ ] and Malayalam [ $t(24) = 5.22, p < 0.001$ ], where performances were better for the normal participants.

It is evident from the results that normal participants are superior in performance for the task in both languages. This highlights the fact that brain damage can affect the speed of processing during naming tasks and increasing the response time in persons with aphasia. Thus, they show obvious poor performances on speed tasks.

McNeil (1988); McNeil, Odell, and Tseng (1991) proposed that there can be some form of linguistic inefficiency or deficit in accessing or activating language rules and representations in persons with aphasia. This performance deficit explanation assumes that there is no deletion of linguistic information from the aphasic person's repertoire, but that these linguistic rules and representations are at times less accessible. This was attributed to damage to the neural mechanisms that control the activation, selection, and inhibition of linguistic elements.

McCarthy and Kartsounis (2000) found that reaction time to naming in a semantically blocked condition in persons with aphasia were higher. This was accounted by the fact that there is an abnormally longer inhibition of competing lexical representations during word selection. Biegler, Crowther, and Martin (2006), in their study on semantic blocking effects in production and comprehension, found increased blocking effect for naming but not word-picture matching in normal participants. But

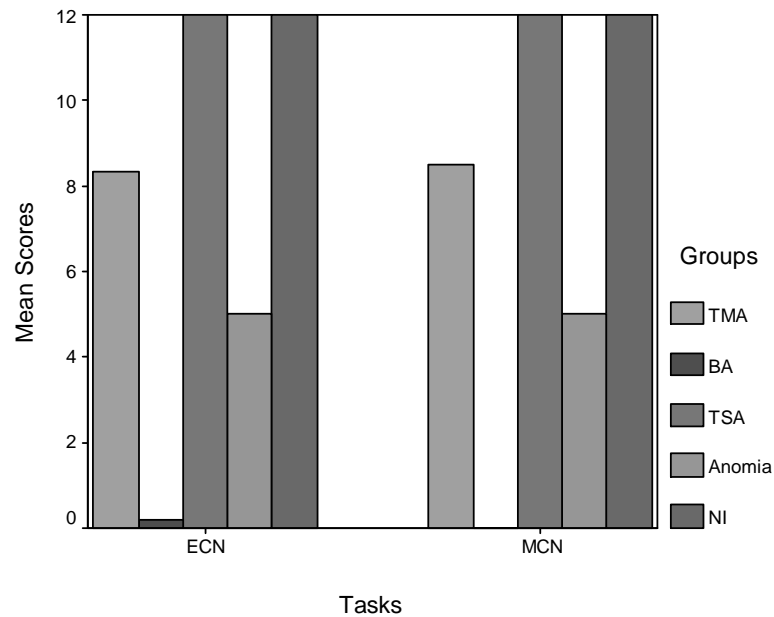
increased effect was observed in both production and comprehension for persons with aphasia. The findings of their study were attributed to an over-activation of the lexical representations of semantic members due to spreading activation. Thus, these participants were unable to suppress (through inhibition) the activation of related but inappropriate representations. This made appropriate selection difficult.

### **Performances of Normal Participants versus Types of Aphasia**

Comparisons of the number of correct responses produced within one minute for the confrontation naming task in both languages were made across the four groups of persons with aphasia (trans-cortical motor aphasia, Broca's aphasia, trans-cortical sensory aphasia and anomia) and normal participants. Mean and standard deviations computed for the same are depicted in table- 7. In English, the persons with trans-cortical motor aphasia and Broca's aphasia, obtained a mean score of 8.33 (S.D. =1.36), 0.20 (S.D. =0.44), respectively, while the single participants with trans-cortical sensory aphasia and anomia scored 12.00 and 5.00, respectively. On the other hand, in Malayalam, the mean scores were 8.50 (S.D. =1.76) for persons with trans-cortical motor aphasia, 0.00 (S.D. =0.00) for persons with Broca's aphasia, 12.00 for the person with trans-cortical sensory aphasia and 5.00 for the person with anomia. The normal participants obtained a mean score equal to the person with trans-cortical sensory aphasia, i.e., 12.00 (S.D. =0.00) in both Malayalam and English. Graph-12 shows the mean scores across these groups.

Table-7: Mean scores and standard deviations for the groups of persons with aphasia and normal participants for responses produced in one minute for confrontation naming.

	Groups				
	TMA	BA	TSA	Anomia	NI
	Mean (S.D.)				
<b>ECN</b>	8.33 (1.37)	0.20 (.45)	12.00	5.00	12.00 (0.00)
<b>MCN</b>	8.50 (1.76)	0.00 (0.00)	12.00	5.00	12.00 (0.00)



Graph-12: Comparison of mean scores across groups of persons with aphasia and normal participants for correct responses produced in one minute in the confrontation naming task.

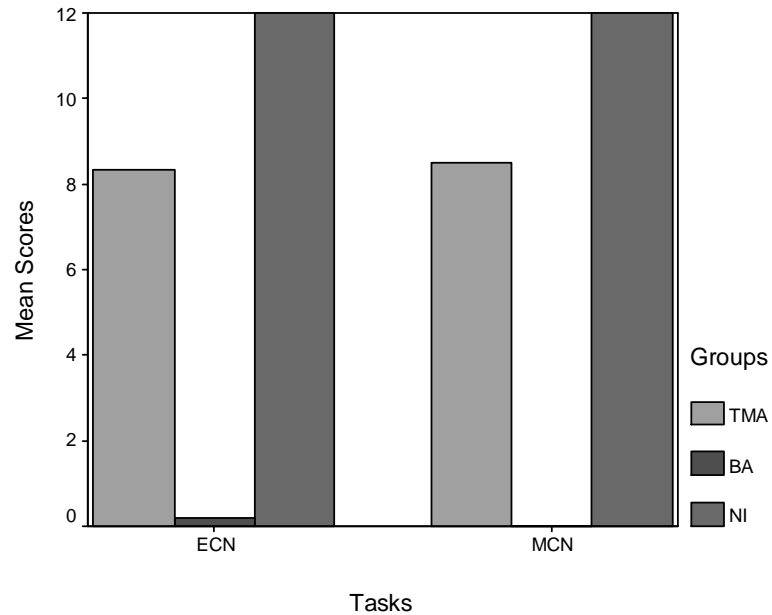
The graph clearly reveals that both normal participants and persons with trans-cortical sensory aphasia have almost equal ability to name the items in a given time, which is evident from the fact that both produced equal number of responses within one minute. The persons with trans-cortical motor aphasia fall slightly behind these two groups. The persons with anomia formed the next group. Broca's aphasia group, producing almost no responses within one minute, was the last group with the least

performance. This supports the evidence that apparent brain damage do affect the person's ability to name items in a given time resulting in obvious poor performances on speed tasks.

Comparison of performances across three groups- persons with trans-cortical motor aphasia, persons with Broca's aphasia and normal participants using Kruskal-Wallis revealed a significant difference [ $X^2(2) = 22.46, p < 0.001$ ] across tasks. On Mann-Whitney test, pair-wise comparison across the three groups was made and significant difference was observed across the groups of persons with trans-cortical motor aphasia and Broca's aphasia in English ( $z = 2.81, p < 0.01$ ) and Malayalam ( $z = 2.90, p < 0.01$ ). Significant differences ( $z = 4.15, p < 0.001$ ) were also observed on comparison of persons with trans-cortical motor aphasia and normal participants in both languages. The same was evident between persons with Broca's aphasia and normal participants in English ( $z = 4.08, p < 0.001$ ) and Malayalam ( $z = 4.12, p < 0.001$ ). The performance of the three groups is represented visually in graph-13.

The differences in performance across the three groups have been discussed as:

The reduced ability to name an item within a given duration in persons with Broca's aphasia could be attributed to their poor language fluency and poor retrieval abilities. This shows that integrity of the brain is essential for maintaining smooth verbal output. Damage to these anatomical regions shows noticeable reduction in performances in verbal output. Support from this comes from studies by Luria (1970) and Goodglass, Quadfasel, & Timberlake (1964).



Graph-13: Comparison of mean scores across the two groups of persons with aphasia and normal participants for correct responses produced in one minute in the confrontation naming task.

Moreover, within group comparisons between tasks on the Wilcoxon Signed Ranks test indicated no significant difference across the groups of persons with transcortical motor aphasia ( $z = 0.13$ ,  $p > 0.05$ ), Broca's aphasia ( $z = 1.00$ ,  $p > 0.05$ ) and the normal participants ( $z = 0.00$ ,  $p > 0.05$ ).

Above findings can be summed up as:

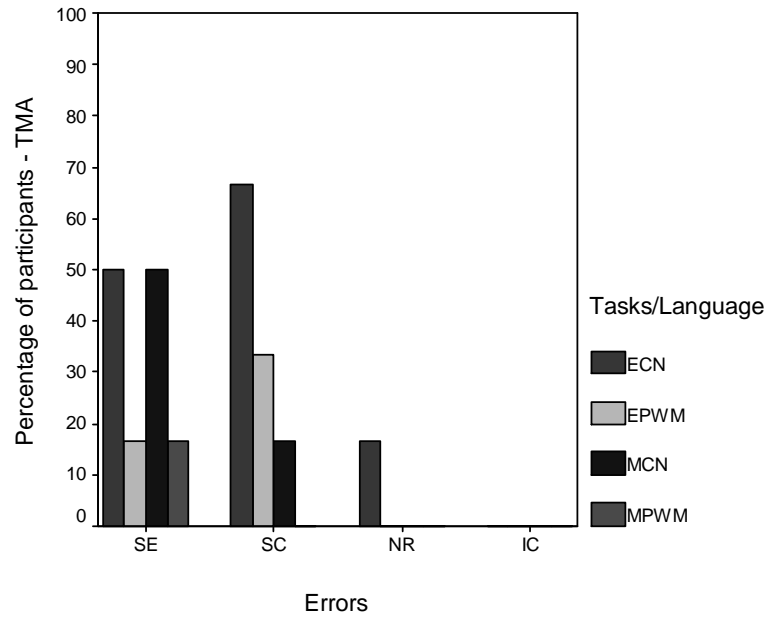
- Persons with aphasia produced lesser number of correct responses in one minute compared to the normal participants. This was true for all of the types of persons with aphasia, except the single participant with trans-cortical sensory aphasia whose performance was in par with the normal participants.
- Apparent brain damage can slow down the time taken to respond to a naming task.

#### **d. Qualitative analysis of types of errors**

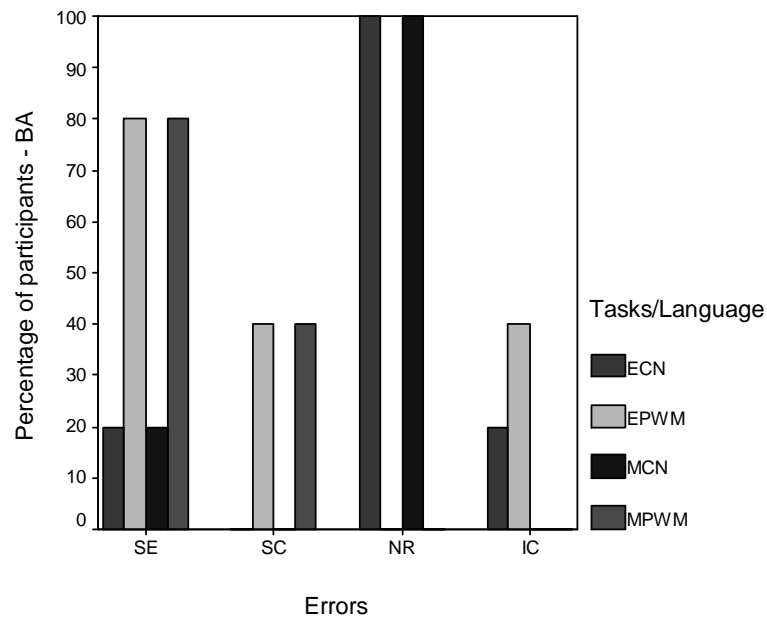
Qualitative analysis was done to find the types of errors across all the tasks in both the languages. This was analyzed only in the groups of persons with aphasia as the normal participants did not exhibit any such errors. Semantic errors, self-corrections and no response errors were evident in the group of persons with trans-cortical motor aphasia for the confrontation naming task in English, while only the former two were found in Malayalam.

The occurrence of any type of error was few in the picture-to-word matching tasks in both English and Malayalam. Semantic errors and self-corrections were seen in English and only a single semantic error exhibited by one of the participants in Malayalam. In contrast, the group of persons with Broca's aphasia also showed an additional error of production of incorrect responses, which was evident in all the tasks in both languages, except the picture-to-word matching task in Malayalam.

The confrontation naming tasks in English and Malayalam revealed no self-corrections, unlike the group of persons with trans-cortical motor aphasia. Only semantic errors, no response errors and incorrect responses were seen in both languages for this task. Alternatively, the picture-to-word matching task performances showed semantic errors, self-corrections and incorrect responses in English, and only semantic errors and self-corrections in Malayalam. Percentage of persons with trans-cortical motor aphasia and persons with Broca's aphasia exhibiting each type of error across the four tasks is depicted graphs-14 and 15, respectively.



Graph-14: Percentage of persons with transcortical motor aphasia exhibiting each type of error across the four tasks.



Graph-15: Percentage of persons with Broca's aphasia exhibiting each type of error across the four tasks.

In case of the single participant with trans-cortical sensory aphasia, analysis of types of errors revealed only self-corrections for the confrontation naming task in Malayalam. On the other hand, the person with anomia showed semantic errors and no



response errors for the English confrontation naming task, and semantic errors, no response errors and incorrect responses in Malayalam for the same task. Semantic errors and incorrect responses were observed in the picture-to-word matching task in English; and in Malayalam, it was the semantic errors and self-corrections that were evident.

However, the results indicating the presence of semantic errors in persons with anomia need to be observed with caution. However these findings have received support from Kohn and Goodglass (1985) who also reported of semantic errors in all types of persons with aphasia.

Semantic errors were the most common type of error found across all groups as observed. This is in agreement with Watamori et al. (1991) who also reported of these type errors during confrontation naming in all types of persons with aphasia. As mentioned earlier, Kroll and Stewart (1994), based on their revised hierarchical model, assumed that the conceptual system in a bilingual individual is common for all languages.

On presentation of a stimulus, activation of several lexical nodes of the different languages occurs within this conceptual system, regardless of the language in which the task is being performed. These act as competitors during the lexical selection. Irrespective of the competition, a mechanism of inhibitory processes may suppress or inhibit the activation of the words that belong to the non-target language (Green, 1998; Hermans, Bongaerts, de Bot, & Schreuder, 1998; Lee, & Williams, 2001). Thus, it could

be stated that an inappropriate inhibition and/or selection mechanisms within a particular language could result in a semantic error.

The effect of semantic similarity has also been quoted by several authors (Morris, 1997; Cole-Virtue, & Nickels, 2004) in picture-to-word matching tasks, which can also explain the existence of such type errors as the most frequently occurring type of error. Additionally, more error types were found for the naming task, irrespective of the type of aphasia, indicating that naming is not cued by any modes, unlike the picture-to-word matching tasks which are cued by semantic and phonological associations.

Thus the qualitative analysis shows that:

- Semantic errors were the most common type of error and the most frequently evident error across all persons with aphasia, except the trans-cortical sensory aphasia.
- These errors are attributed to a deficit in the appropriate selection mechanism for retrieval of a particular target to respond accurately.

The overall findings of the present study can be briefed as:

- Responses to confrontation naming and picture-to-word matching yielded differences in performances between these tasks on comparison of persons with aphasia to matched normal participants.
- The results were consistent across two orthographically different languages, viz., English and Malayalam. Category specific differences in performances were not

observed across the two languages, but differences were evident between the two tasks.

- Calculation of number of responses produced in one minute on the confrontation naming task revealed a lag in performance for persons with aphasia as opposed to normal participants.
- Furthermore, semantic errors were found to be the most common type of error across all types of persons with aphasia on qualitative analysis.

## CHAPTER 5

### SUMMARY AND CONCLUSIONS

The present study investigated the differences in performances for two tasks- confrontation naming and picture-to-word matching- across two languages, i.e., an orthographically regular language (Malayalam) and an irregular language (English) in bilingual persons with aphasia. Moreover, the entire list of stimuli was divided into two categories-animals and objects- for further category specific analyses of performances. The study also observed variations in number of correct responses produced within a minute for the confrontation naming tasks in both languages. Furthermore, the type and accuracy of responses in the verbal and graphic modalities were analyzed.

Four different groups of persons with aphasia (trans-cortical motor aphasia, Broca's aphasia, trans-cortical sensory aphasia and anomia) were considered for the study and their performances were compared across matched normal controls.

The overall results indicated that responses varied across the different tasks, i.e., confrontation naming and picture-to-word matching rather than across both languages for all groups of bilingual persons with aphasia. Thus, the study indicated that there is no influence of orthographic regularity across the tasks. Findings also support the notion that a common conceptual system is present for languages in bilingual persons (de Groot, 1992; Kroll, & Stewart, 1994; Sholl, Sankaranarayanan, & Kroll, 1995).

Thus, the view that it is mandatory to make diagnostic assessments across both the languages that any bilingual person with aphasia is proficient in, has been questioned.

Further, it can be concluded that as long as a bilingual person with aphasia is proficient in the languages he/she knows, diagnostic assessments and therapeutic interventions can be carried out in any of these languages.

Moreover, scores on picture-to-word matching tasks were found to be superior to that of confrontation naming. This was attributed to associations between the semantics of the pictures and their phonologies, which are evident only during a picture-to-word matching task involving written semantic distractors (Marshall et al., 1990). The importance of sub-vocal rehearsals during the picture-to-word matching tasks was also highlighted in the present study.

Results on category specific performances revealed no significant differences across the categories of animals and objects. The high semanticity and equal familiarity of the items within the two categories could have resulted in such findings. These results are consistent with studies by Newcombe et al. (1965); Newcombe et al. (1971); Goodglass et al. (1986).

Number of correct responses produced by persons with aphasia on confrontation naming was fewer when compared to that of normal participants revealing poor

performances in speed tasks. Such deficits in performance were attributed to a damage to the neural mechanisms that control the activation, selection, and inhibition of linguistic elements (McNeil, 1988; McNeil, Odell, & Tseng, 1991), consequently slowing down the response time.

Qualitative analysis on the type of errors produced across the groups of persons with aphasia revealed a high occurrence of semantic errors as opposed to other types of errors. Findings were explained based on the revised hierarchical model (Kroll, & Stewart, 1994). Within the conceptual system of bilinguals, inappropriate inhibition and/or selection mechanisms in a particular language during activation of lexical nodes could result in a semantic error. Error types were also more frequent on the confrontation naming tasks than the picture-to-word matching tasks. This strengthens the fact that picture-to-word matching tasks are cued by semantic and phonological associations.

### **Implications of the Study**

The present study has the following implications:

- The result of the study has thrown insight about the similarities and differences in confrontation naming task and picture-to-word matching task in bilingual persons with aphasia.
- Furthermore, this study considered the influence of orthographic variables across languages. The absence of influence of orthographic regularity in English and Malayalam was an eye-opener to the fact that any language can be used during assessment and intervention in bilingual persons with aphasia proficient in both

languages. Thus, proficiency of the usage of languages is an important factor to be considered.

- This study also highlights the use of picture-to-word matching as a therapy tool to improve confrontation naming abilities in bilingual persons with aphasia.

### **Future Directions**

Studies in other languages of varied orthographic regularity can be conducted to find differences in performances across languages in bilingual persons with aphasia. Moreover, the importance of assessing proficiency across languages rather than employing time consuming procedures to make assessments in all languages a person knows can be further investigated. Studies employing larger number of participants need to be carried out to provide corroborative evidence for the results of the present study.

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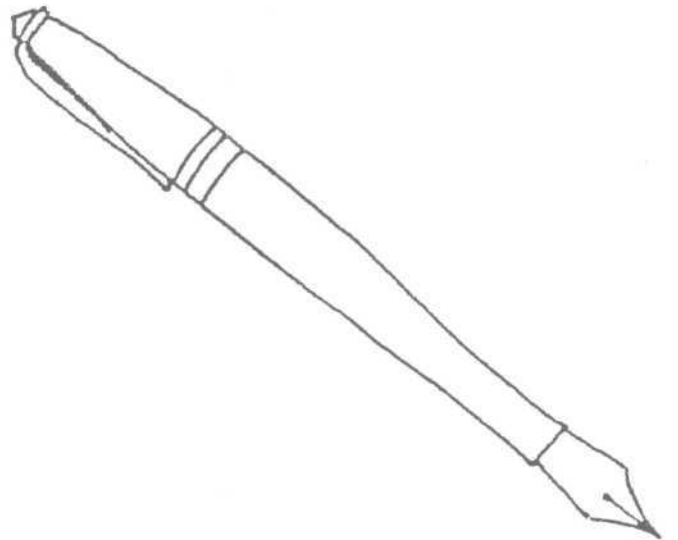
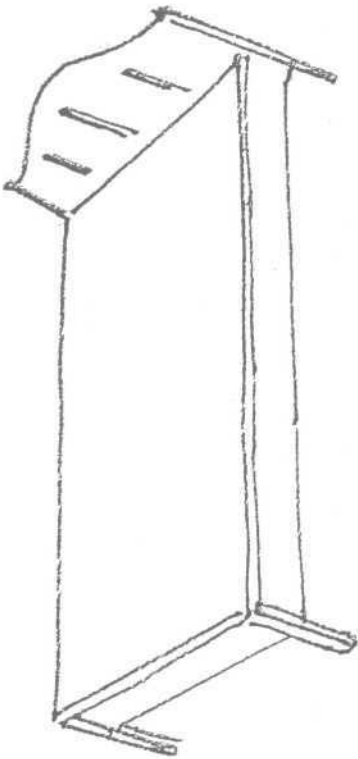
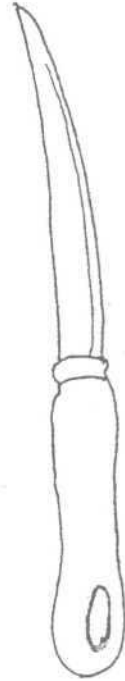
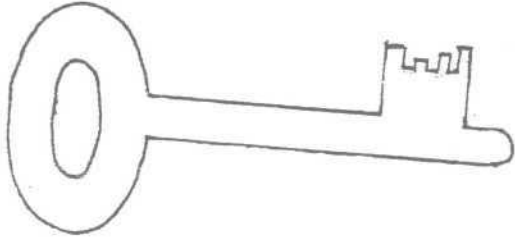
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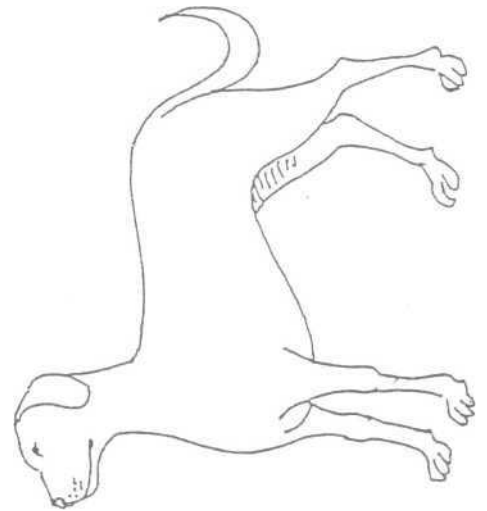
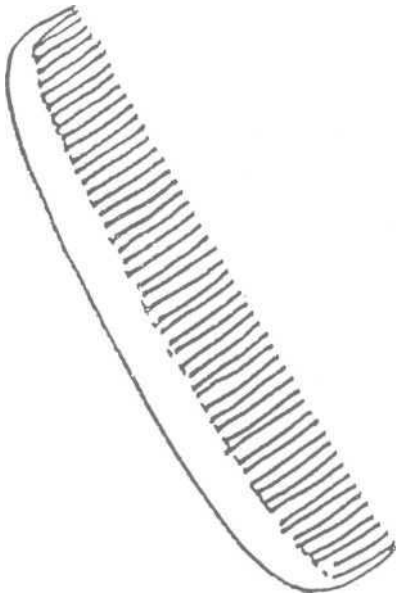
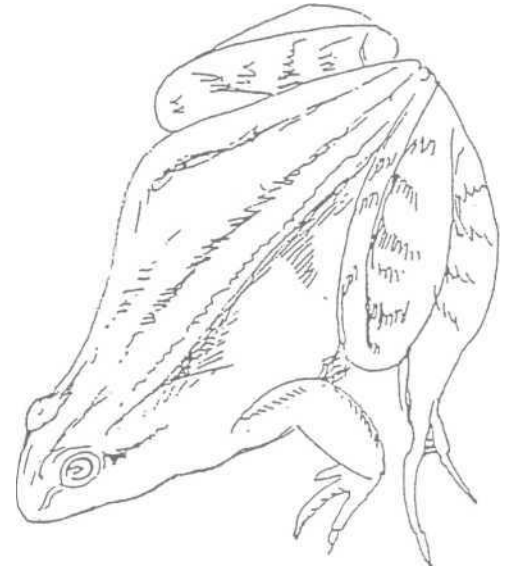
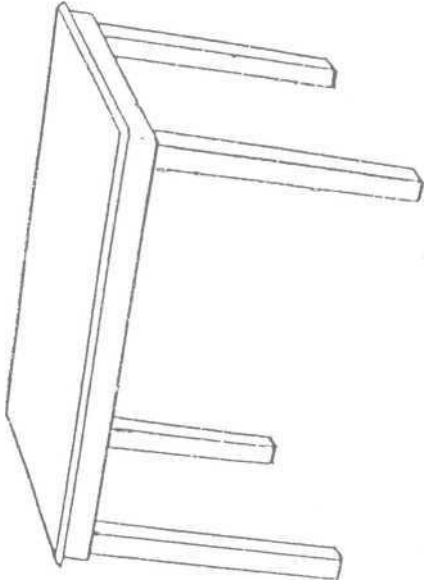
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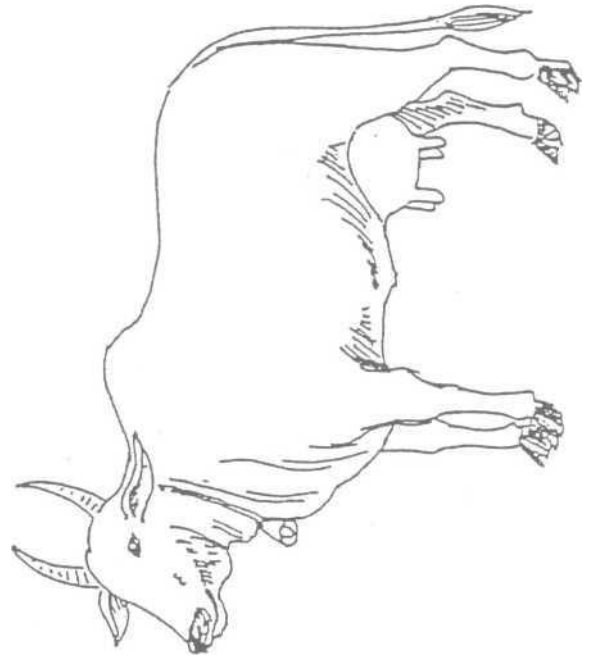
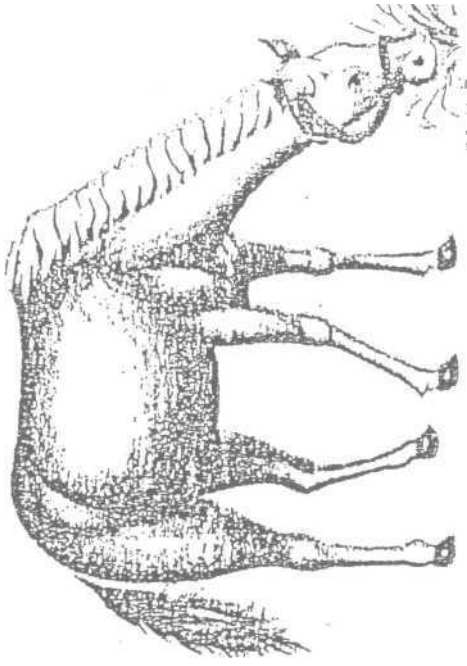
## APPENDIX I

### PICTURE STIMULI

<b>S.No.</b>	<b>Picture</b>
<b>1</b>	Bed
<b>2</b>	Key
<b>3</b>	Pen
<b>4</b>	Knife
<b>5</b>	Comb
<b>6</b>	Table
<b>7</b>	Dog
<b>8</b>	Frog
<b>9</b>	Elephant
<b>10</b>	Horse
<b>11</b>	Lion
<b>12</b>	Cow







## APPENDIX II

### ENGLISH WORD STIMULI

<b>S.No.</b>	<b>Target</b>	<b>Distractor</b>
<b>1</b>	Bed	Mat
<b>2</b>	Key	Lock
<b>3</b>	Pen	Book
<b>4</b>	Knife	Sword
<b>5</b>	Comb	Scissors
<b>6</b>	Table	Chair
<b>7</b>	Dog	Cat
<b>8</b>	Frog	Snake
<b>9</b>	Elephant	Bear
<b>10</b>	Horse	Donkey
<b>11</b>	Lion	Tiger
<b>12</b>	Cow	Buffalo



**BED**

**MIAT**

**KEY**

**LOCK**

**PEN**

**BOOK**

**KNIFE**

**SWORD**

**COMB**

**SCISSORS**

**TABBLE**

**CHAIR**

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**DOG**

**CAT**

**FROG**

**SNAKE**

**ELLEPHANT**

**BEAR**

**HORSE**

**DONKEY**

**LION**

**TIGER**

**COW**

**BUFFALO**

APPENDIX III

MALAYALAM WORD STIMULI

S.No.	Target	Distractor
1	കട്ടിൽ (kaṭṭil)	പായ (pa:ja)
2	താക്കോൽ (ṭa:ko:l)	പൂട്ട് (pu:tə )
3	പേന (pe:na)	പുസ്തകം (puṣṭagam)
4	കത്തി (kaṭṭi)	വാള് (va:lə)
5	ചീപ്പ് (tʃi:pə)	കത്രിക (kaṭṛiga)
6	മേശ (me:ʃa)	കസേര (kaɕe:ra)
7	നായ (na:ja)	പൂച്ച (pu:tʃa)
8	തവള (ṭavaḷa)	പാമ്പ് (pa:mbe)
9	ആന (a:na)	കരടി (karadi)
10	കുതിര (kuḍira)	കഴുത (kazhuda)
11	സിംഹം (simham)	പുലി (puli)
12	പശു (paʃu)	പോത്ത് (po:tə)

കുട്ടിയിൽ

പഠനം

അനുഭവം

പുസ്തകം



പേര

പുസ്തകം

കുറിപ്പ്

വാക്യ

സ്കൂൾ

കുടിയേറ്റ

ബന്ധം

കുടിയേറ്റ

സ്വന്തം

കൂടെ

കൂടെ

കൂടെ

ആന

കരടി

കുയിര

കുയിര

പ്രാർത്ഥന

സുഖം

പ്രാർത്ഥന

പ്രാർത്ഥന

## **APPENDIX IV**

### **BILINGUAL APHASIA TEST (PART-A)**

#### **HISTORY OF BILINGUALISM**

1. What was your date of birth?
2. Where were you born?
3. As a child, what language did you speak most at home?
4. As a child, did you speak any other languages at home?

\*\*\* If the answer to (4) is 'no', then go to question (6).

5. What other languages did you speak at home as a child?
6. What was your father's native language?
7. Did he speak any other languages?

\*\*\* If the answer to (7) is 'no', then go to question (12).

8. What was your father's other language(s)?
9. What language did your father speak most to you at home?
10. Did your father speak any other languages at home?

\*\*\* If the answer to (10) is 'no', then go to question (12).

11. What other languages did your father speak at home?
12. What was your mother's native language?
13. Did she speak any other languages?

\*\*\* If the answer to (13) is 'no', then go to question (18).

14. What was your mother's other languages?
15. What language did your mother speak most to you at home?

16. Did your mother speak any other languages at home?

\*\*\* If the answer to (16) is 'no', then go to question (18).

17. What other languages did your mother speak at home?

18. Did anyone else take care of you as a child?

\*\*\* If the answer to (18) is 'no', then go to question (25).

19. What was his/her native language?

20. Did he/she speak any other languages?

\*\*\* If the answer to (20) is 'no', then go to question (25).

21. What was his/her other language(s)?

22. What language did he/she speak most to you at home?

23. Did he/she speak any other languages at home?

\*\*\* If the answer to (23) is 'no', then go to question (25).

24. What other languages did he/she speak at home?

25. What language did you speak most with friends as a child?

26. How many years of education have you had?

27. When you started school, what was the language of instruction?

28. At that time did you take any participants in another language?

\*\*\* If the answer to (28) is 'no', then go to question (30).

29. What were the other languages of instruction?

30. What language did most of the other students speak at this school?

31. Did you change to a school with another language of instruction after that?

\*\*\* If the answer to (31) is 'no', then go to question (49).

32. What was this language?

33. After how many years, did you switch to this new language of instruction?

34. At that time, did you take any participants in another language?

\*\*\* If the answer to (34) is 'no', then go to question (36).

35. What were the other languages of instruction?

36. What language did most of the other students speak at this school?

37. Did you change to a school with another language of instruction after that?

\*\*\* If the answer to (37) is 'no', then go to question (49).

38. What was this language?

39. After how many years did you switch to this new language of instruction?

40. At that time, did you take any participants in another language?

\*\*\* If the answer to (40) is 'no', then go to question (49).

41. What were the other languages of instruction?

42. What language did most of the other students speak at this school?

43. Did you change to a school with another language of instruction after that?

\*\*\* If the answer to (43) is 'no', then go to question (49).

44. What was this language?

45. After how many years did you switch to this new language of instruction?

46. At that time, did you take any participants in another language?

\*\*\* If the answer to (46) is 'no', then go to question (48).

47. What were the other languages of instruction?

48. What language did most of the other students speak at this school?

49. And after your education was completed, what was your occupation?

50. Before your accident/illness, what languages were you able to speak?