DIFFERENTIAL. DIAGNOSIS OF DEMENTIA FROM APHASIA USING A LANGUAGE TEST IN KANNADA : A PILOT STUDY

Register Number M 9416

Raksha (H R)

A dissertation submitted as part fulfillment of
the final year M.Sc. (Speech & Hearing) to
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Ail India Institute of Speech and Hearing
Mysore - 570 006.
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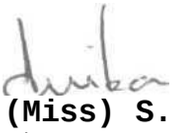
DEDICATED TO

Anna and Amma, who have taught
me the most valuable
lessons of humanity, disciple
and devotion.
Each day I grow with
your love support and
encouragement

CERTIFICATE

This is to certify that this dissertation entitled : **"Differential diagnosis of dementia from aphasia using a language test in Kannada : A pilot study"** is the bonafide work in part fulfilment of the degree of Master of Science (Speech and Hearing) of the student with Register Number M-9416.



Dr. (Miss) S. Nikam
Director
All India Institute of
Speech and Hearing
Mysore - 570 006.

Mysore
MAY, 1996

CERTIFICATE

This is to certify that this dissertation entitled : **"Differential diagnosis of dementia from aphasia using a language test in Kannada : A pilot study"** has been prepared under my supervision and guidance.

Dr. Pratibha Karanth
Professor and Head
Dept. of Speech Pathology
All India Institute of
Speech and Hearing
(GUIDE)

Mysore
MAY 1996

DECLARATION

I hereby declare that this dissertation entitled : **"Differential diagnosis of dementia from aphasia using a language test in Kannada : A Pilot study"** is the result of my own **study** under the guidance of **Dr. Prathibha Karanth,** Professor and Head, Department of Speech Pathology, All India Institute of Speech and Hearing, Mysore and has not been submitted earlier at any University for any other Diploma *or* Degree.

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CONTENTS

INTRODUCTION

INTRODUCTION

Changes in linguistic abilities associated with aging process is a well documented fact. *Over* the years there is increasing interest in detecting the abnormal decline in linguistic abilities in the elderly as a consequence of pathological conditions like dementia.

Dementia is an acquired clinical syndrome in which there is a persistant impairment in the intellectual function as a consequence of brain dysfunction (Cummings and Benson 1983). It is a disorder which affects adults and geriatric population, being most common in people over the age of 65 years. According to Cummings, Benson and Lover (1980) at least three of the following areas of mental activity are disrupted in dementia; language, memory, visuospatial skills, emotion, personality *or* cognition (abstraction, calculation and judgment). Dementia can be caused by a variety of conditions : disease, infection or infarcts. The most commonly occurring cause is the Alzheimer's disease (AD) accounting for 65% of all dementias (Moss and Albert, 1988).

Alzheimer's Disease (AD) is a degenerative disorder. Its onset is generally after the 50th *year* of life. The etiology *of* Alzheimer's Disease is unknown, though a number of theories have been postulated; disordered immune functions, genetic causes, aluminium intoxication, viral infection etc. have been suggested as possible causes.

Alzheimer's Disease is accompanied by characteristic neuropathoiogical changes like the presence of senile-plaques, helical neurofibrillary tangles in the cortex, granulovascular degeneration, loss of neurons, changes in neurotransmitters and neuropeptides. Symptomatology of Alzheimer's Disease includes intellectual dysfunction, sufficient to interfere with social behaviour, memory impairment and at least one of either; personality changes, impairment in abstract thinking, poor judgment or other disturbances of higher cortical functions (language impairment, apraxia, agnosia).

Language impairment in Alzheimer's Disease has been commonly reported. The incidence of language impairment in Dementia of the Alzheimer's Type (DAT) is estimated to be close to 100% [Cummings, Houlihan and Hill, 1985; Thompson, 1987]. Alzheimer (1907) first described a demented woman who frequently used perplexing phrases, some paraphasic expression and suffered from a significant language deficit. There after many descriptions of language in Alzheimer's Disease (AD) have appeared over the past decade confirming and expanding Alzheimer's original observation of language disturbance in AD.

Focus of research on language functions in AD is mainly on

(i) Studying the language characteristics in AD.

(ii) Comparing language disturbances in AD with that of Aphasia and other dementias.

(iii) Developing comprehensive language tools for early identification and differential diagnosis of AD.

Researchers have found that patients with AD do not show an equal degree of impairment across different linguistic levels. It is generally agreed that the semantic and pragmatic language systems appear more impaired than syntax and phonology.

Some researchers use the terms 'aphasia' to explain language impairment in AD [Appel, Kertesz and Fisman 1982; Cummings and Benson 1985], since language impairment seen at different stages in AD, corresponds to specific aphasia syndromes. During early stages of AD speech output is fluent, well articulated and syntactically preserved and auditory comprehension abilities for conversational material and reading aloud is intact. Overall language abilities resemble anomia or semantic aphasia [Hier, Hagenlocker and Shindler, 1985].

During the mid stage of AD, language becomes increasingly paraphasic. They demonstrate an increasing number of uncorrected verbal and literal paraphasic errors in discourse. Neologisms also become frequent and auditory comprehension is impaired. Overall language abilities resemble transcortical sensory aphasia (in absence of a repetition deficit) or a Wernicke's aphasia (in presence of a repetition deficit), (Murdoch et al., 1987; Cummings et al., 1985). In the late stage of AD the patient is nonfluent, echolalic, palilalic and perseverative. In end stages he may be mute or speech is restricted to echolalia or palilalia, auditory comprehension deficit is severe, resembling the reminiscents of global aphasia.

Though language disturbances in patients with AD resembles some of the focal aphasias, they differ from aphasias in classical ways.

(i) Language disorders of AD are not primary or isolated but rather persists, with other intellectual impairments unlike in aphasia.

(ii) AD is unrelentingly progressive and degenerative, so are language disorders associated with it. The language deficits are continually changing and recovery has never been observed unlike in aphasias.

Speech-language pathologists are increasingly called upon to differentially diagnose aphasia and language of dementia. Although traditional aphasia tests give some insight into the language deficits few can identify subtle differences between aphasia and language in AD. Hence in the west, researchers have been working towards developing comprehensive language tests to differentiate AD from Aphasia. In the Indian scenario there have been no systematic attempts in this direction hence the present study was undertaken. With the projected demographic trends indicating a marked increase in the population of the elderly individuals, the present study is an initial attempt to assess the usefulness of the language test in differentiating AD from Aphasia which most commonly involves the elderly population.

REVIEW OF LITERATURE

REVIEW

The past decade has seen a growing interest in Alzheimer's Disease (AD) and its effects on language.

Language impairment in Alzheimer's Disease appears to be present in all stages of the disease. Mild anomia and subtle problems in comprehension of ambiguous, non literal and abstract sentences appear early. Phonology and syntax usually are well preserved until later stages. As a general rule automatic responses are spared (Eg : counting, recitation of alphabets), whereas responses calling sustained attention (Eg : describing pictures, explaining proverbs) are compromised early. Word retrieval errors and verbal paraphasias in conversation are common in early stages of AD. Perseverative responses often appear in the middle stage. As the disease progresses literal paraphasias appear and by the late stage the patient's speech is circumlocutory and semantically empty. Auditory comprehension and reading comprehension becomes progressively impaired as the disease progresses but repetition and oral reading remain intact until the very late stage. Reiterative speech disturbances (echolalia, palilalia) often become prominent in the late stage. Pragmatic abilities are usually affected and progressively deteriorates as the disease progresses. In the early stages the patient talks for too long, strays away from the topic and repeats himself or herself without awareness. The patient has difficulty grasping implicit meaning such as those involved in

humor, sarcasm or non literal statements. As the disease progresses - the patient stops initiating conversation. In the terminal stage the patient loses all orientation to self and surroundings and does not use language in meaningful ways.

The major goals of recent research in language of patients with AD have been

(a) To develop a more complete characterization of the language disturbance in patients with AD.

(b) To compare language disturbances in patients with AD with aphasias and other dementias.

(c) To develop language tools for assisting the diagnostic process. (Early identification and differential diagnosis of AD}.

This chapter presents a brief review of literature on speech and language deficits in patients with Alzheimer's Disease.

Section I : Speech Language Characteristics in AD

1. Phonological abilities in Alzheimer'a Disease

Phonological rules are well preserved in mild and moderate stage of AD and even in many patients with severe disorder (Irigary, 1973; Whitaker, 1976; Bayles and Boone, 1982). AD patients retain their knowledge of the sounds of their native language. Even the neologisms AD patients produce respect the rules of their native language. Patients with a severe disorder correct phonological errors in the sentences they repeat.

(Whitaker, 1976; Bayles and Boone, 1982). Whitaker (1976) was the first to observe the phenomenon of phonological error correction in a case study of advanced AD. Subsequently Bayles and Boone (1982) demonstrated that correction of phonological errors was not idiosyncratic but common in severely demented patients since their phonological abilities were well preserved.

2. Syntactic Abilities in Alzheimer's Disease

Most researchers of language in AD have observed that syntactic abilities appear to be relatively intact when compared to semantic and pragmatic abilities. Since Irigary's (1973) and Whitaker's (1976) studies in which it was claimed that AD patients retain the ability to structure a sentence syntactically but have lost semantic knowledge, many studies have found support for this dissociation between semantic and syntactic abilities in AD [Schwartz et al., 1979; Hier et al., 1983; Bayles, 1982; Kempler et al., 1987].

Evidence for preserved syntactic processing abilities in AD patients has come largely from production and not comprehension studies. Several authors report of preserved ability to generate complex sentences in spontaneous speech (Illes, 1989; Blaken et al., 1987), in picture description (Hier et al., 1985) and sentence construction tasks. There are also indirect sources of evidence for the claim that syntactic processing abilities are preserved in AD, like the ability to correct errors of syntax in anomalous sentences (Bayles, 1982), better use of syntactic than

semantic cues in disambiguating spoken homophones and also while writing them to dictation (Schwartz et al., 1979; Kemplar et al., 1987).

Very few studies have subjected AD patients to sentence comprehension tasks and findings of these studies have been contradictory. Some authors have asserted that sentence comprehension is impaired (Tomoeda et al., 1990; Kontiolo et al., 1990; Emery, 1985) and others that it is preserved (Smith, 1989; Sherman et al., 1988; Schwartz et al., 1979). The studies that show little or no sentence comprehension impairment in AD patients have tended to sample a narrow range of syntactic structures (Schwartz et al., 1979) and use tasks with simpler demands such as sentence picture matching (Sherman et al., 1988; Smith, ' 1989) unlike the studies which show impaired comprehension.

To summarize, there is little doubt that the syntax is better preserved than semantics and pragmatics, however, it appears that the comprehension of syntax is relatively more impaired than production. (Emery, 1988; Linebarger, Schwartz and Saffran, 1983).

3. Semantic Abilities in Alzheimer's Disease

Impairment in the semantic abilities have been considered the salient verbal symptom in dementia of the Alzheimer's type. There is a common consensus on the fact that semantic functions are relatively more impaired than phonology or syntax. Inability to name is the early conspicuous symptom in AD. Hence performance

on various naming tasks have been frequently used to determine the status of a patient's semantic language abilities. Classically naming abilities have been studied in two ways in AD -

(1) Through confrontation naming tasks and
(2) Generative naming tasks.

Other tasks which have been used to study the semantic functions include word association tasks, sentence priming, sentence disambiguation etc.

* Confrontation Naming :

Confrontation naming involves naming in response to pictures (line drawings), photographs or real objects. It is a complex process involving several stages :

(1) Perceptual stage : following the presentation of the stimulus, the image of the stimulus is analyzed for correct identification of the stimulus.

(2) Semantic stage :- semantic representation is activated.

(3) Label (stage) retrieval : phonological representation corresponding to semantic representation is retrieved.

(4) Motor planning stage:- artlculatory sequence gets activated.

This task has been most extensively used to study lexical semantic disturbances in patients with AD in comparison with

normal controls and/or aphasics.

Naming deficits on confrontation naming tasks have been reported by several researchers (Schwartz et al., 1979; Wilson et al ., 1981; Bayles and Tomoeda, 1990 and others).

(a) Real Object Naming

Bayles and Boone (1982) studied 28 subjects with dementia and 36 normal elderly controls *on* real object naming. They found that although the performance differed significantly between the dementia group and normals the procedure did not distinguish patients with mild dementia from normal controls.

(b) Picture Naming (picture naming of objects and actions)

Bayles and Tomoeda (1983) studied 61 patients with mild and moderate dementia of Alzheimer's type and 83 normal elderly individuals on a 20 item confrontation naming test (using coloured pictures). Responses were categorized as no response, unrelated and related response. They found no significant difference in the naming ability of the mild and moderate group with AD, but differences were significant between the moderate AD group and normal group. It was also found that when misnaming occured, it was most likely to be semantically associated to the stimulus in patients with dementia.

Huff, Corkin and Growdon (1986) investigated confrontation naming abilities in patients with a clinical diagnosis of AD and healthy controls. They found significant group differences in naming performance.

Shuttleworth and Huber (1988) studied 20 patients with AD (mild and moderate severity) and 25 normal controls on a confrontation naming test and found significant differences between the groups.

Bowles, Obler and Albert (1987) studied patients with AD, younger and healthy older group on an action naming test (Obler and Albert, 1979). There were significant differences between the groups for mean number of correct responses. Younger adults scored the highest followed by older adults and then by subjects with AD.

Watamori, Fukusako, Monoi and Sasanuma (1990) studied 10 subjects with AD and aphasia on a 50 item naming teat representing 9 different word categories (line drawings and photographs were used as stimuli). They found that mean number of correctly named pictures for AD and the aphasic groups did not differ, but the error did.

Stevens (1992) studied 9 AD patients and 8 dysphasics on a confrontation naming test (line drawings of objects and actions). She found that confrontation naming could discriminate the two groups consistently.

To summarize

- A number of investigators who have studied confrontation naming abilities in the AD group by comparing them with normal controls and/or aphasics have found significant naming deficits in the AD group.

* They have found confrontation naming tasks sensitive to the differences between the AD group, aphasic group and normal control group.

* However researchers who did not find differences in the mean number of correct responses in the AD group when compared with normal control group or aphasic group (Baylos and Tomoeda, 1983; Watamori et al., 1991) found a definite difference between the groups on error analysis.

Bayles and Tomoeda (1983) found that when misnaming occured in AD group it was likely to be semantically related to the stimulus. These findings are in agreement with Wilson et al (1981) who compared patients with AD and normal controls.

Watamori et al. (1990) compared the errors made by patients with AD and aphasics. They found that semantically related words, simple delay response and 'don't know' responses were frequently seen in both the groups. 'Description of attributes' , 'visually related errors', 'personal comments' and 'uncertainty errors' were more frequently seen in AD and, 'unrelated phonological *errors'* and 'phonologically related errors' were frequent in aphasics.

The number of errors are also found to increase with the increase in the abstractness of the stimulus [Kirshner, Webb and Kelly, 1984].

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Though naming impairment is a conspicuous symptom in early dementia, the locus of impairment is not well understood. One suggestion is that confrontation naming failure in AD results from impaired visual perception (Lawson and Barker, 1968; Rochford, 1971 and Cogan, 1985). This is based on the observation that naming improved when demented patients were allowed to handle objects and that perceptual difficulty of the stimulus drastically affected naming performance. However, the fact that patients with AD have enhanced vulnerability to perceptual difficulty does not establish that a perceptual deficit is the primary cause of their naming errors.

Another possible explanation of the naming disorder in AD is that it results from impaired access, word retrieval deficit or loss of semantic information. (Schwartz et al., 1979; Tomoeda 1983; Huff et al., 1986; Obler et al., 1985). This semantic account of the naming impairment is based on error analysis, that is by contrasting the number of errors attributed to misperception of objects with the number of errors that reflected semantic confusions. Since AD patients make fewer perceptual errors when compared to semantically related errors, the deficit is believed to be in the lexical semantic domain. Patients with AD also produce a higher rate of circumlocutions (not benefited from phonological cues). It indicates that the lexicon by itself is intact but circumlocutions are used as a strategy for coping with the impairment of lexical access *or* retrieval.

In short, deficits in confrontation naming abilities are well documented in AD. Distinction between patients with Alzheimer's Disease, Aphasics and Normal controls on these tasks clearly emerge on error analysis. Locus of impaired naming is believed to be in the lexical semantic domain, with further effects of the perceptual impairment in patients with AD.

* **Generative naming** :

In generative naming subjects have to produce as many words as possible corresponding to a given lexical frame with a time constraint. Researchers have commonly used category fluency (task requiring the patient to produce words that are members of a particular category such as animals, vegetables etc) and letter fluency (tasks requiring the patient to produce words that begin with a specific letter such as F, V, S, etc.) to study generative naming abilities in patients with AD.

There is common agreement on the fact that early and striking impairment occurs on word/verbal fluency tasks in patients with AD. (Mattis, 1976; Shuttleworth and Huber, 1988; Butters et al., 1987; Monsch et al., 1992 and Pasquier et al., 1995).

More recently Monsch, Bondi, Butters; Salmon, Katzman Thal (1992) studied the performance of 89 patients with AD and 53 demographically matched elderly normal controls on four verbal fluency measures (category fluency - animals, fruits and vegetables; supermarket fluency, first names and lettery fluency

words beginning with letters F, A, S). They found significant differences between the groups on all four fluency measures. Category fluency demonstrated the greatest degree of discrimination between the two groups, letter fluency was least accurate. Supermarket fluency which is often viewed as a category fluency task did not prove to be as sensitive as animals, fruits and vegetables combined.

Pasquier, Lebert, Grymonprez and Petit (1995) compared patients with frontal lobe dementia, patients with AD matched for severity and normal demographically matched elderly controls *on* category fluency (animals) and letter fluency (for letter P). Both the dementia groups scored lower than the normal controls but those with dementia of frontal lobe did not differ from those with AD. Category fluency was more impaired than letter fluency.

Both the studies by Monsch et al (1992) and Pasquier et al (1995) are in agreement with the previous studies (Mattis, 1976; Shuttleworth and Huber, 1988; Martin and Fedia, 1983; Huff, Corkin and Growdon, 1986) which have documented poorer performance of patients with AD when compared to normal controls on verbal fluency measures.

Bayles, Boone, Tomoeda, Slauson and Kaszniak (1989) studied 21 mildly and moderately impaired AD patients, 41 stroke patients with fluent and nonfluent aphasias and 31 elderly subjects on F, A, S word fluency measure. They found that FAS word fluency measures differed significantly in Aphasic patients and normal elderly, and mild AD patients and nonfluent aphasics.

Of all the verbal frequency measures category fluency has been found to be the most impaired in AD (Shuttleworth and Huber, 1988; Butter et al., 1987; Monsch et al., 1992 and Pasquier et al., 1995). Hence it has been found to be more sensitive in distinguishing patients with AD from normal healthy elderly controls. Impairment on verbal fluency measures increases with increasing severity of AD (Shuttleworth and Huber, 1988; Monsch et al., 1992).

Hence generative naming is useful in detecting AD and distinguishing patients with AD from normals since the task indicates deterioration of semantic knowledge.

Word Association Test :

Changes in the semantic representation and their effect on word production in AD have also been experimentally probed with the free word association paradigm. This is generally tested by supplying the subjects with a list of words to each of which he must respond as quickly as possible with the first word occurring to him by free association. The response to free association is rated in terms of the type of relationship it has with the stimulus [Eg : a response may be rated as paradigmatic if the stimulus word and response word belong to the same grammatical class Eg : Dog (stimulus) - Cat (response)]. Studies using word association paradigms have compared the response patterns in patients with AD with that of normal elderly and/or aphasics.

Santopietro and Goldfarb (1985) studied the response of 91

institutionalized elderly persons with and without dementia on the Goldfarb Halpern Word Association Test (1981;. Subjects with dementia evidenced a characteristic pattern of response which included marked reduction of paradigmatic responses, no decrease in syntagmatic responses and marked increase in unclassifiable and multiword responses.

Abeysinghe, Bayles, Trosset (1990; studied responses of 23 patients with dementia (AD; and 14 normal controls on the Goldfarb Halpern Word Association Test (1981;. They found that AD subjects were more likely than normal controls to give multiword responses, repetition and unrelated responses. Additionally the ratio of paradigmatic to syntagmatic responses was significantly decreased in subjects with AD.

Gewirth, Shindler and Hier (1984; studied word association responses of 38 demented, 17 aphasic and 20 normal controls. They found an increase in idiosyncratic, identity and null responses at the expense of paradigmatic responses in the dementia group. Anomic aphasics gave most paradigmatic responses with relatively few idiosyncratic, identity or null responses. Wernicke's aphasics gave more idiosyncratic than paradigmatic responses and the largest number of identity responses. Broca's aphasics *gave* most null responses with relatively few idiosyncratic or identity responses. Hence using the association paradigms definite differences between the AD group, the Aphasic group and the normal group have been observed.

*** Sentence Disambiguation** :

Bayles and Boone (1982) studied 35 dementia patients and 28 normal senescents on a sentence disambiguation task which consisted of 3 sets of sentences containing lexical, surface and deep structure ambiguities. Interspersed within each of the three sets of ambiguous sentences were 3 unambiguous sentences making a total of 30 sentences to be judged. Subjects were instructed that some of the sentences had more than one meaning and to paraphrase the meaning perceived. A subject's score was the number of ambiguous sentences for which two correct paraphrases were provided. They found sentence disambiguation to be *very* sensitive in discriminating dementia from normal senescents. Of the three types of ambiguities, surface structure ambiguities were the most difficult to percieve.

Bayles, Boone, Tomoeda, Slauson and Kaszniak (1989) used the same sentence disambiguation task and studied 21 mild and moderately impaired patients with AD, 41 aphasics and 31 elderly controls and found that the task was very sensitive in differentiating patients with AD from normal controls and aphasics.

*** Combined measures** :

A number of investigators have used more than one test or combined measures to study semantic impairment in AD.

Sommers and Pierce (1990) studied 10 patients with AD and five non brain damaged controls on confrontation naming and a

semantic association task [Goodgiass and Baker, 1976] in which 7 high frequency words and 7 iow frequency words and their associates were used. On the semantic association task the subjects were instructed to look at the picture and word and then look at the monitor. They were asked to press the 'yes' button if the stimulus word that appeared on the monitor was related to the target word or 'No' if it was not related, as quickly as possible. They found that AD patients were significantly impaired in their naming of low frequency words on confrontation naming. However they performed similar to normal controls on the semantic association task. Results support the findings that impaired naming can occur in the presence of accurate identification of semantic features.

Grist and Maxim (1992) conducted a study in which a build up picture test (BUPT) was given to 15 patients with AD, 15 independent and 15 dependent elderly subjects. The BUPT is a task designed to combine confrontation and generative naming, incorporating priming, cueing and latency aspects to facilitate responses. It involves the presentation of degraded line drawings of objects, built up in stages to black and white photographs. The *control* group scored higher than the AD group and the difference in scores between the groups was highly significant.

To summarize, the semantic abilities in the AD group have been most intensively studied using various tasks. There is little doubt about semantic impairment in this population though the nature of impairment is not well understood. Measures like confrontation naming, generative naming, word association tests

and sentence disambiguation tasks have been found to be *very* sensitive in differentiating the AD from other disorders like aphasia. They have also been useful in differentiating changes that occur in the semantic subsystem due to normal aging and due to degenerative disorders like Alzheimer's disease

4. Pragmatic abilities in AD :

Impaired pragmatic abilities contribute most to communicative deficits in AD. Since analysis of discourse production is a task which is close to naturalistic communication, it is extensively used to understand the impaired pragmatic abilities in AD.

Deficit in discourse formulation is *one* of the early language features of AD. In the early stages in AD these deficits in discourse take the form of poor topic maintenance, briefer but more frequent turns, more directives, breakdown in cohesion and coherence and verbosity (Hutchinson and Jensen, 1980; Irigary, 1973; Ripich, Terrell and Spinelli, 1983; Obler and Albert, 1981; Ripich et al., 1988; Terrell and Ripich, 1986); in middle stages as vague speech; and in the final stage as difficulty in maintaining eye contact and conversational turns.

The most commonly investigated discourse genres in Dementia of Alzheimer's Type (DAT) are conversational discourse (most often elicited from topic centered interviews and open ended conversation) and narrative discourse (elicited in response to picture description, object description and story recall

tasks-immediate and delayed). Researchers have used either of these genres to compare discourse abilities in AD with that of normal elderly and/or aphasics.

Following are the studies that focus on narrative discourse and conversational discourse in AD.

* **Narrative Discourse**

(a) Narrative Discourse using picture description tasks and other tasks

Narrative Discourse in AD and normal controls

Shekim and Lapointe (1984) attempted to describe aspects of discourse in 9 patients with AD and 9 normal adults through several elicited discourse tasks : picture story description, telling a memorable story, expository or subject oriented discourse and procedural discourse. They found that adults with AD were found to have fewer cohesive ties per communication unit, more exphora or references to information outside the text, more performance deviations, slower rate of speech and more maze words (series of words or unattached fragments that constitute a communication unit).

Santopietro and Berman (1984) examined narrative discourse of a group of institutionalized elderly with and without dementia using a picture description task from BDAE (Goodglass and Kaplan, 1983). They noted the presence of more egocentric references, fillers, nonspecific words and fewer content words in the dementia group.

Ulatowska et al (1988) investigated discourse performance of patients with AD across a range of tasks such as retelling a story, detailing a procedure, describing a pictured story and providing a summary. They found that subjects with AD used fewer target propositions in picture story tasks and more irrelevant steps in the procedures. They also produced incomplete sentences and showed abundance of reference errors such as higher proportion of pronouns to nouns and more demonstrative and deictic terms.

Smith, Chenery and Murdoch (1989) examined a group of 18 AD subjects using a picture story task from WAB. AD subjects were found to use shorter phrases and required more time to impart the target information in the story. But there was no difference in the number of content units between AD and normals.

Chenery and Murdoch (1994) studied narrative discourse in response to animations in 7 AD patients and 7 normal controls. The AD group consistently omitted setting information, mention of complicating actions and reference to resolution.

Hier et al (1985) used Cookie Theft picture description task in patients with AD, stroke related AD and normal controls. They found that AD subjects used fewer total and unique words, more sentence fragments and fewer relevant observations on narrative content.

*** Narrative discourse in AD, aphasics and normal controls**

Beeson, Bayles, Tomoeda and Slauson (1987) elicited picture description narratives in subjects with AD (mild and moderate severity), aphasics (fluent and non fluent) and normal controls. They found fewer information units for the mild and moderate AD and nonfluent groups than controls and fluent aphasic groups. There were fewer events than setting observations for the disordered groups, fewer gists and inferential observations or mild AD nonfluent aphasics and moderate AD group.

(b) Story Retelling

Story Retelling in patients with AD and normal controls

Bayles and Boone (1982) studied 35 patients with dementia and 28 normal controls on a story retelling task. They found that this test was most sensitive in differentiating patients with AD from normal controls.

Bayles, Boone, Tomoeda and Slauson (1989) found that delayed story retelling could be used to classify normal elderly and mild AD patient.

Story Retelling in patients with AD and aphasics

Bayles, Boone, Tomoeda and Slauson (1989) studied 21 patients with mild and moderate AD, 41 individuals with stroke caused aphasia and 31 elderly control subjects. They found that delayed story retelling task could be used to differentiate patients with mild AD and aphasics.

Taken together these studies have shown consistent features of narrative discourse deviations in AD group. Their discourse contains

* more exophora *or* references to information outside the text
* more mazes *or* sentence fragments
* fewer unique words
* less syntactic complexity

*** Conversational Discourse**

Hutchinson and Jensen (1980) compared 5 subjects with AD and 5 normal controls on conversational discourse skill. They found that AD subjects had more turns, fewer utterances and did not elaborate on the topic.

Illes (1986, 1989) looked at conversational skills of patients with AD. Subjects were asked to respond to questions about various personal topics. She found a significant increase in the number of long silent hesitations, a significant increase in the number of self corrections and also in the number of aborted phrases in patients with AD.

Ripich and Terrell (1988) studied discourse in 6 AD and 6 normal control subjects through topic centered interviews. They found that AD patients used many more words and conversational turns nd inappropriate use of cohesion.

Ripich, Vertes, Whitehouse, Fulton, Ekelman (1991) studied conversational discourse in 11 patients with AD and 11 normal

elderly who were engaged in a dyadic conversation with the examiner. They found that patients with AD used fewer words per conversational turn, abrupt change in topic, difficulty in relating new topic to old and lack of coherence.

Taken together the following features *are* common across studies on the features of conversational deviations in AD group

* More number of conversational turns
* Fewer words
* Inappropriate use of cohesion
* Lacks coherence
* Reduction of essential information in any given task.

5. Writing abilities in AD

Writing disturbances or agraphia is common in AD (Benson, 1979; Head 1976; Kaszniak et al 1986). Impairment in writing was first described by Alzheimer in his seminal case report of a 57 years old woman with presenile dementia, but little attention has been given to its manifestation in AD. Till date there are *very* few studies on writing abilities in AD. Tasks commonly used to assess writing impairment in AD are

(i) **Narrative writing** : Usually the subject is shown a picture and is asked to write as much as he can about the picture.

(ii) **Writing to dictation** : The patient is asked to write down the spellings of non words and words (both regular and irregular).

(iii) Script Generation : In this task the subject is asked to write on a given topic, for example - the patient is asked to write on all the things that he does when he gets up in the morning till he leaves the house or has lunch.

Researchers have found agraphia to be common on narrative writing and script generation tasks in AD (Henderson et al., 1992; Grafman, 1991; Horner et al., 1988).

Henderson, Buckwalter, Sobel, Freed and Diz (1992) evaluated writing samples of 33 patients with AD and 41 normal controls. They found that AD patients had significantly fewer words, mentioned fewer categories of information and made more writing errors when compared to normal controls.

It is also found that narrative writing impairments correlate with the severity of AD (Horner, Heyman, Dawson and Roger, 1988).

On dictation tests poor performance on irregular words have been noted (Rapcsak, Arthur, Bilklen and Rubens, 1989; Platel, Lambert, Eustache, Cadet, Dary, Viader, Lechevalier, 1993). Errors on irregular words are phonologically correct indicating a selective impairment of the lexical spelling system (Rapcsak et al., 1989).

These studies indicate that the ability to write and spell are both vulnerable in AD. However Neil et al., (1985) found no significant differences between the AD group and normal group on

a descriptive sentence task except that the length of sentences produced were shorter in AD. This could be because of the difference in the task used in this Btudy (descriptive sentence task) when compared to other studies (narrative writing, script generation and writing to dictation).

6. Reading abilities in AD

Reading abilities have been studied less exhaustively in patients with AD. Preliminary investigations on reading abilities in AD have revealed dissociation between reading aloud and reading comprehension. It has been found that reading aloud is better preserved than reading comprehension (Schwartz et al., 1979; Benson Cummings and Thai, 1982; Cummings and Benson, 1983; Obler and Albert, 1984; and Cummings, 1986) and that they use regular spellings to assist reading.

Cummings, Houlihan and Hill (1986) in their study of 13 patients with AD on the ability to read aloud with reading comprehension, report that reading comprehension declines with increasing severity. These finding are further supported by From et al., (1991).

Studies which have addressed the dissociation between reading aloud and reading comprehension consistently demonstrate that AD patients are able to phonologically encode written verbal stimuli but have difficulty semantically decoding such material because of which reading comprehension deficits are observed.

7. Praxis in AD

Alzheimer (1907) in his original report described a patient who with a progressive dementing illness, in addition to language impairment, alexia and agnosia also appeared to have forgotten the use of several objects thought to represent ideational or idiomotor apraxia. Apraxia occurs relatively late in the course of AD after memory and language disturbances are firmly established (Cumming et al., 1983; Sala et al., 1987) and is present in 70-80% of the patients in this stage. There are few systematic studies on apraxia in AD.

Rapcsak, Croswell and Ruben (1989) studied apraxia in 28 patients with AD and 23 normal controls. They found that AD patients were impaired compared to age matched controls on tests of ideomotor and ideational apraxia.

Hence there is little doubt that apraxia is seen in later stages of AD but there exists a controversy regarding whether apraxia is a discrete deficit *or* not.

8. Drawing abilities in AD :

Deficits in constructional abilities including drawing, *are* often early signs of degenerative dementia of Alzheimer's type (Ajuriaguerra et al., 1960; Perez, 1975). The importance of investigating these aspects in AD has been brought to light by Henderson et al., (1989) who demonstrated that patients with AD performed poorly on drawing tasks.

Kirk and Kertesz (1991) Btudied spontaneous drawing in 38 patients with AD and 39 normal controls. Analysis was done by two independent observers using a standardized scoring system. Drawing of patients with AD displayed fewer angles, impaired spatial relations and simplification when compared to normal controls.

SECTION II : Linguistic profiles of patients with AD in comparison with normal elderly, aphasics and other dementias

* **Linguistic profiles in patients with AD and normal elderly individuals**

Early studies viewed language disturbances in AD as quantitatively distinct form normal aging language. AD was also described as exaggerated aging. But current research suggests qualitative differences in language characteristics between AD and normal aged. It has been found that the distinction between language changes that *occur* due to normal aging and due to AD in early stages is very subtle. Hence it is necessary to compare the performance of normal senescents with that of AD patients to filter out the effects of normal aging and to better understand the subtle differences between the two groups using language tasks. Studies which have examined specific areas of language functions in these two groups have been examined in the previous section. In this section we shall deal with the studies which use different tests or combined measures to document the differences between patients with AD and normal elderly controls.

Baylee and Boone (1982) studied the performance of 35 patients with dementia and 28 normal senescents on five language tasks viz. story retelling, naming, sentence correction, sentence disambiguation and verbal expression. Subjects were also tested on psychological measures reputed to be sensitive to the disease such as block design, similarities sub test of WAIS, Mental State Questionnaire (MSQ) and nonsense syllable learning test. A discriminant analysis found that sentence correction task, MSQ and verbal expression tests better discriminated patients with dementia from normals. It was found that language tasks appeared to have more discriminant value than psychologicaJ measures.

Murdoch, Chenery, Wilks and Boyle (1987) studied language profiles of 18 patients with AD and 18 normal controls. Their performance was assessed by means of a test battery comprising of the Neurosensory Centre Comprehensive Examination of Aphasia (NCCEA, Spreen and Benton, 1977) and fluency subtests of WAB (Kertesz 1982). They found that AD patients scored significantly lower than controls in the areas of verbal expression, auditory comprehension, reading and writing. Language deficit is evident in all patients with AD.

To conclude a number of language tests/tasks like the confrontation naming, verbal fluency, verbal description of pictures and objects, word association tests, *story* recall etc. have been found to be sensitive to differences in the language profiles in patients with AD and normal aged individuals.

*** Language profiles of patients with AD in comparison with aphasics**

Signs of language dysfunction in AD and in aphasic syndromes of transcortical sensory aphasia and Wernicke's aphasia have been found to be superficially similar.Some investigators have also reported the presence of aphasia in patients with AD (Seltzer and Sherwin, 1983; Cumming, Benson, Hill and Reed, 1985). Although the disagreement in the use of the term 'Aphasia' to explain some language disturbances in AD still exists, it is clear that the type of errors made by patients with AD and Aphasia *are* qualitatively different. Over the years researchers have examined specific areas of language functions in patients with AD and in aphasic. These studies have been reviewed in the previous section of the review. In this section we shall deal with studies which have been conducted to sketch out the language characteristics in these two groups using language batteries or combined language measures.

Appell, Kertesz and Fisman (1982) studied the language functioning in 25 AD patients, stroke patients and normal controls using Western Aphasia Battery (WAB) (Kertesz 1982) and Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1983). As a group AD patients differed from normals *on* all language variables and from stroke patients in terms of higher fluency and lower comprehensions.

Bayles et al., (1989) studied 21 mildly and moderately impaired AD patients, 41 stroke patients with fluent and

nonfluent aphasias and 31 elderly subjects on 14 of the following tasks : Mental Status, Story Retelling - immediate and delayed, Spatial Recognition Memory, Visual Recognition Memory, PPVT, Oral Object Description, Reading Comprehension, Sentence Disambiguation, Pantomime Expression, Drawing, FAS Word Fluency Measures, Oral Picture Description and Written Picture Description. They found that story retelling (delayed), mental status task, pantomime expression and PPVT could successfully classify normal elderly and mild AD. Aphasic patients performed significantly better than mild AD patients on delayed spatial recognition, delayed verbal recognition and story retelling (delayed). Fluent aphasic patients were superior to mild AD patients *on* mental status task, story retelling (immediate) sentence disambiguation, pantomime expression and drawing test. Mild AD patients were significantly better than nonfluent aphasics on FAS word fluency measures.

Kovesi (1989) used a battery of 6 language tasks, cognitive tasks and neurobehavioural inventory on 45 subjects with dementia, cerebral insult, normal controls and individual with other degenerative disorders like Parkinson's disease. On a discriminant analysis it was found that tasks most effective in distinguishing groups were pantomime expression, immediate and recent story recall, Mental Status Questionnaire and Neurobehavioral inventory.

Horner, Dawson, Heyman and Fish (1992) assessed the usefulness of WAB (Kertesz 1982) for distinguishing disturbances caused by AD from those caused by stroke. On a discriminant

analysis it was found that multi variables "Aphasia quotient (AQ), reading quotient (RQ) and writing quotient (WQ)" classified 29 (72.57.) of the 40 patients correctly.

Stevens (1992) studied 9 AD patients and 8 dysphasic on a language test which comprised of 8 sub tests vis. naming line drawings of common objects, written word/picture matching, action picture description using coloured photographs of objects, action picture description using line drawing of actions, reading *SV0* (subject, verb, object) sentences presented singly, reading *SVO* sentences presented in pairs, written sentence/picture matching and verbal description of objects, with a weighted scoring system. She found that action picture description, verbal description and confrontation naming best discriminated between AD from those with aphasia.

In short language tasks like confrontation naming, generative naming, word association tests, object and action picture descriptions, delayed and immediate story recall, sentence disambiguation etc. have been found to successfully discriminate patients with AD and those with Aphasia.

* **Language profile of patients with AD in comparison with subcortical and mixed dementias**

Dementias *can* be classified as cortical, subcortical and mixed dementias. In cortical dementia neuropathoiogy primarily involves the cortex. The most common type of cortical dementias is Alzheimer's Disease. In subcortical dementias neuropathoiogy

involves subcortical structures. Commonest of all subcortical dementias are Parkinson's disease, Huntington's disease and progressive supranuclear palsy. Mixed dementias involve both cortical and subcortical structures. The most common type of r.ixed dementia is the Multiple Infarct Dementia (MID). Clinically cortical subcortical and mixed dementias have been described as quite different (dimming et al 1984, Joynt 1975). Table I presents common patterns observed in these three types of dementias.

Table I : Dementia classification and common symptom patterns

	Cortical	Sub cortical	Mixed
Intention	Generally intact	Variable with some deficits	+/-
Intelligence	Generally decreased globally	Hay be intact except for slowing, producing a decline in speeded time tasks	Decreased perhaps at an uneven rate
Language	Decreased naming, decreased word fluency, may resemble Wernicke' s or transcortical sensory aphasias, paraphasias common	Naming intact or decreased only slightly, decreased verbal fluency, no paraphasias	+/- aphasia COIIOD naming often decreased
Visuo spatial Stills	Poor construction, iipaired perception/ analytical abilities	Mild deficits, largely due to poor planning	+/-
	No new learning, memory impaired	Forgetful, impairment in recall.	+/-
Good	indifferent, unconcerned depression not common	Depression frequent, concern with and knowledgement of deficits	+/-

Language profile of patients with AD in comparison with subcortical dementias

Cortical dementias generally produce deficits in language abilities, visuospatial skills, memory and intelligence. Cardinal features of patients with subcortical dementias include forgetfulness, slowing of mental processes, intellectual deterioration, personality and affective changes including apathy and depression.

Researchers have compared speech and language abilities in cortical and subcortical dementias. Huber, Shuttleworth, Paulson, Chambers and Clapp (1986) examined 14 patients with AD, 38 patients with Parkinson's disease and 20 normal controls on verbal fluency and naming tests. They found that patients with Parkinson's disease did not have any significant language impairment when compared to AD patients but had mild impairment in memory and visuospatial skills.

Cummings, Darkins, Mrendez, Hill and Benson (1988) assessed speech and language alterations in 51 patients with Parkinson's disease (PD) and 10 patients with AD on BDAE (Goodglass and Kaplan, 1983), WAB (Kertesz 1982), Augmented Dysarthria Scale and scales assisting reiterative speech disturbances. It was found that AD patients produced significantly greater language disturbance including anomia, decreased information content of spontaneous speech, and diminished word length generation. PD subjects had significantly diminished phrase length, impaired

speech melody, dysarthria and agraphia. The results suggests that the dementia of Parkinson's type is distinguishable from that of AD since patients with Parkinson's have prominent motor speech abnormalities whereas AD patients exhibit more profound language alterations.

Language profile of patients with AD in comparison with mixed dementias

Multiple infarct dementia (MID) is a syndrome of acquired intellectual impairment characterized by a step wise deteriorating course with variable mental status deficit, focal neurological signs and symptoms and physical *or* laboratory evidence of associated CVA. MID is a common cause of progressive dementia, ranking closely behind Dementia of Alzheimer's Type (DAT). To characterize the changes in speech and language characteristics of MID and to determine if features of language can distinguish between MID and DAT, comparative studies have been conducted.

Powell, Cummings, Hill and Benson (1988) assessed speech and language functions in 18 patients with MID and 14 with AD. The age range and dementia severity was comparable. Verbal output was assessed using a battery of speech and language tests derived from BDAE (Goodglass and Kaplan, 1983), WAB (Kertesz, 1982) augmented by a dysarthria scale, and a scale for the assessment of reiterative speech disturbances. Results of this study indicate that speech and language abnormalities in MID are distinguishable from those of DAT. In MID abnormal motor aspect

of speech was evidenced, whereas in AD patients empty speech, more marked anomia and relative sparing of motor speech function was observed.

Kontiolo, Laaksonen, Sulkawa and Erkinjuntti (1990) assessed language in 33 patients with AD, 52 patients with **MID** and 86 elderly community residents. An extended battery of Luria's language test was used. The changes in language function in normal subjects could be clearly differentiated from those seen in patients with mild dementia. Patients with MID were significantly better than patients with AD on understanding of temporal relationships, repetition of sentences, repetition of dissociated sentences, understanding of complex grammatical structures and repetition of story.

Relationship between age of onset and language deficits

Heterogeneity within AD is now widely recognised but there is considerable debate as to why this variation occurs. It is believed that age of onset is *one* such factor contributing to the heterogeneity in the AD group. Researchers have examined the relationship between age of onset and language deficits in AD. Researchers have compared language profiles of patients with early onset (onset before 65 yearu of age) and late onset (onset after 65 years of age) AD to examine this relationship. Early studies which compared these two groups found that patients with early onset AD had more severe language impairment (Seltzer and Sherwin, 1983; Chui et al., 1985; Filley, 1986; Sherwin, 1983). In later studies by Grady (1987) and Seines, Carson, Rovner,

Gordon (1985) in which the dementia severity of the two groups were matched no significant difference in the severity of languaged impairment was observed.

More recently Bayles (1991) studied 86 patients with AD and 42 normal elderly controls to assess the relationship between age of onset and language dysfunction. An hierarchical linear model was constructed to assess effects of age of onset and disease duration *on* the performance of patients with AD on four language tasks (naming, reading, auditory comprehension and writing to dictation) after controlling for disease severity. Early age of onset as specified by *care* givers was not found to be related to greater language impairment. Analysis of performance of individual tasks indicated the presence of this relationship between later age of onset and greater language impairment for confrontation naming, auditory comprehension, reading comprehension. A subtle but statistically significant relationship between later age of onset of AD and greater language impairment was reported.

Differences in the results of these studies highlight that the controversial distinction of early and late onset AD needs further investigation to draw any definite conclusion.

SECTION III : Language assessment procedures in AD

For *over* two decades researchers have examined specific areas of language functions in Alzheimer's Disease and have documented that these patients do not show equal degree of

impairment across different linguistic levels. Researchers also indicate that certain language tasks can be used to identify patients with AD and differentially diagnose AD from other disorders like aphasia with information on individual components of language in AD, there is a need to develop comprehensive tools specifically to aid in early identification of AD and differential diagnosis of AD from aphasia which presents a language profile superficially similar to AD.

Traditionally speech language pathologists resorted to the use of aphasia test batteries and their own clinical experience to separate out those patients with focal lesions from those with progressive dementia of Alzheimer's type. Although aphasia tests give some insight into language deficits of dementia few can identify the subtle differences between the groups (i.e, dementia and aphasia). Moreover most of the aphasia test batteries are poorly standardized on the elderly population. Since AD is commonly associated with the elderly, the use of these aphasia tests with AD is limited.

One of the first attempts to discover more about language function in elderly using aphasia tests was that of Walker (1982) who tested normal elderly, patients with dementia, and aphasia on the Minnesotta Test for the Differential Diagnosis of Aphasia (MTDDA . - Schuell, 1965). Walker found that MTDDA did not adequately discriminate between aphasic from dementia.

More recently, Horner et al (1992) have used Western Aphasia Battery (Kertesz 1982) for distinguishing the language

disturbances caused by AD from those caused by stroke. They found that on discriminant function analyses, the multiple variable "Aphasia quotient, reading quotient, writing quotient" classified 29 (72.5%) of the 40 patients correctly. These 29 patients included 8 out of 10 patients with hemisphere infarction and fluent aphasia; 6 out of 10 with AD; 5 out of 10 with right hemisphere infarction; and all 10 of the neurologically normal control subjects. However two patients with aphasia were misclassified as AD.

Other tests like Luria's neuropsychological investigation (Christensen, 1974) which differentiate AD and Alcoholic Korsakoff's syndrome and Aphasia screening test (Whurr, 1974) have been widely used. However, it is still a matter of debate whether aphasic batteries illuminate the underlying deficit in AD.

A more rational approach is to bring together a number of tests that have been shown to discriminate AD and other groups, the rationales assessment of which do not use aphasia as the basis for assessment.

Recently language tests by Bayles and Stevens have been specifically developed to assess patients with dementia.

Stevens (1992) has developed a screening test specifically for discriminating between patients with aphasia and AD. This test does not classify aphasics according to syndromes but is a useful starting point for more detailed language testing because it allows the clinician to probe the possible underlying deficits

by focussing on the quaiity of the response. Steven's screening test consists of 8 sub tests.

* Naming line drawings of common objects
* Written word/picture word matching with syntactic and semantic distractors.
* Action picture description using photographs of objects
* Action picture description using line drawings
* Reading SVO sentences presented singly
* Reading SVO sentences presented in pairs
* Written sentences/picture matching using syntactic and semantic distractors
* Verbal description of objects, with a weighted scoring system.

Bayles et al (1989, 1992) have developed a core linguistic battery consisting of the following subtests. These have now been published as the Arizona Battery for Communication in Dementia (ABCD 1992).

* Confrontation Naming
* Auditory Comprehension (word and picture matching)
* Writing to dictation (single words)
* Reading comprehension (word/picture matching)
* Oral reading (single words)
* Concept definition [word definition scored using WAIS (1958) criteria]
x Coordinate Naming (give two other names in the same category as the object)

* Super ordinate naming (give object - name superordinate category)
* Pantomime expression (pantomime use of object/pictures)
* Pantomime recognition (gestures to picture matching)

Since researchers have found language tests to be one of the more sensitive measures in identifying dementia. Attempts to refine existing tests and attempts to develop new tests still continue. No attempts have been made to develop such language tests for the AD population in India. Hence this study was undertaken as an initial step towards developing a language test for differentiating from aphasia.

METHODOLOGY

METHODOLOGY

* Aim :

The aim of the present study was to compile and assess the potential of a language test in differentiating Dementia from Aphasia.

x Subjects :

Three groups of subjects were studied. Group I included patients with Alzheimer's Disease (AD). Group II included patients with Aphasia and Group III included normal healthy elderly individuals.

*** Criteria** :

The general criteria for subject selection were

(i) Age above 50 years

(ii) Native speakers of Kannada

(iii) Minimum of 10 years of formal education

(iv) Adequate hearing (responds to speech at normal conversational level)

(v) Should have normal or corrected vision

(vi) No history of alcohol or drug abuse.

Additional criteria that the subject groups had to fulfill were as follows.

Group I (AD group)

(i) No major premorbid communication deficit

(ii) No premorbid history of psychiatric and neurological disorder.

(iii) No major cardiovascular signs

(iv) Confirmed diagnosis of AD with mild or moderate severity

Group II (Aphasic group)

(i) No major premorbid communication deficits

(ii) No premorbid neurological and psychiatric disorder

(iii) No history of cognitive decline *or* multiple infarcts.

(iv) At least one month post onset.

Group III (Normal controls)

(i) No major communication deficits

(ii) No history of neurological and/or psychiatric disorders

Subjects in Group I were matched to subjects in Group II and Group III with respect to sex, education, language background and socio-economic status.

Data collection (clinical population including dementics and aphasics) was done in the neurology ward at National Institute of Mental Health and Neuro Science in Bangalore, Victoria Hospital in Bangalore and J.S.S. Medical College Hospital in Mysore after thorough neurological and psychiatric evaluations.

* **Particulars** :

Group I :

Five male subjects with confirmed diagnosis of Alzheimer's disease (AD) were studied (3 with mild severity and 2 with moderate severity). CT scans in all subjects were indicative of diffuse cerebral atrophy. In 4 out of 5 subjects a thorough neuropsychological evaluation had also been carried out.

Subject particulars IIa : Normal controls

Case No.	Age/Sex	History or complaint of any neurological disorder
1	68Y/Male	--
2	86Y/Nale	--
3	81Y/Male	--
4	71Y/Male	--
5	55Y/Male	--

Group II :

Five male subjects with confirmed diagnosis of aphasia (2 Broca's aphasics, one global aphasic, one Wernicke's aphasic and *one* transcortical sensory aphasic) were studied. In all five subjects aphasia was consequent to cerebrovascular accident (CVA).

Table B : Subject Particulars

Subject Particulars IIb : Patients with Alzheimer's Disease

CASE NO.	AGE/SEX (Y)	DIAGNOSIS	SEVERITY	CT SCAN FINDING	DIAGNOSIS ON NEURO PSYCHOLOG-ICAL EVALUATION
1	54/Male	Alzheimer's Disease	Moderate	Dilation of ventricles widening of sulci and diffuse cortical atrophy	Moderate Dementia
2	91/Male	Alzheimer's Disease	Moderate	Diffuse cortical atrophy with dilation of ventricles	NOT DONE
3	83/Male	Alzheimer's Disease	Mild	Diffuse cortical atrophy	Mild Dementia
4	72/Male	Alzheimer's Disease	Mild	Diffuse cortical atrophy	Mild - Moderate Dementia
	68/Male	Alzheimer's Disease	Early Mild	Mild diffuse cortical atrophy with mild ventricular dilation	Mild Dementia

Group III :

Included five neurological1y normal elderly subjects who served as controls.

Subject Particulars IIc : Patients with Aphasia

SL. NO.	AGE/SEX (Y)	HANDEDNESS	DIAGNOSIS	POST ONSET DURATION	CT SCAN FINDING
1	65/Male	Right	Trans cortical sensory Aphasia	3 months	Infarct left temporo parietal region
2	66/Male	Right	Wernicke's Aphasia resolved	5 months	Infarct left temporal region
3	*61/Male	Right	Broca' s Aphasia	5 months	--
4	*50/Male	Right	Global Aphasia	4 months	--
5	70/Male	Right	Broca's Aphasia	2 months	Hypodense in left fronto parietal region

Sub Test I : Object Naming

Sub Test II : Picture Naming (a) Objects (b) Actions

Sub Test III : Generative Naming

Sub Test IV : Word Association Test

Sub Test V : Delayed story recall

Sub Test VI : Picture description

Sub Test I :

Object Naming :

This test was adapted from the Naming subtest of Western Aphasia Battery (Kertess 1982) and Boston Diagnostic Aphasia Examination (Goodglass and Kaplan 1983). It consists of ten commonly used objects. Subjects were asked to name objects presented one at a time. Responses were recorded *on* the score sheet. Each correct response was given a score 2. If the subject failed to respond within 30 sec of the stimulus presentation a phonemic cue was given. Correct response following the phonemic cue was given a score of 1. No response or incorrect response was given a score of zero.

Sub Test II :

Picture Naming :

This subtest includes two subsections. The first subsection consists of pictures depicting objects. This subsection was adapted from WAB (Kertess, 1982) Boston Naming Test (Kaplan et al., 1976) and BDAE (Goodglass and Kaplan, 1983). The second subsection consists of pictures depicting actions. This was adapted from WAB (Kertess, 1982) and Action Naming Test (Obler and Albert, 1979). Pictures were presented *one* at a time and the subjects were asked to name the objects in subsection one and actions in subsection two. Scoring patterns were similar to that used in object naming.

Sub Test III

Generative Naming :

In this subtest subjects were asked to produce words corresponding to three semantic categories : Animals, Fruits and Vegetables within a time limit of one minute each. Each *correctly* named subordinate was given a score of one. Maximum score was set at 15.

Sub Test IV :

Word Association Test :

This subtest was adapted from the Word Association Tests used by Gewirth et al., (1984) and Santo pietro (1985). It consists of 18 words with equal number of nouns, verbs and adjectives scaled equally at three levels of abstraction (High, medium and low). At each level of abstraction there are high frequency words and low frequency words. Subjects were instructed on these lines in Kannada.

'I am going to say a word, I want you to tell me the first word you can think of the moment you hear the word. For example if I say 'sky' you may say 'blue', stars etc.

A maximum response latency of 30 seconds was considered before a rating of 'No Response'. Subjects were reinstructed whenever they gave a multiword response. Responses were noted down and classified *or* assigned to one of the following categories.

*** Paradigmatic response** : A response was classified as a paradigmatic response when the stimulus word and the response word belonged to the same grammatical class.

[Eg (: banana (S) - mango (R)]

* **Syntagmatic response** : A response was scored as a syntagmatic response when the stimulus word and response word belonged to two different grammatical classes.

[Eg|: Sweet *(S)* - eat(R)].

* **Repetition** : A response was scored as repetition when the stimulus word was completely repeated or repeated with modification.

[Eg|: beautiful (S) - beautiful (R)/ready (S) - ready(R)].

* **Multiword response** : A response was scored as a multiword response when the response consisted of 2-3 words.
[Eg|: Children (S) - children *are* God (R)].

*** Unassociated** : A response was scored as unassociated if the response lacked any association with the stimulus

[(Eg|: laugh (S) - muscle (R)].

(S) - Stimulus

(R) - Response

Sub Test V :

Delayed Story Recall :

The story in this sub test was adapted from WAB (Kertesz 1982). The story of 'the fox and the crow' was narrated with pictures. Subjects were asked to recall the story after a picture description task which served as a distractor. Before the story was recalled the subjects were asked to sequence the pictures. The sequencing of pictures (correct or incorrect) was noted down. Narration was qualitatively analysed after transcribing the tape recorded material.

Sub Test VI :

Picture Description :

The picture of a market scene in the discourse section of the Linguistic Profile Test (Karanth 1980) was used. The subjects were asked to describe the picture. The samples were taperecorded and transcribed. A qualitative analysis was done.

Each subject was tested individually. Results and discussion are presented in the next chapter.

RESULTS & DISCUSSION

RESULTS AND DISCUSSION

The present study aimed at assessing the potential of the language test developed, in differentiating dementia from Aphasia.

This was studied in a small sample of 5 patients with confirmed diagnosis of Alzheimer's disease, 5 patients with aphasia and 5 healthy elderly individuals (normal controls) matched for sex, education, linguistic background and socio-economic status. All subjects included in the present study were males.

Subjects in the Control Group ranged from 55-86 years with a mean age of 72.2 (± 10.8) years.

Subjects in the Alzheimer's Disease (AD) ranged from 54-91 years with a mean age of 73.6 (± 12.72) years.

Subjects in the aphasic group ranged form 50-70 years with a mean age of 62.4 (± 6.83) years.

(See Table for Demographic Data)

Table 1 : Demographic Data

Groups	Case No.	Age/Sex	Languages known	Miscellaneous		
Control Group	1	68Y/M	Kannada, English & Telugu			
	2	86Y/M	Kannada & English			
	3	81Y/M	Kannada & English			
	4	71Y/M	Kannada, English & Telugu			
	5	55Y/M	Kannada, English & Tamil			
				Severity of AD		
Alzheimer's Disease Group	1	54Y/M	Kannada English, Telugu	Moderate		
	2	91Y/M	Kannada English, Tamil	Moderate		
	3	83Y/M	Kannada English,	Mild		
	4	72Y/M	Kannada English,	Mild		
	5	68Y/M	Kannada English, Telugu	Early Mild		
				Type of Aphasia	Post Onset	
Aphasic Group	1	65Y/M	Kannada & English	Transcortical sensory aphasia	3 Months	
	2	66Y/M	Kannada, English Telugu	Wernicke's aphasia	5 Months	
	3	61Y/M	Kannada & English	Broca's aphasia	4 Months	
	4	50Y/M	Kannada, English Telugu	Global aphasia (s resolved to Broca's aphasia)	6 Months	
	5	70Y/M	Kannada & English	Broca's aphasia	2 Months	

Language test consisting of the following subtests were administered.

Sub Test I : Object Naming

Sub Test II : Picture Naming

Sub Test III : Generative Naming

Sub Test IV : Word Association Test

Sub Test V : Delayed Story Recall

Sub Test VI : Picture Description

Scores on the first four subtests were subjected to statistical analysis. However, a descriptive analysis was done for sub tests V and VI.

Results on statistical analysis and descriptive analysis are stated in the following section.

(See Table 2 for summary of the results on statistical analysis)

Object Naming :

In object naming the *control* group obtained the highest scores followed by the AD group and aphasic group.

In the control group all subjects except *one* obtained the maximum score of 20. The mean score for this group was 19.8 (± 0.447). One subject who failed to recall the name of the object presented within 30 seconds of the stimulus presentation named the object immediately after a phonemic cue was given.

Table 2 : Summary of Results on Statistical Analysis

SUB TESTS	MAX. SCORE	CONTROL GROUP MEAN	CONTROL GROUP S.D.	AD GROUP MEAN	AD GROUP S.D.	APHASIC GROUP MEAN	APHASIC GROUP S.D.	ANOVA	POST HOC TEST FISHER'S PLSD
Object Naming	20	19.8	± 0.447	14.2	± 8.075	9.2	± 9.011	No significant difference across groups	Significant difference between normal vs. aphasics
Picture Naming (Total) a + b	20	19.0	± 1.00	16.4	± 4.98	4.4	± 4.099	Significant difference across groups	Significant difference between normal vs. aphasics * AD vs. Aphasics
a) Objects	10	10.0	± 0.000	8.8	± 1.789	3.4	± 2.408	Significant differences across the groups	Significant difference between *normal vs. aphasics * AD vs. aphasics*
b) Actions	10	9.0	± 1.000	7.6	± 3.286	4.2	± 5.718	Significant differences across the groups	Significant difference between *normal vs. aphasics * AD vs. aphasics*
Generative Naming									
Animals	15	12.4	± 3.975	7.0	± 3.674	2.6	± 3.975	Significant difference across the groups	Significant difference between normal vs. aphasics

Table 2 continued . . . .

SUB TESTS	MAX. SCORE	CONTROL GROUP MEAN	CONTROL GROUP S.D.	AD GROUP MEAN	AD GROUP S.D.	APHASIC GROUP MEAN	APHASIC GROUP S.D.	ANOVA	POST HOC TEST FISHER'S PLSD
Vegetables	15	10.4	± 2.191	3.8	± 1.304	3.2	± 4.324	Significant difference across the groups	Significant difference between *normal vs. AD *normal vs. aphasic
Fruits	15	11.4	± 2.302	4.0	± 1.871	1.949	± 8.72	Significant difference across the groups	Significant difference between normal vs. AD *normals vs. aphasics
Word Association Test									
Paradigmatic Response		2.739	± 1.225	4.099	± 1.833	1.304	± 0.583	Significant difference across the groups	Significant difference between normal vs. Ad vs. *normal vs. aphasics
Syntagmatic Response		1.098	± 0.49	1.673	± 0.748	0.894	± 0.400	significant difference across the groups	Significant difference between normal vs. aphasics * AD vs. aphasics*
Unassociated Response		0.894	± 0.400	3.536	± 1.581	4.382	± 1.960	No significant difference across groups	No significant difference

Table 2 cootioued.

SUB TESTS	MAX. SCORE	CONTROL GROUP MEAN	CONTROL GROUP S.D.	AD GROUP MEAN	AD GROUP S.D.	APHASIC GROUP MEAN	APHASIC GROUP S.D.	ANOVA	POST HOC TEST FISHER'S PLSD
Multiword response		1.14	± 0.51	1.732	± 0.866	3.899	± 1.744	No significant difference across groups	No significant difference
Repetition		1.304	± 0.583	1.342	± 0.6	9.592	± 4.29	No significant differences across groups	No significant difference
No response		1.304	± 0.583	1.095	± 0.49	9.2	± 9.011	Significant difference across the groups	Significant difference between *normal vs. aphasics * AD vs. aphasics*

(Significant difference at 0.05 level)

In the AD group two subjects with mild AD obtained the maximum score of 20, with the mean score for this group being 14.2 (± 8.075).

In the aphasic group none of the subjects obtained the maximum score, one subject with Broca's aphasia obtained 'no score (0)' on this task. High S.D. values indicated high variability in this group. High variability in the data set could be due to the fact that different subtypes of aphasics were grouped together (See fig. 1 for average response trends on object naming).

Large mean differences were observed between the control group and the aphasic group. Mean differences were almost equal for :

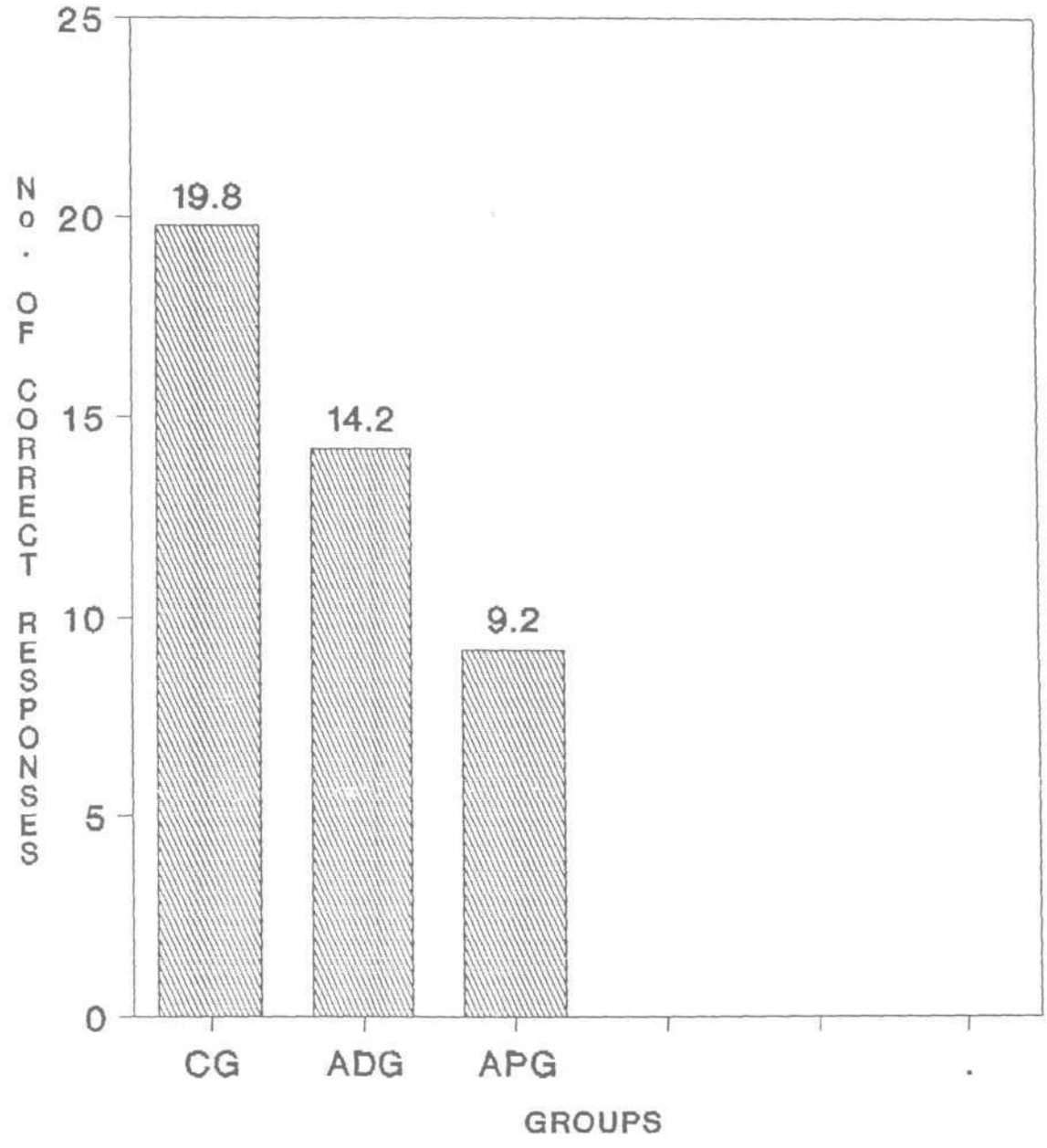
(*) Control group and AD group and

(*) AD group and aphasic group.

To see if the differences across the groups were statistically significant one way ANOVA was used. No significant difference across the groups was observed on ANOVA.

To determine if there were differences between the groups Fisher's PLSD was done. On Fisher's PLSD statistically significant differences were observed between the control group and aphasic group at 0.05 level of significance.

FIGURE 1
AVERAGE RESPONSE TRENDS ON OBJECT NAMING



CG - Control Group;
ADG - Alzheimer's Disease Group;
APG - Aphasic Groups

*<1

Picture Naming :

On picture naming which included pictures of objects and actions, the control group obtained the highest scores followed by the AD group and then by the aphasic group.

In the control group only 2 subject obtained maximum score of 20. Mean score for this group was 19 (± 1).

In the AD group two subjects with mild severity of AD obtained maximum scores of 20 and one subject with moderate AD obtained the lowest score of '8' in this group. The mean score for this group was 16.4 (± 4.98).

In the aphasic group none of the subjects obtained a maximum score. The mean score in this group was 7.8 (± 4.382) (See fig. 2 for average response trends on picture naming).

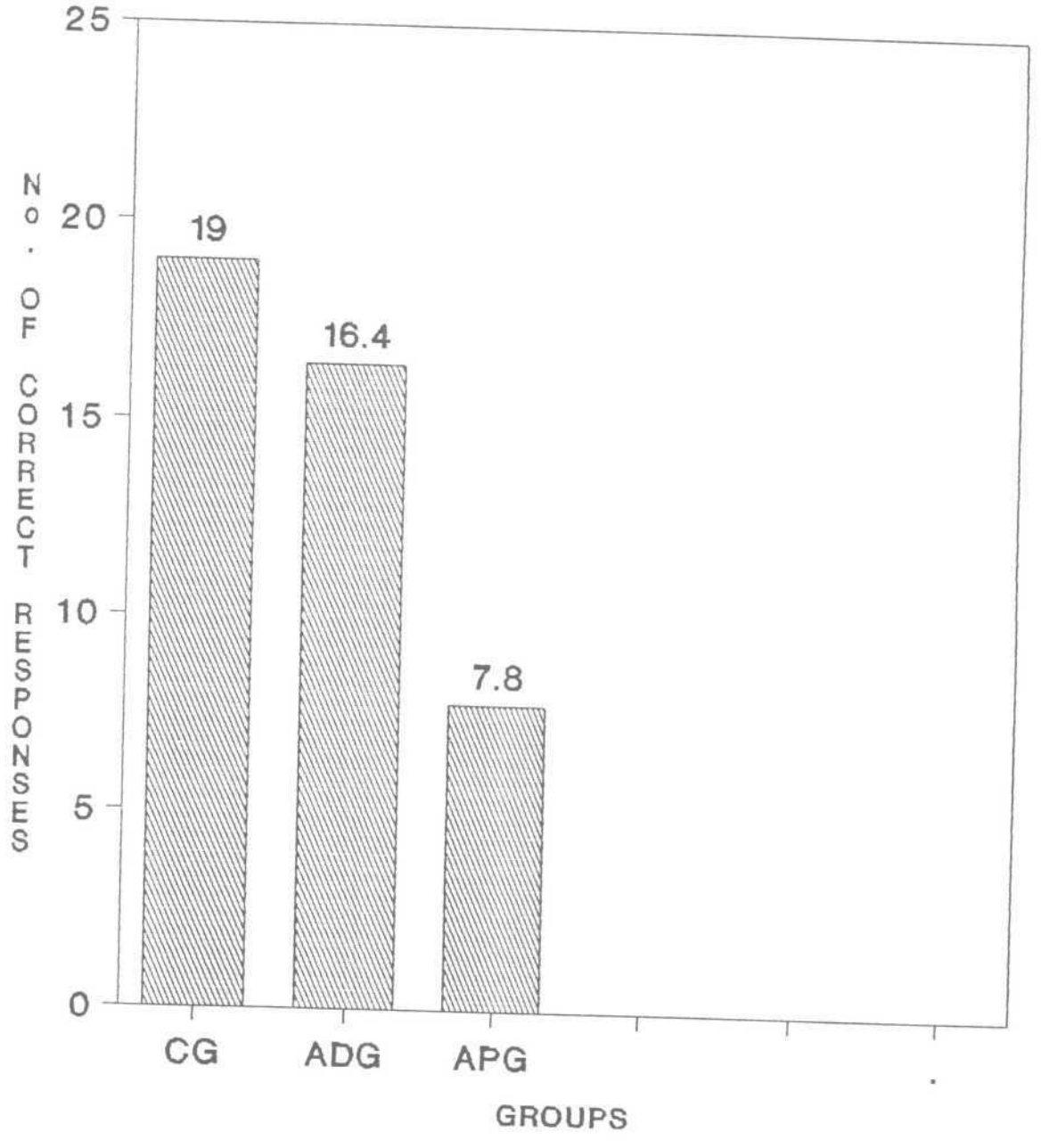
Large mean differences were observed between the following groups :

(*) Control group vs. Aphasic group

(*) AD group vs. Aphasic group.

To see if the differences across the groups were statistically significant one way ANOVA was done. The F value being highly significant Fisher's PLSD was done to analyze the differences between the groups. On this test statistically significant differences were observed between the following groups at 0.05 level of significance.

FIGURE 2
AVERAGE RESPONSE TRENDS ON PICTURE NAMING



CG - Control Group;
ADG - Alzheimer's Disease Group;
APG - Aphasic Groups

* Control group vs. Aphasic group
* AD group vs. Aphasic group.

To see if the results were different for object naming and action naming independently, these too were subjected to analysis separately.

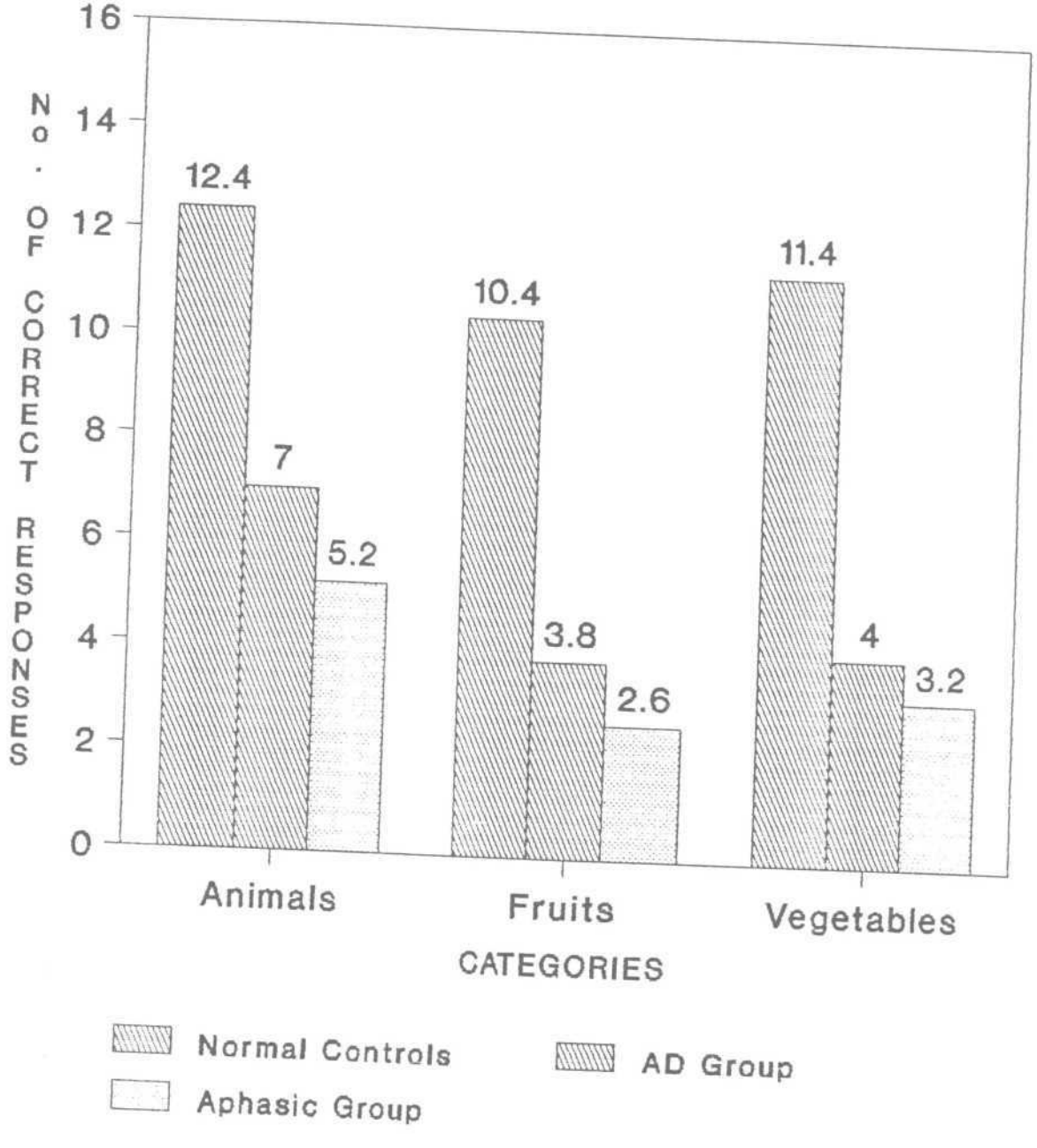
One way ANOVA was done to see across group differences for object naming and action naming of pictures. Significant differences were observed across the groups for both picture naming of objects and picture naming of action. This was followed by Fisher's PLSD for both to analyze between group differences. Significant differences between the following groups were observed for both at 0.05 level of significance.

* Control group vs. Aphasic group
* AD group vs. Aphasic group

Generative Naming :

Generative naming was studied using three semantic categories; animals, fruits and vegetables. Of the three groups the control group produced more number of words followed by AD group and then by aphasic group on all the three categories. Of the three categories more number of words were produced for the category of animals, followed by vegetables and then by fruits. (See fig. 3 for average response trends across categories in all the groups).

FIGURE 3
AVERAGE RESPONSE TRENDS ACROSS CATEGORIES ON GENERATIVE NAMING



To analyse across group differences for each of the three categories one way ANOVA was done. On ANOVA significant differences across the groups were observed for all the three categories i.e, animals, fruits and vegetables.

This was followed by Fisher's PLSD to *analyze* the differences between the groups for each of the three categories. Fisher's PLSD indicated significant differences between the following groups :

* Control group and AD group for fruits and vegetables.
* Control group and aphasic group for all the 3 categories

animals, fruits and vegetables.

To assess across category differences for each of the 3 groups, repeated one factor ANOVA was used. No significant differences was observed across the categories in the control group and aphasic group. However in the AD group across category differences were found to be significant.

Further to analyze between category differences in all the 3 categories Fisher's PLSD was done.

* Fisher's PLSD did not indicate differences between the categories for the control group.

* In the aphasic group significant differences were observed between animals versus fruits at 0.05 level of significance.

* In the AD group significant differences were observed between animals vs. fruits and animals vs. vegetables at 0.05 level of significance. (See table 3 for summary of results on repeated *one* factor ANOVA and post hoc test on each group) .

Table 3 : *Summary* of results on repeated one factor ANOVA and post hoc test in all the 3 group on generative naming for across category differences.

Groups	Repeated one factor ANOVA	Post hoc test Fisher's PLSD
Control Group	No significant difference across the categories	No significant difference between the categories
AD *Group*	Significant difference across the categories	Significant difference observed in animal vs. fruits animal vs. vegetables
Aphasic Group	No significant difference across the categories	Significant differences were observed in animal vs. fruits.

Word Association Test :

On the word association test, comparing the groups *on each* category of response it was found that

* The control group gave maximum number of 'paradigmatic responses (P) (50%) followed by the AD group (20%) and then the aphasic group (7.78%).

* Both control group and AD group gave almost equal number of 'syntagmatic' responses (S) being 20% in AD group and 21.1% in the control group. Aphasic group gave fewer syntagmatic responses (4.4%).

* 'Unassociated responses' (UA) were maximum in the AD group (16.7%) with an almost equal number of unassociated responses in the control group (2.22%) and the aphasic group (2.21%).

* 'Multiword responses' (MWR) were maximum in number in the AD group (31.1%) and almost equal in number in the control group (13.33%) and the aphasic group (12.22%).

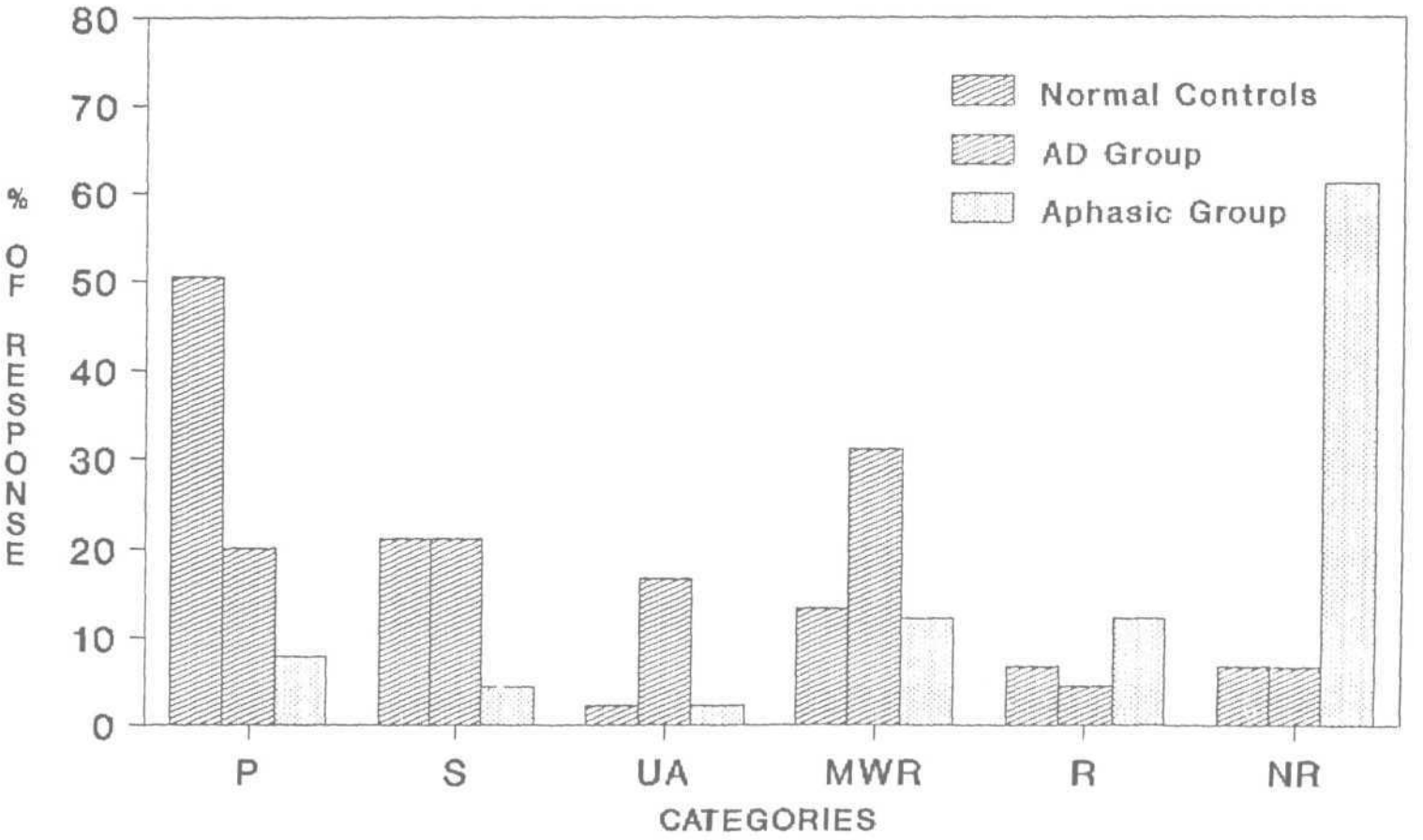
* Maximum 'repetitions' (R) were observed in the aphasic group (12.22%) followed by the *control* group (6.67%) and the AD group (4.44%).

* Maximum number of 'no responses' (NR) were observed in the aphasic group (61.1%) and almost equal number 'no responses' were observed in both the control group (6.67%) and the AD group (6.66%).

See fig. 4 for percentage of responses across categories on word association test.

Summarizing the responses in each group, it was found that the control group gave maximum number of paradigmatic responses followed by syntagmatic responses and multiword response. Almost equal number of repetitions and no responses were observed. Only few unassociated responses were noted.

FIGURE 4
PERCENTAGE OF RESPONSE ACROSS CATEGORIES ON WORD ASSOCIATION TEST



P-Paradigmatic; S-Syntagmatic;
UA-Unassociated; MWR-Multiword Response
R-Repetition; NR-No Response

The AD group had maximum number of multiword responses when compared to other groups. Almost equal number of paradigmatic and syntagmatic responses were recorded. Very few *no* response and repetitions were noted.

In the aphasic group the subjects gave maximum number of *no* response and repetitions. This was followed by multiword response and paradigmatic response. Fewer syntagmatic and unassociated responses were observed.

(See fig.5 for percentage of responses across groups on word association test)

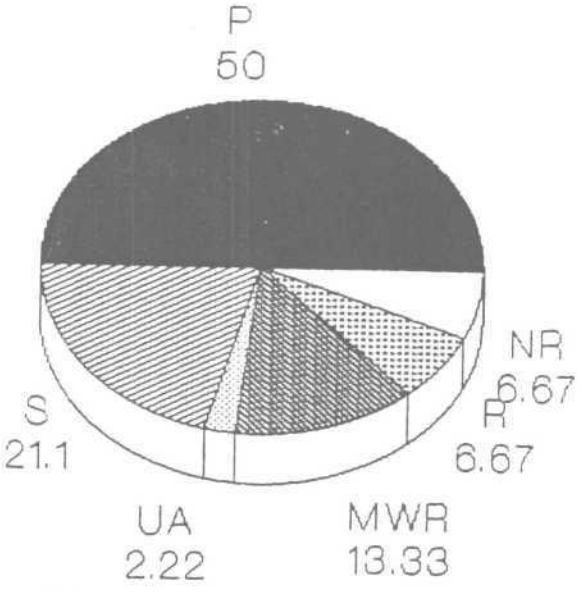
To see if the differences across the groups were significant on each category of response. One way ANOVA was done. Significant differences across the groups were observed in the following response categories :

* Paradigmatic responses
* Syntagmatic responses
* No response

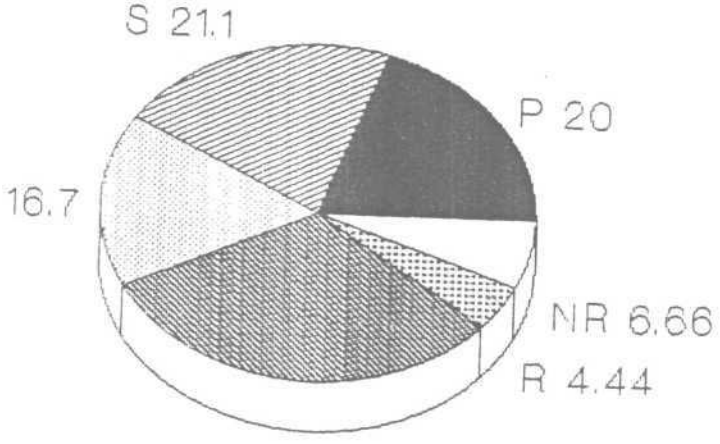
No significant difference was observed in the following categories : across the groups.

* Unassociated response
* Repetition
* No response

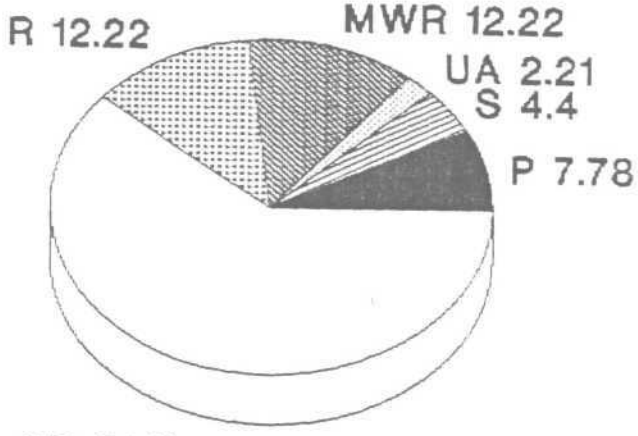
PERCENTAGE OF RESPONSES ACROSS GROUPS ON WORD ASSOCIATION TEST



Normal Controls



AD GROUP



APHASIC GROUP

P-Paradigmatic; S-Syntagmatic;
UA-Unassociated; MWR-Multiword Response
R-Repetition; NR-No Response

Fisher's PLSD was done *on* all categories to analyse between group differences. On Fisher's PLSD significant differences were observed between the following groups at 0.05 level of significance.

* Control group and AD group for paradigmatic response

* Control group and aphasic group for paradigmatic,syntagmatic and no response.

* AD group and aphasic group for syntagmatic and no response.

To analyse within group difference for different response categories Friedman's 2 way ANOVA was used. No significant differences were observed in the AD group and the aphasic group. Significant differences were observed within the *control* group.

(See Table 4 for summary of results on Friedman's 2 way ANOVA for each group)

Table 4 : Summary of results on Friedman 2 way ANOVA for across category differences in each group on word association test.

Group	Friedman 2 way ANOVA
Control Group	Significant difference across categories
AD Group	No significant difference across categories
Aphasic Group	No significant difference across categories

To summarise the result

* Differences across the groups were not significant on object naming. However a significant difference was observed between the control group and the aphasic group *on* Fisher's PLSD.

* Differences across the groups were significant on picture naming (total) and independent measures of pictures of objects and pictures of actions.

Significant differences between the control group and aphasic group and AD group and aphasic group were observed.

* Significant differences across the groups for all the 3 semantic categories were observed *on* generative naming. On Fisher's PLSD significant differences were observed between the following groups :

- Control group vs. AD group for fruits and vegetables.
- Control group vs. Aphasic group for animals, fruits and vegetables.
- No significant difference were observed between the AD group and aphasic group.

Within category differences were not significant for the control group and aphasic group. Within category differences were found to be significant in AD group, with differences between animals vs. fruits, and animals vs. vegetable categories.

* Significant differences across the groups were found on syntagmatic, paradigmatic and no response categories on the word association test. On Fisher's PLSD a significant difference was observed between the following categories.

* Control group and AD group for paradigmatic response.

* Control group and aphasic group for paradigmatic, syntagmatic and no response categories.

* AD group and aphasic group for syntagmatic and no response categories.

Within group differences were not significant for AD group and aphasic group unlike the control group.

Delayed story recall and picture description :

As stated earlier the next two subtests i.e, delayed story recall and picture description were subjected to a descriptive analysis. After a brief note *on* both these subtests, interpretation of discourse analysis of one subject in the control group, one subject with early mild AD, one subject with mild AD, one subject with moderate AD and one aphasic (transcortical sensory aphasia) representative of their respective groups is presented. (In the appendix - IV the discourse of each of these subjects is transcribed using International Phonetic Alphabet and a direct translation into English is also given).

DELAYED STORY RECALL :

As stated in the methodology the story of 'fox and the crow' was adapted from WAB in Hindi. In this subtest the story was narrated immediately after which the next sub test the picture description was administered, following this the subjects were asked to recall the story narrated earlier and were also asked to sequence the pictures used while narrating the story. In the control group all the subjects sequenced the pictures correctly, one subject in the AD group and two in the aphasic group sequenced the picture incorrectly.

Picture Description : :

This was adapted from Linguistic Profile Test (Karanth, 1980). The picture depicting a market scene was used and the subjects were asked to describe the picture.

Discourse on both these tasks were tape recorded and transcribed using International Phonetic Alphabets- Interpretation of discourse of subjects representative of their respective groups is presented here.

*** CONTROL GROUP : NORMAL SUBJECT**

Picture Description :

Interpretation

Analysis of discourse indicates that the normal subject has used complete grammatically correct complex sentences to describe the picture. The description is elaborate and contains anaphoric references (Eg : this, that) demonstrative references. (Eg. here, here), pronominal references (Eg. He) and comparative references (Eg. another). Inter and Intrasentential cohesion is maintained. Collocations are also observed ie, association of lexical items that regularly co occur (Eg.
Description is more of events and setting information and personal value judgement about the picture is also observed. Exophora's (information outside the text. Eg ; If I think of it my tongue starts watering) and repetitions (Eg : book, book. are seen. Subject uses appropriate pauses and normal intonation.

Story Recall :

Interpretation : :

Analysis of discourse indicates that the subject uses complex grammatically correct sentences. The story format is retained but elaborate information is sequenced correctly. Anaphoric references were appropriately used (Eg : this). Inter and Intra sentential cohesion is maintained repetitions are observed Eg (plan, plan, crow, crow) content of the story is

maintained, and the focus is more *on* event and gist informations. Appropriate pauses and normal intonation patterns are observed.

ALZHEIMER DISEASE GROUP : A patient with eariy mild dementia (AD)

Picture Description

Interpretation :

Analysis of this person's discourse indicates that the discourse generally remains on picture description. Subject has used sentences shorter in length when compared to the normals. Number of words used in the description *are* reduced when compared to normals. But the sentences are grammatically *correct* and maintain inter and intrasentential cohesion. Anaphoric references *are* appropriately used. There is a increase in the number of demonstrative references (Eg : here, here) and pronominal references are appropriately used. There is increased reliance on indefinite terms (eg : like something) self correction is also observed (eg : if not a balloon seller). Discourse contains more event and gist than setting information. Appropriate pauses and intonation patterns *are* used.

Story Recall :

Interpretation :

Analysis of this patients discourse on the story recall task indicates that the story format is maintained. He uses simple and complete. Uses fewer sentences when compared to normals. Major content of the story is maintained and sequenced *correctly* in

terms of events. Minor content modification is observed (Eg uses the term eatable instead of roti which was used while the story was narrated initially). Anaphoric references are used appropriately. Indefinite terms are also used (Eg : probably). Gives importance to both setting and event information.

ALZHEIMER DISEASE GROUP : A patient with mild AD.

Picture description :

Interpretation :

Discourse analysis indicates that the focus is *on* specific events in the picture.

The case has used simple but grammatically correct sentences. The amount of information *conveyed* is limited. Fewer propositional phrases are observed. There is a marked increase in the number of indefinite (Eg ; something, some) and demonstrative references used (Eg •• here). Anophoric references are present. Repetition of ideas *are* also seen (he has left papad *or* something to float - No papd or something is floating).

Story Recall :

Interpretation :

Analysis of discourse indicates that the focus is on story recall. The story format is maintained.

Simple sentences are used to recall the story. There is a decrease in the total number of words when compared to normals. Fewer target propositions *are* observed. The case uses pronouns without antecedents (Eg : Fox came and saw a roti in its mouth). The term "its' is used without referring to the crow previously. Incomplete cohesive ties are used (Eg : It got). The sequence of events is not maintained and the content of the story is modified. (Eg : Because the fox told the crow that he was singing well, he got a piece of meat). Anaphoric references *are* used appropriately.

ALZHEIMER'S DISEASE GROUP : Patient with Moderate AD

Picture Description :

Interpretation :

Analysis of discourse indicates that he has merely pointed out to some of the components of the picture.

Information is limited and lacking. He uses words and sentence fragments to describe the picture. Focus is only on the setting information. There is very little information on events. Description lacks cohesion. Repetition of words is common Eg : house, house). Repetition of syllables (Eg : ma ma) are also present.

Story Recal1 :

Interpretation :

Analysis of discourse on story recall indicates that the story format is lacking. Simple sentences are used but there is a lack of inter and intrasentential cohesion. Fewer unique words are present. There *are* fewer proportions. Content of the story is not maintained. Sequence of events in the story are not correctly maintained. With large number of sentence fragments the discourse lacks cohesion and is *very* incoherent.

APHASIC GROUP : Patient with Transcortical Sensory Aphasia

Picture Description :

Interpretation :

Analysis indicates that the subjects has just pointed out to components of the picture.

It contains fewer information units. Simple sentences are used but the discourse contains more number of comments (Eg can't see anything). Abortive phrases and sentence fragments are present. Repetition of words are common (Eg : boy boy). Infinite are terms (Eg :like some one). Intersentensial cohesion is absent. None of the cohesive devices are present (conjunctions, ellipses, demonstrative and comparative references-.

Story Recall :

Interpretation :

Discourse lacks story format. Content of the story is not conveyed clearly and the sequence is also not maintained. Incomplete sentences *or* sentence fragments *are* present with lack of inter and intrasentential cohesion. Number of comments made by the subjects are high (I don't know the story, can't remember), work repetitions *are* common (don't know, don't know, crow, crow). Discourse lacks cohesions.

DISCUSSTON

Effects of AD on different langauge subsystems *are* unequivocal. It is believed that the semantic and pragmatic subsystems *are* more vulnerable to deterioration than phonological and syntactic subsystems of language.

More specially the effects of AD on the lexical semantic domain of language is seen in early stages with word finding problems being the earliest and most obvious symptom. This aspect of language has been extensively studied and the focus has largely been on studying the naming impairment in AD. Though there is a common consensus on the presence of naming impairment in AD, there is little agreement on the locus of impairment.

In the present study it was found that the AD group scored much lower than the control group both on real object naming and picture naming. However the differences between the groups were not found to be significant which is in agreement with the previous studies (Bowles, Obler and Albert, 1987; Shuttieworth and Huber, 1988; Henderson et al., 1990; Bayles and Tomoeda, 1990). Hence no clear statement can be made about the naming abilities of AD group compared to the controls, based on the number of correct responses on these two confrontation naming tasks. Though naming impairment in AD is well documented, the difference in the naming abilities in the AD group and the control group did not emerge in the present study on these

confrontation naming tasks probably because three out of the five subjects included had mild dementia of the Alzheimer's type. From previous studies (Bayles and Tomoeda 1982) it is known that confrontation naming is not very sensitive to differences in the naming abilities in the elderly and in patients with mild AD.

However clear differences between the AD group and the control group were observed in terms of the type of errors made on error analysis on both real object naming and picture naming. In the control group very few errors were made. Errors were predominantly circumlocutary in nature (Eg :- the girl is holding a book and thinking, for reading) however in the AD group subjects made semantically related errors (eg : Sitting for reading; pen for pencil). Semantically related errors in AD suggested that the naming errors may be due to a deficit in the underlying conceptual and semantic representation with erosion of the referential boundaries (Kempler 1988), whereas circumlocutions in the control group suggested that the naming errors may be due to the problems in lexical access and retrieval. These errors give some idea about the changes that occur in the semantic functions due to AD in comparison to changes that occur due to normal aging.

Findings of the present study also suggest a definite and clear difference in the naming abilities between the control group and aphasic group, on real object naming and picture naming, with consistent impairment in naming objects and pictures demonstrated by the aphasics. These results were expected and

have also been observed in similar studies conducted (Kohn and Goodglass, 1985; Towne and Banik, 1989; Mahendra, 1996).

In the present study differences between the AD group and aphasic group in terms of number of correct responses were observed for both object naming and picture naming. However, this was found to be significant only for picture naming, with the aphasic group performing poorly *on* both the tasks when compared to the AD group. These results suggest that naming impairment in aphasic group is definitely different from that found in the AD group and that by varying the stimuli the differences between the two groups clearly emerge. The results of this study are in accordance with a more recent study conducted by Stevens (1992) who found that confrontation naming using pictures could best distinguish between the AD and dysphasic group.

Both naming pictures of objects and actions independently have been found to be as sensitive as the total measure in differentiating the AD group the from aphasic group. Consistent with the previous studies, better scores were obtained *on* naming pictures of objects than on naming pictures of actions (WiiJiams and Canter 1987; Bowels, Obler and Albert, 1987; and others'.

Differences between the AD group and aphasic group became clearer *on error* analysis. On both real object naming and picture naming it was found that the aphasic group had errors which were phonologicaliy related to the stimulus and *very* few semantically related errors were made. The nonfluent aphasics in particular verbalized but failed to name correctly. The type of

errors made by the aphasia group suggests that the errors may be because of inefficient activation of the phonological subsystem in aphasics (Watamori et al., 1990) unlike in AD. Hence confrontation naming tasks give some evidence on the nature of naming impairment in AD and aphasics also.

On the generative naming task, which is a divergent word retrieval task, clear differences in the naming abilities in the elderly and the AD group were observed. It was found that the subjects in the control group produced more number of words in all the three categories (animals, fruits and vegetables) when compared to the AD group. The differences were found to be significant for fruit and vegetable naming. Though naming abilities did not differ statistically on confrontation naming, clear cut differences observed here suggests that the AD group may have a problem in access and retrieval in a time bound task like this because of which fewer words are recalled in any category when compared to normals. In addition it was observed that subjects in the AD group included words from other semantic categories ie., words which did not belong to the category specified. This further strengthens the hypothesis that there is a degradation in semantic representation and erosion in the reference boundaries in AD because of which the words produced are not confined to only the semantic *category* specified. These findings are in agreement with previous studies on generative naming in AD group and normals (Mattis, 1976; Martin and Fedio, 1933; Shuttleworth and Huber, 1988; Huff, Corkin, Growdon, 1986;-Mcnsch et al., 1992).

The lack of difference between the control group and AD group on animal naming is not well understood. It is widely believed that not all categories *are* equally sensitive in differentiating control group and AD group. With animal category having larger representation, retrieval of words from this category may be easier for both the groups.

In this study it was noted that the aphasic group produced fewer words in all the three categories when compared to the controls and these differences were found to be significant. With access and word retrieval problems being common in aphasic, more so on a divergent time bound word retrieval task, the difference observed needs *no* further explanation. Researchers have commonly documented higher verbal fluency *scores* in normal elderly when compared to aphasics (Goodglass and Kaplan, 1983; Grossman, 1981; Kertesz et al., 1982; Adams, Reich and Flowers, 1989).

Though the differences between the aphasic group and AD group were not significant what was more interesting was that the aphasics produced words more representative of the category towards the beginning unlike the AD group who did not maintain the hierarchy. (Eg : Animal naming : Aphasics - dog, cat, cow, etc; A.D. group : frog, giraffe, hen, etc.).

This suggests that the semantic representation is intact in aphasics and they produce fewer words on any category because of problems in access or retrieval. In AD group there is no doubt that under a time bound task the individuals *have* problems in

access and retrieval and with but further degradation in the semantic representation, hierarchy can not maintained.

Addressing the across category and between category differences it was found that the control group performed equally well on all the three categories. In the aphasic group significant differences were observed between animals and fruits. This difference may be because the category - 'animals' is associated with a larger number of representative words when compared to fruits.

In the AD group the performance varied across categories. Significant differences were found between animals vs. fruits and animals vs. vegetables. The difference may again be due to differences in the number of representative words for each of the semantic categories.

In the word association test it was found that the AD group produced fewer paradigmatic responses than the normal group. This difference was also found to be significant. Decrease in paradigmatic responses is believed to be due to deficits in the lexical knowledge, *or* a failure to accurately *access* semantic markers (Milberg and Blumstein, 1981) due to the destruction of these semantic markers (Buckingham, 1981; Goodglass and Baker 1976; Lucy, Caramazza, Myerson and Galivin, 1974).

Syntagmatic responses seem largely unaltered in AD. Gewirth et al., 1984 speculate that unlike paradigmatic responses syntagmatic responses depend less upon access to the semantic marker and more upon the knowledge of proper sequential use of

words in sentence structures. This knowledge of proper sequential use of words may be more resistant to deterioration in AD than the semantic markers which *carry* out word meaning, hence syntagmatic responses are unaltered.

The AD group was also found to have larger number of unassociated and multiword responses than normals. Multiword responses suggest that the subjects are unable to make single word association due to access and retrieval problems and hence rely heavily on preserved syntactic strategies to make associations. Most of the unassociated response came from moderate AD patients indicating that they were unable to make meaningful associations. This may be because of eroded semantic knowledge in AD.

Differences between the AD group and aphasic group were found in all the categories. Aphasic group gave more number of repetitions and no responses and AD group more syntagmatic, paradigmatic, unassociated and multiword responses.

It is commonly believed that the type of association made depends on the subtypes of aphasics. In the aphasic group fewer syntagmatic responses were observed when compared to the AD group. This may be because 3 out of 5 patients had nonfluent aphasias. It is generally believed that since nonfluent aphasics are unable to link words that normally *occur* together are unable to make syntagmatic associations (Buckingham 1981). However the large number of 'no response' in this group may be explained by two different mechanisms. On the one hand word access problems

could be so severe in nonfluent aphasics that these subjects cannot generate random associations to certain words, *or on* the other hand the self monitoring mechanism is so efficient that a null response is preferred to a random and semantically inappropriate response (Gardner, Silverman, Wapner and Zurif, 1978; Goodglass and Baker, 1976; Zurif et al., 1974).

A large number of repetitions were found in aphasics though they were not significantly different in number when compared to the AD group. These repetitions were produced by the fluent aphasics and this is believed to be due to some dysfunction in the mechanism responsible for inhibiting perseveration (Gewirth et al., 1984) .

Though multiword responses were present in aphasics the number was greater in the AD group. Large number of unassociated responses in AD and few in aphasic group give further evidence to the fact that the nature of changes in the semantic functions in AD is different from aphasics.

Addressing the difference between the aphasic group and *control* group, the aphasic group had more number of *no* responses and repetitions and fewer syntagmatic and paradigmatic responses. Probable reason for the increase in the number of 'no responses' and 'repetitions' and decrease in syntagmatic responses in the aphasic group has been discussed while discussing the differences between the AD group and aphasic group. The result of this study is in agreement with a similar study conducted by Gewirth et al., (1984). Hence word association test is useful in differentiating

the groups. High variability is observed in the data set this may be because of the small sample size. More so, the S.D. values are exceeding mean values in the aphasic group. This may be because, different subtypes of aphasics were grouped together. Inspite of the high variability since the results *are* in accordance with the previous studies inferences can be made the data set.

Pragmatic abilities in all the 3 groups were studied using delayed story recall and picture description. The samples were tape recorded and transcribed. Discourse analysis was done. On analysis definite differences in the discourse were found between the all the three groups. Following *are* the findings *on* discourse analysis in AD which are in agreement with previous studies on AD in comparison to the normal elderly.

* Sentence complexity decreased and sentence length is reduced in AD (Ulatowska et al., 1994).

* Total number of words are reduced (Hier et al., 1985).

* There is a reduction in the information conveyed (Beeson *ax,* al., 1987; Ulatowska, 1994).

* Fewer target prepositions (Ulatowska et al., 1988).

* There is an increase in the number of indefinite terms (Obler et al., 1982).

* There is increase in diectic terms (Obler et al., 1982).

* They exhibit fewer cohesive ties (Shekim and Lapointe, 1984).

Differences between the AD group and nonfluent aphasics were very evident. In the nonfluent aphasics there was *very* little verbal output, utterances made were not complete *or* meaningful on both picture description and delayed story recall. (Eg : * ah ah . . . . . ah ah ah. These were the utterances of a Broca's aphasic *on* a picture description task). Gestures were generally used to describe the pictures.

The fluent aphasic group differed from the AD group on the following features on discourse analysis

* Increased repetitions and perseverations (Obler et al., 1982).
* Large number of comments during descriptions and story recall tasks (Eg : might have understood can't remember, story, sin, etc.)

Taken together the study has shown several features of narrative discourse deviations in early mild, mild and moderate AD patients which can be differentiated from the discourse in normals and aphasics.

To conclude : the test developed and used in the study has shown definite differences between the AD group and aphasic group on picture naming, word association test, picture description and delayed story recall. This test has also drawn definite differences between the control group versus AD group and the

control group versus aphasic group. Hence this is not Just a sensitive tool to differentiate dementia from aphasia, but it has good potentials in differential diagnosis of dementia, aphasia and language related changes in the elderly.

SUMMARY & CONCLUSION

SUMMARY AND CONCLUSION

The present study was undertaken to assess the potential of a language test used in differentiating Alzheimer's Disease from Aphasia.

On review of literature it was found that language impairment is a common feature of dementia (AD) and also that the semantic and pragmatic functions *or* abilities are more vulnerable to deterioration than syntactic and phonological abilities. With regard to the language assessment in AD it is clear that initially aphasic batteries were used for assessment and differential diagnosis, increasingly researchers are developing tools specifically to evaluate AD since the aphasia batteries are not sensitive to subtle differences in language impairment in AD and other disorders.

In the present study three groups of subjects were studied : patients with Alzheimer's Disease, patients with aphasia and normal healthy elderly individuals matched for sex, education, linguistic background and socio-economic status.

A language test consisting of the following subtests was administered to all the subjects

1) Real object naming
2) Picture naming
3) Generative naming

4) Word association test

5) Delayed story recall

6) Picture description

Of these tasks picture naming, word association test, delayed story recall and picture description were found to be sensitive in differentiating AD from aphasics, and generative naming, word association test, delayed story recall and picture description tasks were found to be sensitive in differentiating AD group from the control group.

The results supports the observation that the nature of deficit in AD is different from the changes that occur in the various language subsystem due to aging and aphasia.

LIMITATION

This study has its limitations

1) Sample size is small
2) Only male subjects were studied
3) Different subtypes of aphasias were grouped together.
4) Language test used assesses only semantic and pragmatic abilities.

SUGGESTIONS

Further studies can be done :

* By taking larger samples
* By comparing patients with AD with different subtypes of aphasias individually, in particular fluent aphasias
* By comparing patients with AD with aphasias and right hemisphere damaged individuals.
* By comparing AD with subcortical and mixed dementia.
* By using measures which will assess other aspects of language.

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APPENDIX

(APPENDIX - I) SUB TEST -1

Object Naming:

Instructions : Ask the subject to name the object presented. Score 2 for each correct response. If the subject fails to respond within 30 seconds of the stimulus presentation a phonemic cue is given (initial phoneme with which the word begins with). Score 1 for each correct response following phonemic cue. An incorrect response or no response (following phonemic cue) is given a score of zero.

Stimulus	Response without Cue	Response with a Phonemic Cue	Score
ಕಪ್			
ಪೆನ್ಸಿಲ್			
ಬೀಗದ ಕೈ			
ಬಾಚಣಿಗೆ			
ಕತ್ತರಿ			
ಬೆಂಕಿ ಕಡ್ಡಿ			
ಚಾಕು			
ಹೂವು			
ಟೂತ್‌ಬ್ರಷ್			
ಉಂಗುರ			

Max. Score: 20

Patient's Score : _____106

SUB TEST - II

Picture Naming:

Instructions: Ask the subject to name the picture presented. Score 2 for each correct response. If the subject fails to respond within 30 seconds of the stimulus presentation a phonemic cue is given (initial phoneme with which the word begins with). Score 1 for each correct response following phonemic cue. An incorrect response or no response (following phonemic cue) is given a score of zero.

A. Objects :

Stimulus	Response without Cue	Response with a Phonemic Cue	Score
ಮರ			
ಮನೆ			
ಛತ್ರಿ			
ಗಡಿಯಾರ			
ಜೀಗ			

Maximum Score : 10 Patient's Score : 10

B. Actions :

Stimulus	Response without Cue	Response with a Phonemic Cue	Score
ಓದುತ್ತಿದ್ದಾಳೆ			
ಮಲಗಿದ್ದಾನೆ			
ಓಡುತ್ತಿದ್ದಾನೆ			
ಅಳುತ್ತಿದ್ದಾಳೆ			
ಕುಡಿಯುತ್ತಿದ್ದಾಳೆ			

Maximum Score : 10 Patient's Score : 10

Max. Score : 20

Patient's Score : 107

SUB TEST - IV

Word Association Test:

Instructions: Ask the subject to say the first word he can think of the moment he hears the stimulus work. Assign the response to one of the following categories : Paradigmatic response, Syntagmatic response, Repetitions, Multiword response or Unassociated response. If the subject fails to respond within 30 seconds of the stimulus presentation, 'No Response is marked.

Names			Verbs			Adjectives		
S	R	RC	S	R	RC	S	R	RC
ಕಪ್ಪ			ಚಾಕು			ಸುಂದರ		
ಅಪರಾಧ			ಸೋಲು			ಭಯಾನಕ		
ಸಮಾಚಾರ			ತಯಾರಿಸು			ಆರ್ದ್		
ಉಪಾಯ			ಆಚರಿಸು			ಬಿಸಿ		
ಮಕ್ಕಳು			ನಗು			ಸಿಹಿ		
ಬಾಳೆಹಣ್ಣು			ಸುರಿ			ಕುರುಡು		

R- Response RC - Response Category

RESPONSE CATEGORY	TOTAL NO.
PARADIGMATIC (P)	
SYNTAGMATIC (S)	
UNASSOCIATED (UA)	
MULTIWORD RESPONSE (MWR)	
REPETITION	
NO RESPONSE	

SUB TEST - V

Delayed Story Recall :

Instructions : **After** the story of the 'The Fox and the Crow' is narrated with picture cues, the subject is asked to sequence the picture and recall the story after the picture description task.

SUB TEST - VI

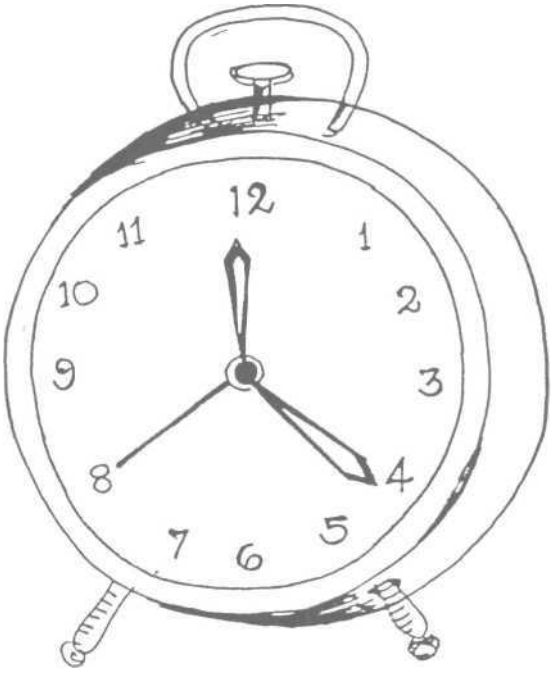
Picture Description :

Instructions : Subject is asked to describe the picture presented (picture of a market scene).

Sub Test I

Real objects used

* Cup
* Pencil
* Key
* Comb
* Scissors
* Match stick
* Pen
* Flower
* Tooth brush


12
1
2
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4
5
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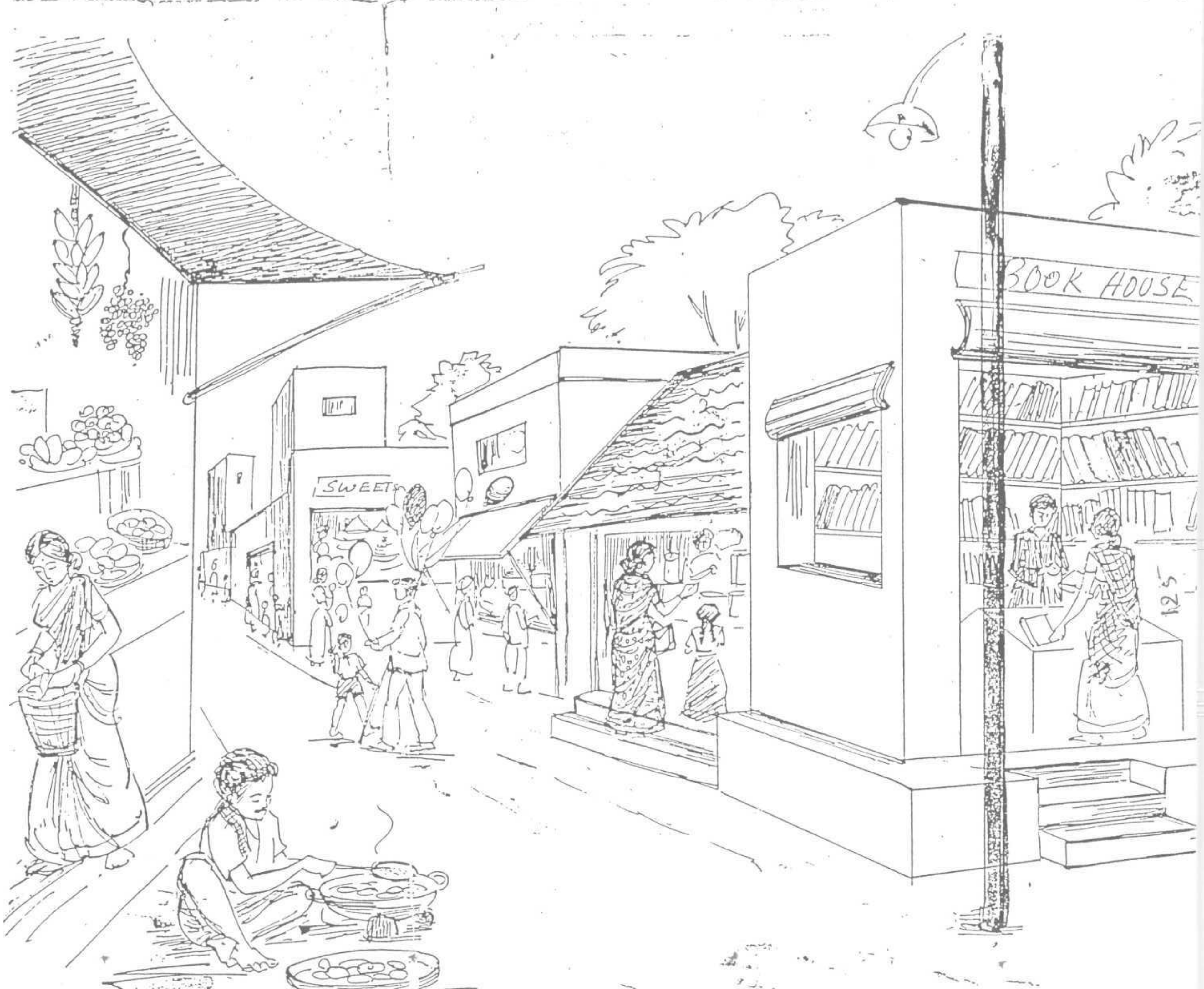
9
10
11


HARRISON


SWEETS
BOOK HOUSE

APPENDIX - IV

DISCOURSE (Transcription and Translation)

CONTROL GROUP : NORMAL SUBJECT

Picture Description :

Transcription :

idu ondu pustakada angadi. pustakagalannu no;ddi dunuve nanage i:
pusṭaka be:ku, i: pustaka idya, anta ke:luttidda:le. innondu
kade:li mitha:i githa:i taya:ru madikoiluttida:ne. vade gide
pako:da galannobba bi:diyalli mu:le:li be: yisuttidda: ne.
innobbalu taraka:riyannu buttiyalli ha:kikondu, hotkondu, ontara
the;nka:radalli ho:guttidda:le innondukade yalli maguna ta:yi
karkondu hoguttiddale angadi mungattu no:do:dikkendu. innondu
bi:di:li belu:nu vya:pa:riyobba ya:vono idda:ne.nanage i: belu:n
be:ku a.... anta magu aluttide. idu be:da kano: karcu
ja:stiya: gibidatte anta appa heluttidda:ne. athava anna:nu iraba-
hudu. avaniginta hiriyavara:girabahudu. pakkadalli ondu swi:t
martide. adannu nenasikondare na:1igeyalli niru u:rakke suru
a:gatte. a... i:gluk? n ondu ma;tre jasti hakikollabe:ka:guttade.
swi:t martnalli tara:vari swi;tide. alii jana ja:sti kanisutta:
ilia. obbaru ibbaru alii illi ma:tra ida:re. bilding kelagade
neral.inalli ibbara e:no: nodutidda:re. me:lgade, taraka: ri
angadiyalli ba:lehannu, drakši ivannella. pradaršana ma:di ya:ru
ya:rige ye:nu be:ko kollakke somensip go:skara alii vivida
ristiya: giruvanta. taraka: rigalannu andare bi:tru:t, badaneka:yi,

huralika:yi, ityadi taraka:rigalannu itkondu ha:ge ka:nisatte. buk hausnallantu bahala ni:t a:gibuks jo:diside.

Translation :

This is book shop. After seeing the books she is asking "I want a book. Do you have that book". At another side sweets are being prepared : In the corner of the street another person is making pakodas. At another side the mother is going with the child to see the shops. In another street some one is selling balloons. 'I want the balloon's a.... a child is crying. The father is telling him "don't want, it is costly". It might even be the brother. Someone elder to him. Beside, there is a sweet mart. If I think of it my mouth will start watering, a... Have to take one extra eglucion. Cannot see many people there. There are one or two here and there. Two people standing in the shade are looking at something. In the vegetable shop, it seems like mango, grapes etc. are exhibited, different varieties of vegetables, beet root, brinjal, beans etc. are kept for showmanship so that who ever wants whatever, can buy. In the book shop books are arranged neatly.

Story Recall :

Transcription :

ondu dina ka:ge a:ka:šadalli ho:guttitu. rotti no:ditu. rotti: ba:yalli kaccikondu, kušiya:gi a:hara sikbidtu anta bahala majava:gi ho:guta:ittu. adannu ondu hasida nari no:ditu. ka:ge i: rotti kackondide, nanage hasuva:gide, e:nadaru ma:di nari

upa:yakke hesaru ta:ne, a: rottina hya:ge adarinda kitkollo:du

upa:yavagi anta yo:cane ma:dtu. adakkoskara ka:gena ya:vatara

prasamse madadre, fl tar ma:dadre tanage i. roti sigatte anta

upa:ya hudtu. adakke ka:ge kanta cennagi paricaya iddidarinda,

ninna kanta ko:gile kanta:nu miri bidatte, entaha susra:vya

va:da kanta ninadu antandiddunu indra, candra, de:ve:ndra anta

hogali bittitu. hogalikege ba:i bittu nanna sama kanta elli bantu

narira:ja. annta he:litu a: sambramadalli, sadagaradalli rotti

ja:ri bittu idane: ka:yuttida nari, sikkidare sa:ku anta,

ya:va:ga kelage bitto ava:ga, ta:nu adannu togo:tu. adu innu

ha:di kolluta:ne ittu. ha:dida me:le prajne bantu roti ja:ri

biddide anta. nari innella:daru idre kokki biti:tu anta o:ta

kitti o:ditu. upa:yadinda hogallike inda entavarannu: attakke

e:risi bittiddunuve, tamma sva:rtakkee:nu be:ko: ma:dikolluta:re.

hogalikege guri yadavaru munde bahala tondarege olaga:gutta:re

anta i: kate su:cisatte.

Story Recall :

One day the crow way flying in the sky. Saw a roti. Happy on finding food, was going with pleasure holding the roti in its mouth. A hungry fox saw it. "Crow is holding the roti, I am feeling hungry", fox known for its cleverness thought "how can I snatch take the roti from it cleverly". For this it planned in what way the crow should be praised or flattered. Since it was familiar with the crows voiced it praised "Your voice excel even cuckoo's voice, what a sweet voice, you are indra, chandra, devendra".

Struck by the prouse crow opened its mouth and said "Oh fox who can equal my voice". In this excitement roti fell down. Fox waiting for this, picked it up the moment it fell down. Crow was still singing. After singing it realized that the roti had fallen down. Fox scared it would pick if it stayed any longer ran away. With cleverness and praise any one can be placed high easily, for their own selfish motto and can do whatever they want. People who get struck by praise will have problems in the future is the moral of this story.

ALZHEIMER'S DISEASE : A patient with early mild dementia.

Picture Description :

Transcription :

idu ondu ma:rket plɔ s. idu ondu buk lɔ Ibrari. illi obbaru buk togondu ho:go:dikke ke:lutiddare. innodu kade ta:yi magalannu karedukondu ya:vudo: kelasakke ho:gutidda:le. pakka ondu c x :t haus tara ka:nuttide. e:no tino:dikke ibbaru prayatna ma:dutidda:re. iili obba manuṣya avana huduga irabahudu, e:no he:lutiddane swe:t ṣopnalli huduga nanage swe:t be:ku anta ke:lirabahudu. illa:ndare belu:n ma:ruvavanu. avanu tande alla belu:n ma:ruvavanu. huduguu belu:n tegedukoluttidda:ne. adakku: munde ro:dnalli obba huduga kutkondu se:l ma:duttidda:ne. angadinalli obba le:di taraka:ri buttinalli tegedukondu ho:gutidda:le. me:le ondu ba:le gone ide, dra:kṣi ide, kelage hannu taraka:ri irabahudu. potetotara ka:ṇbahudu. market ple:s binna binna vastugalannu ma:ruttidda:re, janaru tegedukollutidda:re.

Translation :

This is a market place. This is a book library. Here a person is taking permission to take the book. Elsewhere the mother is taking here daughter along, for some work. Besides can see a chat house. Two people are trying to eat something. Here is a man, this might be his son, he is telling something in the sweet shop. The boy might have asked for sweets. Otherwise it is a person who is selling balloons. The boy is buying balloon. In

front, in the street the boy is selling something. In the shop the lady is taking vegetables in the basked after buying. Up there are bananas and grapes. Down fruits and vegetables may be there. I can see potato. In market place they sell various items, people buy them.

Story Recall :

Transcription :

Ondu ka:ge marada me:le ku:tide. ka:ge ba:yalli tindivastu ide.
astaralli ondu nari bantu. a: narige bahushaha hotte hasu
ka:geinda a:ha:ra vastu e:na:daru ma:di togobe:ku annuva
udesadinada a: ka:ge hattira mata:dutta ide. ni:nu bahala
sundaravagi haduti:yante. ninna ha:du ke:labe:kendu a:se ide.
solpa ha:du antu. nari mo:dige mo:sa ho:gi ka:ge ku:galu
a:rambisitu. adara ba:yalliruva a:ha:ra vastu kelage bittu.
bidda:ga nari togondu o:di ho:yitu.

Translation :

A crow is sitting on the tree, in the crow's mouth there is an eatable. In the mean while a fox came may be that fox is hungry. With the intention of taking away the eatable the fox spoke to the crow. "It seems you sing very beautifully, I have a desire to listen to your song". It said "can you sing a little". Fooled by the crow and crow began shout.

The eatable in its mouth fell down. When it fell the fox picked it up and ran away.

ALZHEIMER'S DISEASE GROUP : A patient with mild AD

Picture Description :

Transcription :

illi angadinalli e:no: kondukoluta:ida:re. illi hapala:na e:no
tela:duttide. idu sihi ma:ro angadi. ivalu e:no hannu tegedukondu
ho:guttida:le. ilondu di:pa ide. idu ya:vudo: swe:t hanco jana
beka:dastu buks ma:ruttidda:re. illi hannugalu tegedu kondu
ho:guttiddare.

Translation :

Here they are buying something from the shop. Here Papad or something is floating. This is a shop which sells sweet. She is taking some fruits and going. There is a light here. There are some people distributing sweets. Many books are being sold. Here she is taking fruits and going. It has left something to float.

Story Recall :

Transcription :

na:ri bandu adara ba:yalli rotti ide anta no:ditu. a: nari ondu
upa:ya ma:ditu. e:nu anta andare adu. solpa ha:do:dakke suru
ma:didare roti tanna palagatte anta. idu nari upa:ya. adu
canna:gi hadutiddiya anta nari ka:gege he:lidakke narige mamsada
tundu siktu. a: tundu etkondu o:di ho:yitu. illi ka:ge a:mele
etkondu horato:yitu. adakke siktu.

Translation :

Fox came and saw a roti in its mouth. That fox made a plan. What the plan was is if this starts singing I will get the roti. This is the fox's plan. Because the fox told the crow that he was singing well. He got a piece of meat. He took the piece and *ran* away. Here afterwards the crow took it and went away. If got.

ALZHEIMER'S DISEASE GROUP : A patient with moderate AD

Picture Description :

Transcription :

ma:msa kanda ... ma:msa ... le:di.... angadi, mane, magu, mane, angadi, angadialli ma:vinahannu .... mane, mamara, elektrik l ɔ It, mane, angadi, angadi, ma:vinahannu, angadi mane.

Translation :

Flesh ... lady ... shop, house, baby, house, shop, mango in the shop ... house, tree, electric light, house, shop, shop, mango, shop, house.

Story Recall :

Transcription :

Ka:ge, rotti kelage bittu. rotti, kombegalu, rotti ka:ge kacci-kondu ho:gatte. rotti kelage bido:gide. mara kadiduho:gide. rotti tegedukollatte. nari roti kaccikondide. nari tinuta:ide. nari marada kombe me;le ku:tide. ka:ge ku:tide, narikelagide. ka - - - anta ku:gutte biddo:gi bidatte.

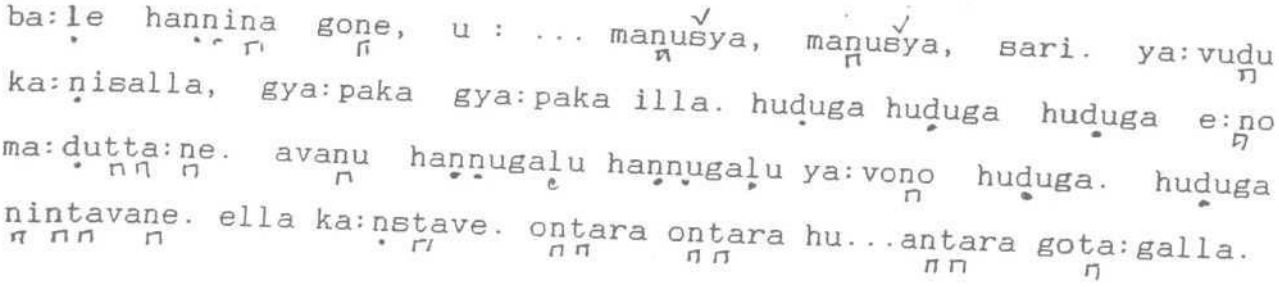
Translation :

Crow, roti fell down, roti, branches, roti is taken away by the crow. ro:ti has fallen down. Tree is cut down. Takes the roti. Fox, is holding the roti. Fox is eating. Fox is on the branches of the tree. Crow is sitting. Fox is down. Says ka : It falls down.

APHASIC GROUP : A patient with transcortical sensory aphasia

Picture Description

Transcription :

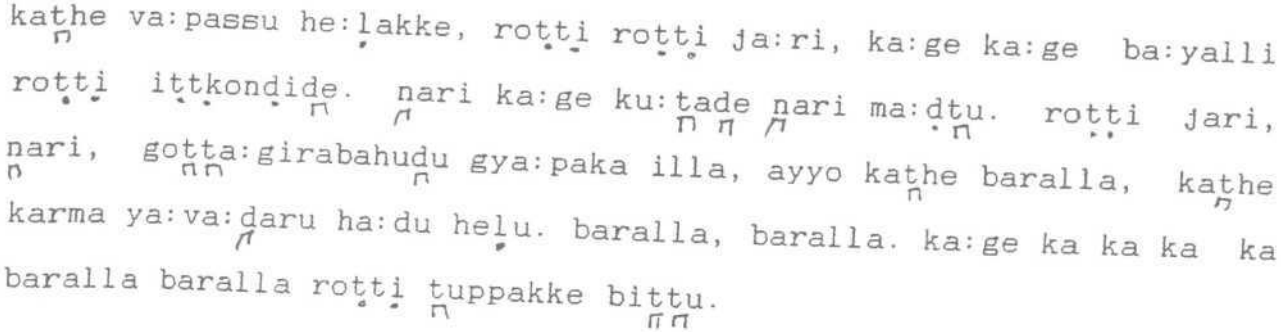


Translation :

A bunch of banana: u.....man, man, O.K.,Can'tsee anything, remember, can't remember, boy, boy. boy is doing something. I can see everything. Something something hu.... I can't understand.

Story Recall :

Transcription :



Translation :

To retell the story, roti slipped, crow, crow, crow had a roti in the mouth. Fox did, roti slipped fox, I might have

understood but can't remember, ayyo, don't know the story, story sin, sing any song, don't know, don't know, crow ka ka ka ka, don't know, don't know roti fell into the ghee.