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Word Association Ability in Persons with Aphasia and Dementia

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ABSTRACT

Introduction

Word association is a linguistic ability which occurs as a result of neural links between several concepts. These concepts could be semantic i.e. paradigmatic or syntactic i.e. syntagmatic in nature. These associations are intact and faster in neuro-typical individuals. Several studies have reported deficits in this association ability in brain-damage individuals. Thus the present study focuses on comparing the word association ability in persons with dementia and aphasia.

Material & Methods

26 persons with aphasia (PWA) and 29 persons with dementia (PWD) were considered as the clinical groups for the study. The control groups included 98 neuro-typical participants who were age matched to the clinical groups. The participants were grouped according to severity and type of disorder. A set of ten paradigmatic and syntagmatic stimuli each were presented to the participants and there were instructed to complete the task appropriately. Cues were provided in a hierarchy and the responses were appropriately scored. The data was then statistically treated.

Results

The results of the study revealed that the word association scores are reduced in individuals with aphasia and dementia when compared to the neuro-typical participants. The paradigmatic responses were significantly more affected than the syntagmatic associations in persons with dementia and aphasia. The findings of the study support the assumptions that the paradigmatic associations tend to be damaged earlier to the syntactic associations.

Conclusion

Word association ability proves to be a behavioural assessment measure to detect the linguistic impairments in persons with brain damage. The variations in syntagmatic and

paradigmatic responses in PWA and PWD are of clinical importance in future research studies.

Keywords: Word association, Paradigmatic, Syntagmatic, Aphasia, Dementia, behavioural measure

INTRODUCTION

Words and its appropriate associations are essential for a human communication. It is this association of words which attribute to the meaning of a sentence and exchange of information. Human language is so unique to produce an infinite number of combinations of the same word elements differently and produce meaningful sentences. It is the interrelation between the components of language and cognition which aids in these appropriate associations of words (Muma, 1978). Language components in a sentence include the content i.e. meanings, words or semantics; form i.e. system of rules for combination of sounds and grammar and use (i.e. appropriate link of content and form in a social setting (Bloom & Lahey, 1978; Wiig, Becker, & Semel, 1984). These linguistic components are processed cognitively which involves the transformation of the sensory stimuli, elaboration of the inputs, neural storage or data, recovery and use of these data appropriately (Neisser, 1967). The cognitive system includes the semantic memory which is the core base of the linguistic and cognitive output in the human communication. Throughout the language development period from childhood all these cognitive and linguistic processes develop, and the associations are linked and stored as data for future use.

Several theories and models explain how these information are stored in specific areas of brain and how these are activated and retrieved. One such theory, the Spreading Activation theory (Collins & Loftus, 1975), which explains that the long term

memory includes interconnected units of information. The connections are wired according to the associations between each of the concept. It is these associations which get strengthened according to their frequency of use, and familiarity. The related concepts are spaced at closer proximity. The association are made based on the meaning (semantic), sound (phonological) and even the grammatical structures (syntactic) features between concepts. The semantic association between concepts are referred to as paradigmatic associations; whereas the associations based on the syntactic structures and sequences are known as syntagmatic.

Ferdinand de Saussure (1916, 1983) first specified on the meaning in a sentence arises from two kinds of signifiers- syntagmatic (based on positioning in a sentence) and paradigmatic (concerning substitution). Two words are said to be in syntagmatic relation when they tend to co-occur in spoken or written language more often and when they have different grammatical class or associated grammatically in a sentence i.e. like a *sequential association*. Some exemplars include word pairs such as water-*drink, teacher-school, milk-white.* Whereas, a paradigmatic association refers to relationship between two words when they can be interchangeable in a sentence without affecting the grammatical structure of the sentence. These items generally belong to a specific category of concept. Generally, these words belong to the same class of words or form a *parallel association*. Some examples include- *fast-slow, eat- drink, rose-jasmine*.

These linguistic constructions are found to be affected in persons with brain damage where in the cognition is affected or in individuals where in there is specific language impairments. These findings reveal that there is an extensive relationship between linguistic components and brain damage conditions. And thus, variations in the extent and nature of impairment in the brain affect these linguistic associations accordingly. Some of the

common brain damage conditions include the aphasia and dementia. "Dementia is a syndrome and not a consequence of the normal process of aging. Dementia refers to a condition of chronic progressive deterioration in intellect, personality and communicative functioning and can be associated with numerous causes, among them infection, anoxia, tumour, trauma, toxicity, nutritional disturbances, and Alzheimer's and other diseases (Bayles, Kaszniak, Tomoeda, 1987). Persons with dementia (PWD) have major deficits in language, memory, visuospatial skills, emotion or personality and cognition (Cummings and Benson, 1992). Whereas, aphasia refers to the 'disturbance of any or all of the skills, associations and habits of spoken and written language produced by injury to certain brain areas that are specialized for these functions. Disturbances in communication that are due to paralysis or in coordination of the musculature of speech or written or to impaired vision or hearing are not, of themselves, aphasic' (Goodglass & Kaplan 2001). Persons with aphasia (PWA) would have complex deficits in auditory verbal comprehension, spontaneous speech, vocabulary, linguistic rules and executive functions. The disruption between the paradigmatic and syntagmatic components of language was initially reported by Jakobson (1964). Persons with aphasia are observed to lose the ability to combine linguistic elements. Their grammatical structures are affected and they may produce isolated words. And as the severity increases the reduction in words and structure are affected greatly (Caplan, 2006). In a study by Howes and Geschwind (1964), who explored the word association ability in 60 persons with aphasia, they found that the participants responded similar to that of neuro-typical individuals however the speed and accuracy of word selection was affected. They hypothesize that the vocabularies of persons with aphasia are shifted in reduced variety. In another comparative study between the aphasia and neuro-typical participants on the word association ability using non verbal picture modality (Semenza, Bisiacchi & Romani, 1992), it was found that the Broca's aphasia individuals selected more pictures according to the class

whereas the Wernicke's aphasia participants selected pictures based on the thematic relation. These findings are in consensus with the implications of Jakobson's studies (1964) that there is a deficit of contiguity in Broca's aphasia and a deficit of similarity in Wernicke's aphasia.

Similar studies have been conducted in persons with dementia. The results of the study by Gewirth, Shindler and Hier (1984), Pietro and Goldfarb (1985), revealed that the paradigmatic and syntagmatic association skills were affected in dementia individuals when compared to the neuro-typical individuals. The paradigmatic responses were significantly lesser than that of the neuro-typical individuals, whereas the syntagmatic responses were similar to that of the neuro-typical group. A comparative study on the word association ability in PWA, PWD and neuro-typical individuals was carried out by Gewirth, Shindler and Hier (1984). They studied the word association using paradigmatic and syntagmatic stimuli in 38 PWD, 17 PWA and 22 normal participants. They report of that the performance of the clinical groups showed a word association deficit when compared to the normal participants. Varying response patterns in each of the participant groups were discussed in the study.

METHOD

The current study was focussed to study the syntagmatic and paradigmatic association pattern in native Malayalam speaking persons with aphasia and dementia using cognitive-linguistic behavioural measures. Three groups were considered for the study which included the neuro-typical (Group A) i.e. normal healthy group; aphasia (Group B) and dementia (Group C). The neuro-typical group (Group A) was considered as the control group and it included 98 age matched participants in four different age groups of 20-40 years; 41-60 years; 61-80 years; and >81 years. Whereas the clinical groups of aphasia (Group B) included 26 persons (mean age 58.58 years; range 23-83 years with seven females and 20 males) with aphasia (PWA); and Group C included 29 persons (mean age 74.90 years; range 60-90 years

with 19 females and 11 males) with dementia (PWD). The inclusionary criteria for the participants are as follows:

Neuro-typical participants (Group A) : Participants with the following criteria were considered for the study.

- Right handed individuals having Malayalam as their native language
- No congenital or acquired sensory, physical, speech, language, psychological, psychiatric and/or cognitive problems
- Passing the screening for cognitive- linguistic deficits using the Mini-Mental State Examination (Folstein, Folstein & McHaugh, 1975)
- Having a minimum level of education equivalent to 10^{th} grade

Persons with Aphasia (Group B) : Participants with the following criteria were considered for the study.

- Diagnosed as having aphasia (with type of aphasia as Fluent or Non fluent) following cerebrovascular accident by Neurologists and /or Speech Language Pathologist based on the neurological examinations and Test of Aphasia in Malayalam (WAB adaptation) Philip, 1992
- Post stroke duration ranging from lesion (4 weeks to 4-5 months) or late phase (i.e. more than 6 months) post stroke period (Fabbro, 1990)
- No history or post-morbid condition of psychiatric disorders.
- Pre-morbidly right handed having Malayalam as their native language
- Minimal motor ability of pointing and holding objects using their dominant or non dominant hand based on their post morbid motor skills
- Having a minimum level of education equivalent to 10^{th} grade

The demographic profile of the participants is as shown in Table 1.1.

Persons with Dementia (PWD) Group C: Participants with the following criteria were considered for the study.

- Diagnosed as having dementia made by neurologist and /or neuro- psychiatrists following neuropsychological examinations including the Mini- Mental State Exam-MMSE (Folstein, Folstein & McHaugh, 1975). Severity of the condition ranged from mild-moderate to severe. The severity of dementia was rated using the Clinical Dementia Rating - CDR (Hughes, Berg, Danziger, Coben & Martin, 1982)
- No history or post-morbid condition of psychiatric disorders or pre-morbid neurological, physical, psychological sensory or any known organic deficit/s history
- Pre-morbidly right handed having Malayalam as their native language
- Having a minimum level of education equivalent to 10^{th} grade

  The demographic details of the participants are as specified in the Table 1.2.

The participants were grouped according to their gender, years of education, vocation, severity of the problem. The participants or the caregivers were oriented about the purpose, duration and testing procedures involved in the study. Following which an informed written consent was taken from the participants or caregivers.

The study was conducted with the aim of comparing the word association ability in persons with dementia, aphasia and neuro-typical participants. The word association ability included two measures of syntagmatic and paradigmatic associations, in the current study. The material included a set of ten linguistic stimuli (as specified in Appendix 1) for each of the syntagmatic and paradigmatic associations compiled from various linguistic tests in Malayalam.

Sl. No	Age	Gender	Type of Aphasia	Severity of Aphasia*	Post stroke duration (in months)	Years of education	Vocation
1	35	Male	Fluent	mild-Moderate	12 months	12	Self-employed/business
2	25	Male	Fluent	mild-Moderate	06 months	15&above	Self-employed/business
3	23	Male	Fluent	mild-Moderate	05 months	15&above	Professional
4	38	Male	NF	mild-Moderate	13 months	12	Self-employed/business
5	36	Female	NF	severe	09 months	10	House wife
6	45	Female	NF	mild-Moderate	08 months	10	House wife
7	49	Male	Fluent	mild-Moderate	03 months	15&above	Self-employed/business
8	60	Male	NF	mild-Moderate	07 months	15&above	Officer- government servant
9	42	Female	NF	mild-Moderate	11 months	10	House wife
10	57	Female	NF	severe	14 months	15&above	House wife
11	59	Male	NF	severe	02 months	15&above	Professional
12	65	Male	NF	mild-Moderate	12 months	12	Self-employed/business
13	62	Female	NF	severe	02 months	10	House wife
14	69	Male	NF	severe	06 months	12	Officer-government servant
15	72	Male	NF	severe	02 months	12	Officer- government servant
16	78	Male	NF	severe	15 months	15&above	Officer- government servant
17	65	Female	NF	mild-Moderate	11 months	10	House wife
18	68	Male	NF	mild-Moderate	11 months	15&above	Professional
19	77	Male	Fluent	severe	14 months	10	Self-employed/business
20	75	Male	NF	severe	06 months	15&above	Officer-government servant
21	69	Male	NF	mild-Moderate	10 months	12	Officer-government servant
22	67	Male	NF	mild-Moderate	03 months	12	Self-employed/business
23	71	Male	NF	mild-Moderate	05 months	12	Officer-government servant
24	70	Male	NF	severe	09 months	10	Self-employed/business
25	63	Female	NF	severe	16 months	15&above	Officer-government servant
26	83	Male	NF	severe	12 months	15&above	Self-employed/business

Table 1.1. *Demographic profile of persons with aphasia (NF- non fluent)*

*Severity rating scale-Aphasia Quotient (AQ)=0-25-Very severe; 26-50-Severe; 51-75-Moderate; > 75- Mild

Table 1.2. *Demographic profile of persons with dementia (AD-Alzheimer's disease)*

(*Severity rating scale-CDR=0-no cognitive decline; 0.5-questionable dementia; 1-mild dementia;2- moderate dementia and 3-

Sl. No:	Age	Gender	Type of Dementia	Dementia severity*	Post diagnosed duration (in months)	Years of Education	Vocation
1	65	Female	AD	mild-moderate	12 months	15&above	Officer-government servant
2	73	Male	AD	Severe	24 months	15&above	Professional
3	79	Female	AD	severe	16 months	10	House wife
4	64	Female	AD	severe	18 months	12	Officer-government servant
5	78	Female	AD	mild-moderate	24 months	15&above	Professional
6	73	Male	AD	severe	28 months	10	Self-employed/business
7	75	Male	Other dementias	severe	12 months	10	Officer-government servant
8	79	Female	AD	mild-moderate	29 months	15&above	Professional
9	68	Female	AD	mild-moderate	12 months	15&above	Officer-government servant
10	64	Female	AD	mild-moderate	15 months	10	House wife
11	71	Female	AD	mild-moderate	17 months	12	Professional
12	75	Female	AD	mild-moderate	23 months	10	House wife
13	64	Male	Other dementias	severe	16 months	15&above	Officer-government servant
14	60	Male	AD	mild-moderate	12 months	12	Self-employed/business
15	78	Female	AD	severe	30 months	10	House wife
16	75	Female	AD	mild-moderate	18 months	12	House wife
17	68	Male	AD	mild-moderate	24 months	12	Self-employed/business
18	78	Male	AD	severe	24 months	10	Self-employed/business
19	75	Female	AD	mild-moderate	32 months	10	House wife
20	76	Male	AD	severe	12 months	15&above	Officer-government servant
21	65	Female	AD	mild-moderate	14 months	10	House wife
22	86	Female	AD	mild-moderate	18 months	15&above	Professional
23	82	Female	AD	severe	22 months	10	Professional
24	84	Female	AD	mild-moderate	18 months	10	House wife
25	82	Male	AD	mild-moderate	12 months	10	Self-employed/business
26	90	Male	AD	severe	20 months	10	Self-employed/business
27	83	Male	AD	severe	36 months	10	Self-employed/business
28	81	Female	AD	mild-moderate	24 months	12	Officer-government servant
29	81	Female	AD	severe	19 months	10	House wife

The paradigmatic stimuli included ten simple, highly familiar and concrete nouns which were linguistic exemplars of a category. Similarly, syntagmatic stimuli included ten simple, highly familiar and concrete verbs associations of a task. The participants were explained about the nature of testing and specific instructions. Testing was conducted in a well-lit quiet room with one to one sitting with the participants. For the paradigmatic association task, the participants were instructed to listen carefully to the words presented and to provide one name of the group to which these items belonged (e.g. items such as *'car..bus..lorry..bike..belong to - expected response is 'vehicles'*); while for the syntagmatic association tasks the participants were instructed to attend to auditory stimuli presented and complete the phrase with the best suitable verb or attribute which describes the specific noun (e.g. items such as ' *if rice: eating then water:- expected response is 'drinking'*). The sections were randomly presented and to avoid any recency or familiarity effect, sufficient time intervals between the tasks were maintained. The instructions provided were that they had to verbally express the labels of the items presented. An average of 30 seconds inter stimulus interval was provided and when the participant fails to respond to the stimuli, then a hierarchy of cues are introduced by the examiner. Cues such as semantic and syllabic cues were provided if the participant fails to respond. The hierarchy cueing and scoring patter incorporated for the study is as shown in Table 2. The responses were recorded and transcribed for further statistical analysis.

Table 2: The scoring and cueing pattern used for the persons with AD

Parameter	Score
No Response/Incorrect/unrelated:	0
Incorrect but perseverated/paraphasic error-	1
Partially correct with phonemic/semantic cue (given)	2
Correct with phonemic/syllable cue (given):	3
Correct with semantic cue (given)	4
Correct but with self correction/minimal articulatory errors	5
Completely correct with no cues from examiner	6

The recoded samples were analysed and appropriate measures were carried out using the commercially available software Statistical Package for the Social Sciences (SPSS) (version 17.0). The results of the study are depicted and discussed as below.

RESULTS

The responses of the participants were transcribed and scored accordingly. The raw scores were compiled and the descriptive summaries of the data were tabulated across the groups- Group A (neuro-typical); Group B (aphasia) and Group C (dementia) as shown in Table 3.

Table 3. *Mean, SD and median of all variables across the groups (A to C)*

	Normal			Aphasia			Dementia		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Association in Paradigmatic	59.19	1.44	60.00	25.92	20.43	22.50	40.72	12.67	39.00
Association in Syntagmatic	59.64	1.11	60.00	29.08	20.11	28.50	44.69	9.04	45.00
Word Association total	118.84	1.83	120.00	55.00	39.44	54.00	85.41	19.84	87.00

The mean scores indicated that the overall word association ability was better in the neuro-typical group when compared to the clinical groups. Following this, the Kruskal-Wallis test was performed to assess the effect of groups (aphasia, dementia and neuro-typical) on the tasks. Across the group comparison, there was significant difference [χ^2 (2)=112.73, $p<0.01$] in word association scores as shown in (Table 3.1). The performance of the neuro-typical group was better (120.00) than the dementia group (87.00). The persons with aphasia (PWA) group obtained the least scores on the word association ability (54.00).

Table 3.1. *Kruskal Wallis test statistics for word association ability across groups*

Variable	Word Association total	
	χ^2 (2)	p
Groups	112.73	.000***

Note = p<0.05*; = p<0.01**; = p<0.001***

Table 3.2. *Mann -Whitney test statistics for content domain across groups*

Variable	Neuro-typical & Aphasia	Neuro-typical & Dementia	Aphasia & Dementia
	|z|	|z|	|z|
Word Association Total	8.38***	8.62***	2.67***

Note = p<0.05*; = p<0.01**; = p<0.001***

Further, Mann-Whitney test was performed to compare between each of these groups (Table 3.2). The results of the test indicated a significant difference between each of the groups i.e. neuro-typical and aphasia; neuro-typical & dementia and also aphasia and dementia. The data were further scrutinized to study the performance of the various groups specifically between the paradigmatic and syntagmatic tasks. The tasks scores were measured for their mean and SD values across the groups. The mean values varied across the groups as the neuro-typical participants performed better (59.19; 59.64 in paradigmatic and syntagmatic association respectively) than other two groups (25.92; 29.08 in the aphasia group and 40.72, 44.69 for the dementia group) as seen in Table 3. Non parametric Kruskal-Wallis test was later performed to assess the significant effect of groups (Table 3.3) on paradigmatic association and syntagmatic association. There was significant difference in both the tasks (p<0.001). Further, comparison between each of these groups was done (Table 3.4). Paradigmatic and syntagmatic association scores were significant between neuro-typical and aphasia; neuro-typical and dementia and also aphasia and dementia groups. Overall, the performance of the aphasia group of participants was least in both paradigmatic and syntagmatic association tasks as depicted in Figure 1.

Table 3.3*: Kruskal Wallis test statistics across different groups*

Variable	Across groups	
	χ^2 (2)	p
Paradigmatic association	96.24	.000***
Syntagmatic association	128.45	.000***

Note = p<0.05*; = p<0.01**; = p<0.001***

Table 3.4: Mann -Whitney test statistics across the groups:

Variable	Neuro-typical & Aphasia	Neuro-typical & Dementia	Aphasia & Dementia
	|z|	|z|	|z|
Paradigmatic Association	7.78***	8.09***	2.69***
Syntagmatic Association	9.65***	9.82***	2.55**

Note = p<0.05*; = p<0.01**; = p<0.001***

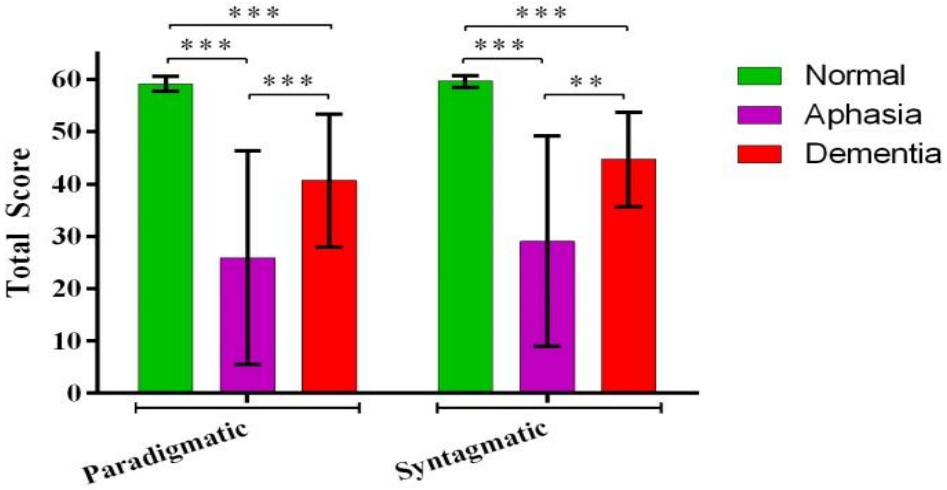

Fig: 1: Paradigmatic & syntagmatic association across neuro-typical, PWA & PWD

The significant difference between groups were further analysed to compare the performance of syntagmatic and paradigmatic within each of the groups. The percentage scores were computed for each of the tasks as shown in Table 3.5. The Wilcoxon Signed rank (Table 3.6) was done to analyse the difference between tasks within each of the groups. The results showed a significant difference between the tasks only within the neuro-typical and dementia group.

Table 3.5. *Percentage values across the groups (A to C)*

Group wise - Percentage									
	Normal			Aphasia			Dementia		
	Mean	SD	Median	Mean	SD	Median	Mean	SD	Median
Association in Paradigmatic	98.66	2.40	100.00	43.21	34.05	37.50	68.25	20.92	65.00
Association in Syntagmatic	99.40	1.89	100.00	48.27	33.28	47.50	73.74	15.66	75.00
Word Association total	99.02	1.52	100.00	45.83	32.87	45.00	70.99	16.66	72.50

Interestingly, the scores revealed that the performance of the syntagmatic association was better than the paradigmatic association within all the three groups- neuro-typical, aphasia and dementia. These are also as depicted in Figure 2.

Table3.6: *Subtask comparison within group:*

Variable	Neuro-typical	Aphasia	Dementia
	|z|	|z|	|z|
Paradigmatic-Syntagmatic association	2.33*	1.23	2.07*

Note = p<0.05*; = p<0.01**; = p<0.001***

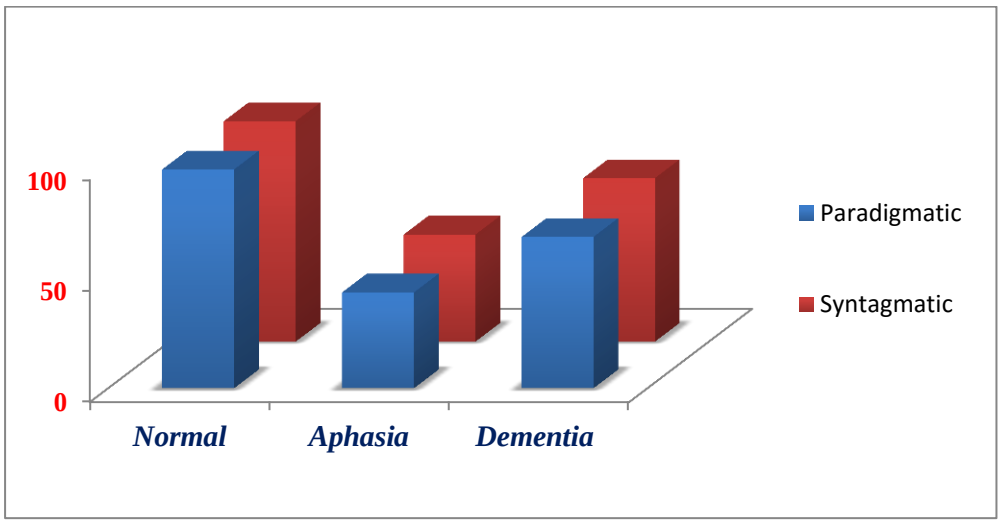

Fig: 2: Paradigmatic & syntagmatic association within neuro-typical, PWA & PWD

Overall, the results of the study showed a significant difference in the performance of the word association ability between the neuro-typical group and the persons with aphasia

and dementia. Performances of the persons with dementia were better than the persons with aphasia in both syntagmatic and paradigmatic associations. However, the aphasia group did not show a significant difference between syntagmatic and paradigmatic tasks. The results of the study also reveal that the scores of the syntagmatic association task are better than the paradigmatic association task both the aphasia and dementia groups.

DISCUSSION

The word association ability were assessed in 98 neuro-typical participants, 26 person with aphasia and 29 person with dementia using linguistic test stimuli. The responses obtained were scored and analyzed appropriately.

Word association ability were analysed using the syntagmatic and paradigmatic tasks. These were compared across the neuro-typical, aphasia and dementia groups. The results indicated that the performance of PWA and PWD were significantly different when compared to the neuro-typical participants. This result is in corroboration with the results of Gewirth, Shindler and Hier (1984); Laatu, Portin, Revonsuo, Tuisku, and Rinne (1997); Kumar and Goswami, (2012) studies. They also report that the performances of the aphasia and dementia group are significantly poorer than that of the neuro-typical participants. The association skills are affected in persons with dementia as the etiology of dementia affects the linguistic structures in them.

The present study also revealed that the syntagmatic association task scores were better than that of the paradigmatic association task scores in persons with dementia. These results are in consensus with the findings of Gewirth, Shindler and Hier (1984). They report that in persons with dementia the correct paradigmatic responses were decreased with increased idiosyncratic and null responses were increased. The frequency of syntagmatic

responses were however, not affected significantly. These authors hypothesize that each word is attached to a syntactic and semantic marker. The decrease in paradigmatic scores could be attributed to the progressive loss of semantic markers. The syntagmatic responses depend more on the knowledge of the proper sequential use of words in sentence structure which shows less resistant to deterioration than the semantic markers in dementia. Goodglass, Kaplan, Weintraub and Ackerman (1976) also report of increased syntagmatic responses in brain-injured participants. The performance further decreases with the severity of dementia. As the severity increases the correct responses are replaced with more null and incorrect responses. Hough (2004) also report that the control group (neuro-typical) performed better when compared to the persons with Alzheimer's disease on naming and category concept generation tasks. However, the poorer performance of the older participants could be as a result of the impaired lexical access but relatively spared category naming as opposed to the clinical group who showed deficits in the earlier stage of conceptual knowledge.

Several studies have reported the word association ability in persons with aphasia. In the present study, the association skills were poorer in individuals with aphasia when compared to neuro-typical individuals. The results also revealed a significant difference between aphasia and dementia group, with the performance of the dementia group better than the aphasia group. The brain damage tends to affects the linguistic functioning such as the word association skills in persons with aphasia. Similarly, the responses of the paradigmatic and syntagmatic associations were relatively lesser when compared to the dementia participants. This could be attributed to the fact that word association ability in persons with aphasia varies according to the types of the conditions and varying severity. Findings of earlier study by Gewirth, Shindler and Hier (1984), show that persons with anomic aphasia produced more of the paradigmatic responses when compared to the Broca's or Wernicke's type of aphasia. Persons with Wernicke's aphasia produced more of the idiosyncratic

responses than the paradigmatic responses. However, in persons with Broca's aphasia the syntagmatic responses were relatively better than the paradigmatic responses, which in contradiction to the assumptions of Buckingham (1981) that non-fluent aphasia such as the Broca's aphasia would perform poorer on the syntagmatic associations. In the present study too, as the non fluent participants were comparatively more than the fluent aphasia so overall the syntagmatic responses were better than the paradigmatic responses. This could be possibly explained as the result of the more neural firing and thereby the ability to link high content and familiar words. Also, since in persons with Broca's aphasia the self monitoring mechanism is good and so they tend to give more null responses than semantically error responses, thus resulting in poorer paradigmatic responses.

The present study reflects the results of better syntagmatic responses in both aphasia and dementia groups. This could imply that the underlying semantic associations in brain damaged individuals such as in aphasia and dementia degrade earlier to the syntagmatic associations. The reduced performance in the association tasks indicates the deterioration of the mechanism producing syntactic networks may show less resistance to deterioration as opposed to the semantic associations. (Dell, Oppenheim & Kittredge, 2008). In the neuro-typical population, there is better paradigmatic and syntagmatic word association ability especially in the younger age groups.

CONSLUSION

The word association ability in persons with aphasia and dementia was compared with the neuro-typical populations. These include the paradigmatic and syntagmatic association ability. A set of linguistic stimuli for paradigmatic and syntagmatic associations were tested in persons with aphasia, dementia and neuro-typical participants. The results revealed a significant difference in word association ability in persons with brain -

damage and neuro-typical individuals. The responses were better in the syntagmatic association when compared with the paradigmatic associations in both persons with aphasia and dementia. The results confirm the findings of earlier studies that associations with syntactic relations tend to be impaired slower than the semantic associations. Thus, word association ability proves to be a vital assessment aspect of language function and level in cognitive- linguistic impaired conditions. The findings of the assessment will further aid in linguistic management of these conditions.

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APPENDIX 1

Word Association Stimuli:

a) Paradigmatic Association: /i: vas̪ukkaḷ e̪u gaṇa̪t̪ t̪il peṭṭa̪a:ṇenn para̲juka/

/pu: tʃa, puli,kuraŋŋan,na:ja,a:na,……../

/lo:r̲i, bassu, ka:r̲u, o:tto,…../

/do: ʃa, pu:ri, laddu, mur̲ukk, tʃappa: t̪ t̪i,...../

/sa:ri,muṇṭu, ṣar̲ttu, pa:va: ḍa,...../

/ ṣu:s, tʃappal, me̪t̪iyaṭi, sa:ndalu,..../

/ka:kka, t̪a t̪ t̪a, kuruvi, pra:vu,..../

/atʃan, amma, tʃe:ttan, makan,..../

/r̲o:sa, mulla, t̪a:mara, tet̲ti,...../

/pa:l, pantʃasa:ra, tʃa:yappoṭi, veḷḷam,..../

/maṇal, kambi, simen̲t̲,……./

b) Syntagmatic Association: /i: kriyakaḷ ʃarija:ji pu:rippikkuka/

/kad ^{h}a- keḷkkuɳɳu, pa:ttu-...../

/mi:n- ni: nʈuɳɳu, pakṣi-...../

/ tʃo:ru- uṇṇɳɳu, veḷḷam-...../

/muttam- ʈu:kkuɳɳu, ʈuṇi-……../

/mujal- ve:gam, a:ma-...../

/a:ka: ʃam-ni:la, pullu-...../

/pa:vakka- kaippu, pandzasa:ra-……./

/ro:sa- tʃuvappu, mulla-...../

/viṣu- e:pril, kris ʈumas-...../

/minnuɳɳa ʈella:m- ponnalla, ka:kka kuḷi tʃa:l-...../

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