LANGUAGE PERFORMANCE IN KANNADA-ENGLISH BILINGUAL DEMENTIA

Project under AIISH Research Fund (ARF) 2010-2011
(Ref: SH/CDN/ARF/3.91/2010-11 with total funds of Rs. 5,92,000.00)

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

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INTRODUCTION

Dementia is a general term that describes a brain syndrome characterized by problems with memory, judgment, language, orientation and executive functioning. Alzheimer's disease is the most common cause of dementia, but dementia can also be caused by strokes, Parkinson's disease, head injury or a host of other conditions which are very few of which are reversible. At least three of the following five areas of mental activity must be involved in individuals with dementia; Language, Memory, Visuospatial skills, Emotion/Personality & Cognition (ex: abstraction, calculation & judgment) [Cummings and Benson (1992)].

Dementia is an umbrella term that encompasses many distinct subtypes. There are atleast 11 principal dementia syndromes;

- Degenerative disorders
- Vascular disorders
- Myelinoclastic disorders
- Traumatic conditions
- Neoplastic disorders
- Hydrocephalic dementias
- Inflammatory conditions
- Infection related dementias
- Toxic conditions
- Metabolic disorders
- Psychiatric disorders.

According to The Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM – IV) American Psychiatric Association (1994), the essential feature in dementia is the impairment in short term and long term memory. This deficit in memory may also be associated with one or more features like aphasia, apraxia, agnosia, impairment in abstract thinking, impaired judgment and personality changes. The salient points of the full length definition (all of which do not necessarily have to be present for a diagnosis of dementia are:

1. Impairment of short term and long term memory
2. Impairment of abstract thinking
3. Impaired Judgement
4. Disturbances of higher cortical function (for example, aphasia, apraxia, agnosia, constructional difficulty).
5. Personality change
6. Specific organic factor
7. Absence of a non-organic factor as a reason for the symptoms (for example, major depression).

Prevalence

According to the WHO (2003) study, about 4% of the population over 65 years is afflicted with dementia. It is expected to be 36 million afflicted with Alzheimer's disease by 2020 (WHO, 2003). Dementia can be caused by a variety of conditions like diseases, infections and infarcts. The most commonly occurring cause is Alzheimer's disease accounting for 50 to 60% of all the patients with dementia. Vascular dementias (dementias caused by multiple infarcts) are seen in 20% of the dementia patients. Alzheimer's dementia and vascular dementia co-occur in approximately 15% of this sample, and other conditions such as Pick's disease, Parkinson's disease (PD), Progressive Supranuclear Palsy (PSP) and Creutzfeldt-Jacob disease (CJD), account for the reminder of the irreversible dementias. Gradually worsening of dementia is widely documented.

Numerous scales have been developed to grade dementia severity. The simplest staging descriptors are mild, moderate, severe and profound.

Mild stage dementia describes a state with consistent forgetfulness that is more marked for recent events, inability to function effectively in interests and more complex activities (work, community, home, or social activities) and maintained social judgment. Although the patient may require prompting to perform activities of daily living (Eg. bathing and grooming), he or she is able to complete independently these tasks.

Moderate stage dementia patients' long-term memory may be only slightly affected, but their short-term memory is poor. They exhibit impaired social judgment and cannot perform independently outside the home. Activities in the home are usually limited to simple chores and interests are severely curtailed.

Severe dementia corresponds to severe memory loss, with severe deficits in long-term and short-term memory, disorientation usually to time and place, inability to independently function inside or outside of the home, requirement of help with activities of daily living (toileting, bathing, and eating), and possible incontinence.

Profound dementia corresponds to a patient being unintelligible, unable to follow simple commands, incontinent and unable to ambulate or to accomplish purposeful tasks. This later stage may also be used to describe persons who are bedbound, are unresponsive, have swallowing difficulties and have contractures.

Dementia is defined as a significant loss of intellectual abilities such as memory capacity, severe enough to interfere with social or occupational functioning. Criteria for the diagnosis of dementia include impairment of attention, orientation, memory, judgment, language, motor and spatial skills, and function.

Classification of Dementia

Reversible and Irreversible Dementias

There are both reversible and irreversible dementias. All possible causes of reversible dementias must be ruled out in the diagnostic process before moving to an identification of irreversible dementia. Reversible or treatable dementias resulting from drug toxicity, metabolic imbalances, infections, tumors, normal measure hydrocephalous, alcohol abuse, neurosyphillis and epilepsy. Geriatric depression (pseudodementia) is classified as a reversible dementia in some diagnostic models (Tonkowich, 1988). Irreversible dementias include DAT, multi infarct

dementia (MID), pick's disease and those associated with Parkinson's disease, Huntington's disease, Wilson's disease, supranuclear palsy, Creutzfeldt – Jakob disease and Korsakoff's syndrome.

Cortical and Sub-cortical Dementias:

One dichotomy used to distinguish dementia types is the cortical versus subcortical distinction. This classification system is controversial and even its advocates acknowledge that the terms may be inappropriate and the concept of the dichotomy of functioning has yet to be documented (Whitehouse, 1986). The distinction made between cortical (DAT and Pick's disease) and sub-cortical dementias (Huntington's disease, Parkinson's disease, Wilson's disease and supranuclear palsy), and mixed or vascular dementias (MID, Creutzfeldt – Jakob disease and Korsakoff's syndrome) emphasizes the separation of these anatomic regions but fails to account for neuro-chemical and neuro-pathologic relationships between the areas (Whitehouse, 1986). Nevertheless, the cortical and sub-cortical distinction provides a neuro-anatomic organization that is useful in sorting out the syndromes causing dementia. In the cortical dementias, the dementia is the primary dysfunction, whereas in the sub-cortical dementias, the dementia occurs as a secondary feature of the symptom complex (Ripich, 1995).

Cortical dementias:

- DAT

The onset of DAT is gradual and the etiology is the diffuse damage in the neurofibrillary tangles, senile plaques, granulovascular degeneration. Course is progressive and irreversible. In terms of speech and language deficits, semantics and pragmatics are impaired early, syntax and phonology is impaired later and speech is impaired very late. Memory is impaired early and goes worse for remote events. Individuals with DAT usually are alert and show consistent level of performance. Physical characteristics are generally normal.

- Pick's Disease

Onset is gradual. It is caused due to the Pick bodies, inflated neurons, atrophy of the anterior portions of the frontal and temporal lobes and the disease is generally progressive and irreversible. Defect in auditory comprehension, breakdown in syntax, anomia, slow and deliberate speech. Recent memory is impaired. Performance characteristics exhibited by the individuals are emotional liability, apathy and loss of judgment ability. Physically, motor deficits could be noticed at the later stages.

Sub-cortical Dementias:

- Parkinson's disease

Onset is Sporadic. It is an autosomal dominant, degenerative disease of the nervous system especially in the substantia nigra. The disease course is generally progressive and irreversible. Language is minimally impaired whereas; speech is weak with breathy voice, abnormal pitch rate and loudness accompanied with inappropriate silences. Individuals with Parkinson's disease are generally forgetful, impaired recall and exhibit slowed responses on the memory tasks. Performing ability is generally slow. Physically they are abnormal, slow, tremors are seen, rigidity and bradykinesia.

- Huntington's disease

Onset is Insidious. It is an autosomal dominant trait, idiopathic, drug induced, postencephalitic, loss of golgi cells in corpus callosum. Disease is progressive & irreversible. In terms of speech and language, deficits in language organization, sequencing and naming abilities are noted and the dysarthria worsens as the disease progresses. Memory is impaired, especially for the remote events in the disease. In the early stages of Huntington's disease irritability, apathy, untidiness & impulsiveness are noticed during their performance. Physical characteristics exhibit abnormal, shuffling gait, jerky gait, and festinating choreic movements.

- Supranuclear Palsy

The onset is gradual. Etiology is related to changes in the reticular formation, thalamus or hypothalamus. The course is progressive. Speech becomes inaudible and unintelligible with gurgling, harsh guttural sounds due to dysarthria component. Memory is often impaired.

Pseudobulbar palsy, dystonia, severe rigidity of head and neck producing a backward retracted head position are some of the physical characteristics shown by the individuals with supranuclear palsy.

- Wilson's disease

Onset is gradual. It is an inherited autosomal recessive trait, basal ganglia, Excessive levels of copper in the brain and lever. Course of the disease is progressive. Dysarthria can be seen leading to speech deficits such as irregular articulatory breakdown, hyper-nasality & inappropriate silences. Memory is impaired. Physical characteristics are slowness, tremors, rigidity, bradykinesia or involuntary movements, severe ataxia and dysphagia in the later stages.

Mixed Dementias:

- Korsakoff's disease

Onset of the disease is gradual. It is caused due to the cortical atrophy resulting from chronic alcohol abuse. The course of the disease is stable or minimally progressive. Decreased skills in memory, poor attention and amnesia have been noted. Performance characteristic is affected. Individuals with this particular disease may show some motor disturbances.

- Creutzfeldt –Jakob disease

Onset is Variable: gradual or sudden. Etiology may be infectious, transmissible, unconventional virus, results in degenerative cortical tissue, i.e. spongiform encephalopathy and nonspecific atrophy. Disease is rapidly progressive in course. With respect to speech and language deficits, aphasia, apraxia & agnosia may be seen in the second stage and mutism may be noted in the third stage. In terms of memory, forgetfulness can be seen in the initial phase. Generally these individuals are apathetic. Sensory and visual impairments, cranial nerve palsies, rigidity, myoclonus, tremors, cerebellar disturbances.

- MID

It is a sudden onset disease. It is caused due to the multiple lesions, softening of brain tissue, alteration in cerebral blood vessels. Course of the disease is stepwise, irreversible. Speech

and language skills of these individuals exhibit impaired pattern, dependent on site of lesion. Memory skills are impaired, depends on the site of lesion. Performance is variable based on the focal lesions. It may be abnormal dependant on the site of lesion.

Language is the major instrument of cognition. Language mediates not only the social relationship systems, but also the control of cognitive processes ("metacognition"). It is well known, however, that the ability to maintain fluency in more than one language decreases with aging. Older bilinguals may experience increased difficulties handling two different languages due to the effects of cross-language interference. These effects in aging bilingual persons can be further exacerbated in those who develop dementia. Usually, the difficulty to select the appropriate language observed in aging bilinguals becomes more severe in cases of dementia. It has been suggested that bilingual speakers with dementia, even in the early stages of deterioration, make errors in selecting the appropriate language and maintaining the correct language during conversational speech. Communication abilities in bilingual demented patients, and pattern of language decline for L1 and L2 in dementia, are issues rarely mentioned in the dementia literature. Hence this study was taken up to assess the language performances in dementia participants who were bilingual.

REVIEW OF LITERATURE

Dementia & Ageing

- **Normal Ageing**

In order to understand the complexities of dementia it is worthwhile describing what happens in normal ageing and understanding what can go wrong and gives rise to abnormal conditions such as dementia. Ageing can be distinguished in terms of biological, social and psychological factors. But there is a great overlap and interaction between them. The influence of one aspect of ageing on another should also be remembered; this is important when considering and comparing past and present cognitive functions within same person. Normal ageing brings with it changes, not just to an individual's appearance, however subtle, but also to the higher mental functions or cognitive functions. Memory can also be affected, sometimes because the individual has failed to receive information correctly or sometimes because it can no longer be encoded and stored effectively. The effect of ageing and on memory is very often one of the first of the cognitive changes to be noticed by others and can cause considerable distress to the individual and to relatives, close friends and care givers. Deterioration and memory functioning is characteristic of dementia, but it also can indicate other dysfunctions which should also be considered in any assessment. Generally, older people can learn as much as younger people, but more time is needed for them to achieve the same level of learning, as they cannot process and 'absorb' information as quickly as younger people. Sometimes this speed reduction becomes noticeable and marked, and leads to the onset of depression. If memory has noticeably changed, and continues to do so, it may indicate the onset of dementing process.

Changes in language abilities can also be a characteristic of dementia, but voice characteristics of people tend to change with the age as part of normal ageing process with pitch becoming higher during the fifties, the resonance thinner and the volume lower. Personality also plays a large part in normal ageing. Some people adjust better than others to changes in circumstances, be it changes to their living environment, loss of occupational status or physical changes such as decreased mobility, lack of independent transport and so on. Some individuals become restless or agitated at the frustration of their changed world, while others may be more placid or resigned and withdrawn. Others adapt to change and are realistic about expectation that

older people will not be sexually active is unfounded, since there is a great deal of variation in both sexual interest among all groups of people, younger or older.

Structural changes to the brain give rise to cognitive changes that may be noticed by others observing the individual. In normal ageing, the brain undergoes several structural changes including a decrease in size, flattening of the surface and increase in amounts of intracranial space (Janigan, Zatz & Feinburg, 1980). Other microscopic and biochemical changes occur, as well as changes to the electrical activity (electrophysiological changes) within the brain (Brizee et. al., 1980; Hansch, Syndulko & Pirozzolo, 1980; Zatz, Jernigan & Ahumada, 1982a, 1982b). Verbal skills, particularly the well learned skills of reading, writing, vocabulary and word usage tend to be maintained (Botwinick, 1977) and the general intellectual status of healthy older people, as measured by neuropsychological tests tends to remain within normal limits through the eighties(Benton, Eslinger & damasio, 1981). Arithmatic ability is also generally stable among older people (Kramer & Jarvik, 1979; William, 1970). Arithmetic and memory tests that show decreased performance in older people. Contrary to conventional belief, normal ageing processes do not affect the immediate memory span in older people (Williams, 1970). Lezak (1983) points out that the normal intellectual decline associated with old age shows up most strikingly in four areas of intellectual activity; these can be summarized as follows.

1. The primary, or working memory capacity of intact older people differs from that of younger adults (Erickson, 1978), except when the amount of material to be remembered exceeds the normal primary storage capacity of 6 or 7 items (Craik, 1977).

2. Diminished ability for abstract and complex conceptualization typifies the intellectual functioning of older people (Botwinick, 1977; Denny, 1974; Reitan, 1967).

3. Mental inflexibility, manifesting as difficulty in adapting to new situations, solving novel problems or changing mental set, characterizes intellectual performance failures of older age (Botwinick, 1978; Schaie, 1978).

4. General behavioural slowing is a predominant characteristic of ageing that affects perceptual (Kramer & Jarvik, 1979), cognitive (Botwinick, 1977; Thomas, Fozard & Waugh, 1977) and memory function as well as all psychomotor activity (Benton, 1977; Hicks & Birron, 1970; Welford, 1977).

Physical and psychological problems of ageing:

Confusion is commonly misunderstood to be a part of the dementing process, when in fact, an acute confusional state is a consequence of change in the body's metabolism which leads to the high temperature, fever and delirium that in turn can cause temporary disorientation, memory loss, a state of 'muddled perplexity', poor concentration, hallucinations, clouding of consciousness and restlessness' (Goudie, 1993). Signs such as changes in muscle tone, persistent language problems, perceptual problems and personality changes may indicate other conditions such as Transient Ishemic Stroke (TIA) or Cerebrovascular accident ('stroke'). Hemorrhage in the blood vessels leading to the brain or in the vessels of the brain itself can result in the stroke. The cognitive changes associated with the stroke can be confused with the dementing process if the physical effects of the stroke are disguised or are subtle. Indeed, some small strokes do not cause devastating or obvious outward changes, but many small strokes that cause death to specific brain sites (multi-infarcts) often lead to dementia (Thompson & Morgan, 1996).

In Murphy's 1982 survey, about 30% of people were found to be depressed. Indeed it is the most common emotional problem affecting older adults (Goudie, 1993). Identifying the signs of dementia and depression are crucial to dementia and treatment. While it is generally not too difficult to list the signs of depression- for example, Hanley & Baikie (1984) list low mood, loss of interest, sleep disturbance, weight loss, hopelessness, thoughts of death or suicide, agitation, loss of energy thinking and concentration disturbances and forgetfulness – It is sometimes harder to distinguish between an older person suffering from depression alone, versus depression and dementia.

Memory and Dementia

Dementia is complex; to understand its complexities, it is necessary to describe what happens in normal ageing and understanding what can go wrong and gives rise to abnormal conditions such as dementia.

Normal ageing brings with it changes, not just to an individual's appearances, however subtle, but also certain changes to the higher mental functions and or 'cognitive' functions. Memory can also be affected (Craik, 1994; small, et. al, 1995), sometimes because the individual has failed to receive information correctly or sometimes because it can no longer be effectively encoded and stored (Nyberg, et. al, 1996). The effect of ageing on memory, particularly episodic memory (Morris, 1994a), is very often one of the first of the cognitive functions to be noticed by others and can cause considerable distress to the individual and to the caregivers. Deterioration in memory functioning in characteristic of dementia (Mitrushina, Uchiyama & Satz, 1995) but it can also indicate other dysfunctions which should always be considered in any assessment.

Anxiety and Dementia

Anxiety is also common and overlooked in older people. It can affect memory functioning and is particularly common in people with dementia. However it is also very common indeed in people who have neither dementia nor problems with other cognitive functions. Typical symptoms include: 'butterflies in the stomach, sweating, feelings of sickness, palpitations and even diarrhea. Hyperventilation (breathing at a rate that is faster than normal) and dizziness, tightening of the chest and head and abdominal pains can be the result of acute anxiety panic attack. This is termed 'free floating anxiety'.

There are other conditions that might be confused with the diagnosis of dementia in older people. Some of these include paraphrenia (often defined as 'schizophrenia of late life'), alcohol related problems (Korsakoff's psychosis) and Parkinson's disease (the most common).

Table 1: S*imilarities and differences to dementia of several of the most common problems*

Problem	**Similarities to dementia**	**Differences from dementia**
Depression	Slow, Unresponsive, poor concentration.	Usually answers with accuracy though 'do not know' is frequent.
Anxiety	Total failure to cope, Unable to carry out daily tasks due to agitation.	Insight to impaired functioning and no confabulation; when stress in minimized, ability is normal.
Alcohol problems	'Immediate memory loss, disorientation, poor co-ordination.	Problems reduced when sobered up, consciousness clouded.
Paraphrenia	Self neglect, misinterprets actions or statements.	Despite some bizarre reasoning/hallucinations some parts of behavior unimpaired.
Parkinson's disease	Withdrawal from social activity and increase in dependency.	Involvement/abilities improve with medication.
Stroke	Slowing, poor concentration and withdrawal, speech and language problems.	Motor deficits not global with insight into loss and recovery of function possible; compensates for deficits using intact abilities.

Notes. Cited in Introduction to Dementia. In Simon B. N. Thompson (eds.), Dementia and memory: a handbook for students and professionals, pp 3-17.

Language and Dementia

A few important observations about language in DAT must be mentioned before processing.

1. There are language impairments that do not occur in DAT. For instance, there are no reports on agrammatism of the type associated with Broca's aphasia in DAT. There are also no reports of proportionate difficulty with repetition in fact unbidden repetition in the form of echolalia and palilalia is one of the characteristics of late DAT. Finally, there are no description phonologic disturbance that is DAT patients do not violate the phonotactic consume of their native language (using non-native sound or sound combinations) or make errors in prosodic aspects of language.

The pictures of language breakdown in DAT that is quite specific semantic and pragmatic deficits or marked morpho-syntactic deficits are rare and phonologic deficits are rarer still.

2. Many authors have attempted in describing the language disturbance of DAT by comparison with focal aphasia; arriving at the conclusion for example, that transcortical sensory and Wernicke's aphasias are frequent in DAT. Although the language of DAT does manifest some typical aphasic symptoms (anomia, semantic periphrasis and comprehension deficits), the language disorder of DAT is not primary or isolation but rather persists among other intellectual impairments. In the context of general discretion of intellectual function, language disorder typically becomes intertwined with so many concomitant neurobehavioral changes. Also, identifying the language disorder of DAT as aphasia may imply (by association with focal aphasias) that there is a static quality to the disorder and that there is the possibility of recovery. However, because DAT is unrelentingly progressive and degenerative so is the language disorders associated with it. The language deficits are continually changing and recovery has never been observed among the language patterns of focal aphasia that may be similar to the language disorder of DAT in some ways, but also differ in many important respects. This must be remembered when planning research, considering diagnosis, or contemplating treatment. Difficulty in naming or word retrieval has been observed to be the most obvious early symptom of dementia, regardless of cause and has been found to occur before other language changes associated with the syndrome are measurable (Bayles, Tomoeda, Kaszniak & Troset, 1990). Naming has been considered as a meaningful representation of the integrity of the semantic memory system; naming failures exhibited by individuals with dementia have been examined as a means of identifying the nature of the semantic memory impairment. However, naming is truly a measure of lexical memory. Furthermore, impairment in naming has also been reported in healthy normal adults (Nicholas, Obler, Au, & Albert, 1996); thus, the exact nature of the naming deficits in individuals with dementia and healthy older adults is difficult to differentiate. Studies investigating categorization skills in adults with dementia have revealed that these individuals show significant deterioration in the structure and/ or contents of semantic and conceptual knowledge as compared to their peer age matched healthy cohorts (Hough, 1998).

Difficulty with name retrieval is considered a common early sign of probable Alzheimer's disease (PAD), an illness in which patients show progressive impairment in ability across all cognitive domains. Reduced performance on verbal fluency tasks (Huff, Corkin, & Growden, 1986; Bayles, Boone, Tomoeda, Slauson, Kaszniak, 1989) and the increasing occurrence of circumlocutory responses (Hodges et al. 1991) are also consistently reported. Patients with PAD make more tip-of-the-tongues than age matched controls and their word definitions become more tangential with decreasing acknowledgement of conventional form (Astell and Harley, 1996). By contrast, spontaneous speech remains fluent with appropriate syntactic structure (Appell, Kertesz, & Fisman, 1982; Kirshner, Webb, & Kelly, 1984) and phonemic processes are relatively preserved (Appell et al. 1982, Hodges et al. 1991). While utterances characteristically become shorter than those of age-matched controls (Blanken, Dittman, Haas & Wallesch, 1987; Ripich, Vertes, Whitehouse, Fulton, & Ekelman, 1991), PAD patients retain the structure of turn-taking and other features of orderly conversation (Ripich et al. 1991). Overall communicative function decreases due to the reduced information content as in PAD spontaneous speech progressively contains fewer nouns and more verbs and adverbs than that of controls (Blanken et al. 1987). There is some evidence that underlying lexical representations are intact and that naming difficulties arise from a problem in lexical access or retrieval for verbal production. Evidence supporting this view includes the findings that:

1. In tasks of confrontation naming, DAT patients can often give a related name or circumlocution suggesting that they know much about the meaning of the word but cannot find the exact name (e.g. "cutter" for saw "this is for your eyes" for glasses).
2. Comprehension of words is generally superior to production of the same words, indicating that the underlying representation can often be accessed in a passive comprehension task when the name cannot be generated or retrieved on demand.
3. DAT patients can utilize phonemic cues to help retrieve words, indicating again that the information is there, but cannot be easily retrieved.
4. There have been several reports of DAT patients using gesture to indicate the function of an object that they could not name suggesting that the deficit is limited to lexical retrieval and may not affect basic symbolic representation presumed to underlie both gestural and language

productions. Semantic priming data that indicate that sub conscious semantic associations may be intact in DAT. Several researchers have demonstrated that like normal participants, DAT patients react faster in lexical decision formats if the target word is preceded by a related word than if it is preceded by an unrelated word. Initially, this was taken to indicate that underlying semantic associations were intact and that the anomia was not the result of permanent underlying semantic problems but must be an effect of impaired lexical access.

However, findings from other studies have not always confirmed intact semantic priming in DAT. Salmon, Shimamura, Butters & Smith (1988) found that DAT patients did not exhibit any effect of priming and Albert and Milberg (1989) found semantic priming only in a subset of DAT patients. Several other studies have found that DAT patients show greater priming effects than control participants (Chertkow, Bub, & Seidenberg, 1989). Chertkow, et al (1989) found that hyper priming in DAT was associated specifically with words that were shown to be semantically degraded on a variety of other tasks (e.g. responses to probe questions).

Although most description of language DAT have observed that syntactic ability appear intact, few experimental investigations have contradicted this. The earliest detailed investigation of this phenomenon was Whitaker (1976) description of a severely demented patient who spontaneously corrected agrammatic but not semantically anomalous sentences in repetition (e.g. There are two books on the table repeated as "There are few books on the table" while " The book is very happy" was repeated verbatim) This finding was taken to indicate that grammatical competence was selectively preserved and therefore must be somehow autonomous from the rest of cognition. Schwartz, Marin and Saffron (1979) also support this view. Many patients with dementia are able to perform correct grammatical operations, even when they have lost the ability to engage in meaningful speech. For example, the ability to modify word endings, negate sentences, and add plural endings can be essentially normal. However, on closer examination, syntactical errors are apparent, particularly beyond the early stages of disorder. Sentences may be left unfinished, and breakdowns may occur in the use of phrase markers and grammatical agreement.

Syntax appears to be less impaired when the context cues or structures he syntactic task. Formal assessment of syntactical ability in AD has been conducted by Emery (1988) using the tests for syntactic complexity and Chomsky's test of syntax. This shows that early AD patients are unable to process complex syntactic structures. They were also unable to interpret correctly sentences in which the grammatical relations that held among the words in a sentence were not expressed in the surface structure. One cause of syntactical errors stems from the fact that complex grammatical forms place a demand on the working memory of a participant, as the surface form of a phrase has to be held in memory while it is processed. A working memory deficit in AD would contribute to syntactical errors of processing. Another difficulty in interpreting the cause of these types of errors is that the complexity of syntactical processing is usually associated with the complexity of semantic processing, so semantic errors could cause deficits in the complex syntactic tasks. Kempler, Curtiss, & Jackson, (1987) evaluated the spontaneous speech of 10 DAT patients and 10 normal controls, and demonstrated that the spontaneous speech of DAT patients contained few syntactic errors and also few lexical semantic errors. More importantly, the range and frequency of sentence types were almost identical to the normal controls and there was no difference between the DAT patients and the control population on a measure of structural complexity.

Comprehension of syntax has not proven to be as consistently intact as production of syntax. Schwartz, Marin and Saffran (1979) demonstrated intact comprehension of four syntactic forms by a single demented patient. However Emery (1988) using the test of syntactic complexity and the Chomsky Test of syntax has document of syntactic comprehension deficits in a sample of 20 DAT participants These tests evaluate the patients' comprehension of syntax by eliciting verbal response to grammatically complex stimuli (e.g. The dog was bitten by the cat which animal bit the other and which was bitten?) or gestural responses to similarly complex auditory stimuli (e.g. "Mickey tells Donald to hop up and down make him hop). In contrast to Schwartz et al, (1979) findings of preserved comprehension of grammatically complex structures, Emery (1988) found impairment in DAT patients' ability to process syntactically complex grammatical constructions. Although the research in these areas increasingly relies on mathematic models and computational solutions, data from abnormal populations still provide

supporting evidence for the relative inter dependence of various cognitive abilities. As such, syntactic sparing in DAT demonstrates that syntactic ability can function in the adult without support from semantic and other cognitive or conceptual operations.

Pragmatics the study of language use in context includes a large variety of language skills from turn taking to appropriate topic introduction and overall discourse structure, all generally considered within the context of interpersonal interaction. In its broadest sense, pragmatics covers everything relevant to communication beyond sentence structure and linguistic semantics, often including extra-linguistic features of facial expression and body language. Some aspects of discourse are clearly impaired in DAT though the mild and moderate DAT patients take conversational terms when appropriate and often produce socially ritually parts of the conversations with appropriate timing affect and linguistic structure. These observations indicate DAT patients are able to adhere to basic structure and obey pragmatic rules of some verbal interactions. However, there are also subtle programme problems early on, such as a tendency to term things unnecessarily and to lose the topic of conversation. At this stage deficits are attributed to failing attention and memory.

Nicholas, Obler, Au, & Albert, (1996) compared DAT patients performance on the Boston naming test (BNT) with elements of empty speech in narrative description of the cookie theft picture in an attempt to evaluate the claim that discourse incoherence could be attributed to anomia. The authors reported a significant negative correlation between the score of DAT patients on the Boston Naming test and the use of indefinite terms (e.g. thing and stuff) and significant positive correlation between the BNT and the production of content elements (i.e. references to characters and actives in cookie theft stories). They concluded that the naming deficit did not underlie the emptiness of discourse presumably because many other measures of discourse emptiness (e.g. paraphasias pronouns with accidents and deictic terms) did not correlate with the BNT scores. The data however also suggest that at least some of the referential problems that make discourse difficult to follow might be result of anomia. That is to the degree to which patients are anomic and substitute or omit content elements; their discourse will be difficult to interpret. Nicholas, et al (1996) undoubtedly correct in their general conclusion that

the anomia does not underlie the discourse deficits, but it is undoubtable that the anomia does contribute to the observed discourse deficits. Majority of studies was devoted to the lexical and semantic aspects of language (Girelli, Luzzatti, Annoni, & Vecchi, 1999), but pragmatic aspects of language use were also examined, either in picture description tasks or in more spontaneous conversations (Perkins, Whitworth, and Lesser, 1998). Globally, findings unsurprisingly showed that the patients' communicative efficiency was affected. While describing scenes, persons with DAT used more frequently indefinite and vague terms, did not focus on the most important topics and were less informative, i.e. had smaller ratios of content units per words (Nicholas et al, 1996). During conversations, proportion of content words was lower in persons with DAT than in healthy speakers, number of referencing errors was higher (Blanken, Dittman, Haas, & Wallesch, 1987) and their discourse was less coherent (Ripich, Fritsch, Ziol, & Durand, 2000). Carlomagno, A. Santoro, A. Menditti, M. Pandolfi, A. Marini (2005) recently designed a study to better understand why communication fails in cases of DAT. Persons with mild to moderate DAT, with fluent aphasia and normal controls were given figures that consisted of four line-drawings (one target and three distractors), and were simply asked to produce discriminating information that would enable the examiner to identify the target picture. However, despite similar language disorders, the discourse of participants with aphasia, compared with that of persons with DAT, was much more efficient in establishing reference, since it gave rise to fewer misunderstanding incidents due to confounding or irrelevant information and it required fewer requests for repairs from the listener. According to Carlomagno et al. (2005), in some cases of DAT, the 'empty speech' is due to a specific difficulty in pragmatic-conceptual elaboration of discourse content, i.e. difficulty in generating preverbal representations of discourse content. This difficulty might relate to a deficit of attention and executive control which is common in the early stages of the illness.

Bilingualism and Dementia

Recent research has shown that the over half of the world's population is bi/multilinguals (Grosjean, 1982; cited in Fabbro, 1999). Cameli, Phillips, Kousaie & Panisset (2005) studied memory and language in bilingual Alzheimer and Parkinson patients by taking the insights from Verb Inflection. They aimed at testing the usefulness of a neurolinguistic model that posits links

between neuro-functionally separable memory systems and specific language functions in explaining language disturbances in bilingual AD and PD. A double dissociation was observed in the verbal modality between the performance of AD and PD patients on tests of declarative and procedural memory, with the PD group being selectively impaired on a test of procedural memory and the AD group showing stronger impairment on the tests of declarative memory. It has been suggested that bilingual speakers with dementia. Even in the early stages of deterioration, make errors in selecting the appropriate language, and maintaining the correct language during conversational speech (Hyltenstam & Stroud, 1989, 1993, De Santi et al. 1990). There is however, large variability in the extent of inappropriate language use, with some individuals showing more language mixing than others (Friedland & Miller, 1999). De Santi et al (1990) concluded that the ability to make the correct language choice and keep language separate is correlated with the overall stage of dementia. The mixture may be so significant, that it is not easy to recognize what language the patient is attempting to speak. Normal bilinguals can use the knowledge of two languages to increase verbal production, whereas dementia patients are unable to profit from the knowledge of two different languages. De Picciotto and Friedland (2001) concluded from their study that normal bilinguals can recur to both languages in an attempt to improve performance; dementia patients were unable to use this strategy.

Sunil Kumar Ravi (2009) studied the cross language variations in linguistic deficits in DAT individuals and concluded that the individuals with DAT have language deficits in both comprehension and expression and also in memory tasks. Deepa & Chengappa (2010) investigated the spectrum of cognitive linguistic functions in bilingual persons with mild dementia and compared the performance with the normal elderly and concluded that Degenerative changes in central nervous system seem to affect especially the complex forms of language without disturbances in the symbolic aspects of language and the disorders lie primarily in the cognitive aspects of language. Bilinguals performed better as compared to the monolinguals in both the tests and across the cognitive domains of the tests. Bilinguals had an advantage of two choices to come out with the response unlike monolinguals, which had single language choice.

Kempler & Goral (2008) discussed the neuropsychological aspects with respect to language and dementia and suggested that many language impairments seen in dementia are due to extralinguistic rather than linguistic deficits. Problems with memory and attention disrupt word finding in early and moderate in DAT; decreases in executive function and memory cause sentence-level processing problems seen in all three dementia syndromes.

Murdoch et al (1987) studied language disorders in dementia of Alziemer's type and found the evident language deficits in Alzheimer's patients. The study supported the inclusion of a language deficit as a diagnostic criterion of Alzheimer's disease. Cummings (1985) stated that Alzheimer's patients were aphasic. Throughout most of the course, the language disorder resembled transcortical sensory aphasia, and increasing language impairment correlated with increasing severity of dementia. Aphasia was present regardless of age of onset or family history of dementia. Aphasia is an important diagnostic criterion of dementia of the Alzheimer type. Kontiola et. al (1990) found that pattern of language impairments is different in Alziemer's disease and multi-infarct dementia. Joanette and Brownell (1990) discussed the theoretical and empirical perspectives on discourse ability and brain damage. They concluded that bilingual demented patients exhibit many of the language problems reported for monolingual patients but as with the bilingual but these may be differently exhibited in each of the languages. They also stated that certain phenomenon specific to bilingualism, breakdown in dementia. In particular, normal bilingual participants always select the appropriate language during the interaction with the monolingual interlocutor. Furthermore, a healthy bilingual does not code-switch at all with a monolingual interlocutor. In individuals with bilingual dementia, no longer maintained the distinction between conversing with a bilingual and a monolingual that is, they both chose an inappropriate base language and code-switched with either examiner.

AIMS

- To study the language performance in Kannada-English bilingual speakers with dementia.

OBJECTIVES

The study has the following objectives:

1. To evaluate the responses of Kannada-English bilingual speakers with dementia on Kannada version of DAB subtests namely; Memory, Linguistic Expression, Linguistic Comprehension and Visuo-spatial construction and on MMSE subtests namely; orientation, registration, attention and calculation, recall, and language.
2. To compare the performance of Kannada-English bilingual speakers with dementia with neurotypical Kannada-English bilingual speakers on Kannada version of DAB test.

METHOD

Two groups of participants were taken, each group containing minimum of 30 participants. Among 2 groups, first group consists of 3 subgroups of participants who are bilingual Kannada-English (K-E) normal participants (young adult, Adult & Geriatrics) and other group being bilingual individuals with dementia. Normal older people will be tested to form a baseline which will be considered as normative for this test. People with various types and severities of dementia will be included to provide norms for this group, to whom this test is devised.

Inclusion Criteria for normal adults: Group I (3 Subgroups)

- Must be aged between 20 – 40 years (Subgroup I), 40-60 Years (Subgroup II) & 60 years and above (Subgroup 3).
- Must be a native Kannada speaker and having English as his/her second language, with no history of major neurological or psychiatric illness or of alcoholism or drug abuse.

Inclusion Criteria for individuals with dementia: (Group II)

- Must be aged over 50 years, diagnosed as having dementia by a neurologist/ psychiatrist according to NINCDS – ADRDA.
- Must be the native Kannada speakers with English as his/her second language with adequate hearing and vision, reported history of gradual deterioration in cognitive abilities.
- The participants with dementia will be identified through local neurological hospitals, associations and other dementia clinics.

Tests/ tools

All the participants were assessed using following test batteries.

1. Mini Mental Status Examination (MMSE) (Folstein, Folstein & McHugh, 1975): The MMSE is a tool that can be used to systematically and thoroughly assess mental status. It is an 11 – question measure that tests five areas of cognitive function: orientation, registration, attention and calculation, recall, and language. The maximum score is 30. A score of 23 or lower is

indicative of cognitive impairment. The MMSE takes only 5-10 minutes to administer and is therefore practical to use repeatedly and routinely. The test material is given in Appendix – A.

2. Dementia Assessment Battery – Kannada (DAB-K): Dementia Assessment Battery was developed in Kannada. The DAB – K (Dementia Assessment Battery – Kannada) comprised of 17 subtests which comprehensively assessed memory, linguistic expression, linguistic comprehension, and visuospatial construction. The subtests were selected from different language tests, mainly from Arizona Battery of Communication Disorders of Dementia, which was standardized on USA and UK population. The overview of DAB – K (various domains, subtests under each domain) is given in table 11 and as well as in Appendix – B.

3. Australian second language performance ratings (ASLPR): ASLPR is a scale that describes how second language proficiency develops on a scale from zero to native-like proficiency, providing performance descriptions in terms of practical tasks.

DAB-K test

This test was developed and standardized in Kannada by Sunil Kumar Ravi (2009). The author considered four groups of participants in which three groups of participants were normal individuals (young adults, adults and geriatric groups) and another group included individuals with dementia.

Normal people were tested to form a baseline. Normal 30 young adult participants in the age range of 20-40 years, normal 30 adults in the age range of 40-60 years and normal 30 old participants aged above 60 years were selected based on the following inclusion criteria: native Kannada speakers, no history of major neurological or psychiatric illness or of alcoholism or drug abuse, all participants were evaluated for their mental status on MMSE and all passed with a score of above 23. Finally, individuals who received rating of 1 or 2 on Brief Cognitive Rating Scale (Riesberg, 1983) and rating of 1 (normal/no cognitive decline) on Functional Assessment Stages (Riesberg, Ferris, Anand, 1984) were included in the group.

30 participants with various types of dementia were included in which 10 participants in each group with mild, moderate and severe dementia based on Functional Assessment Stages (Reisberg, Ferris, & Anand, 1984) and Brief Cognitive Rating Scale (Riesberg, 1983) were taken. The selection criteria were: age over 50 years, diagnosed as having dementia by a neurologist/psychiatrist according to NINCDS-ADRDA, native Kannada speaker, adequate hearing and vision, reported history of gradual deterioration in cognitive abilities. All the participants were evaluated for their mental status on MMSE and all failed with a score of below 23. Finally, individuals who received rating above 2 on Brief Cognitive Rating Scale (Riesberg, 1983) and rating above 1 (normal/no cognitive decline) on Functional Assessment Stages (Reisberg, Ferris, & Anand, 1984) were included.

The 17 subtests of DAB-K were selected from different language tests, mainly from Arizona Battery of Communication Disorders of Dementia. All the participants were assessed using the above three tests and individual scores and performances were statistically analyzed and presented in the results and discussion section. All the participants were made to sign a consent letter before prior to the onset of data collection.

RESULTS AND DISCUSSION

The main objective of the current project is to study the language performance in Kannada-English bilingual speakers with Dementia. For this, the test materials were administered on two different groups (group 1- normal group consisting of 3 groups in the age range of 20-40 years, 40-60 years and above 60 years; and group 2 consists of persons with Dementia) of participants. The data was analyzed using SPSS – 18.0 in the following parts.

PART I: Across group comparisons

1: Comparison of normal participants and persons with Dementia across subtests and total score of MMSE.

2: Comparison of normal participants and persons with Dementia across subtests and total scores of DAB-K.

3: Comparison of subgroups (three age groups) of normal participants across subtests and total scores of MMSE.

4: Comparison of subgroups (three age groups) of normal participants across subtests of DAB-K.

PART II: Within group comparison

5a: Comparison of subtests of MMSE in persons with Dementia.

5b: Comparison of subtests of DAB-K in persons with Dementia.

6a: Comparison of subtests of MMSE in normal participants.

6b: Comparison of subtests of DAB-K in normal participants

7: Comparison of subtests of DAB-K within normal subgroup of 20-40 years.

8: Comparison of subtests of DAB-K within normal subgroup of 40-60 years.

9: Comparison of subtests of DAB-K within normal subgroup of 60 years & above.

The descriptive tables of raw scores and percentage score are given below. Percentage scores of MMSE in normal and Persons with Dementia is as follows,

Table 2: *MMSE percentage scores of Normal vs. Dementia participants*

MMSE subtests	Normal			Dementia		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Orientation	90	100.00	0.00	30	46.33	27.35
Registration	90	100.00	0.00	30	73.33	40.49
Attention & Calculation	90	100.00	0.00	30	19.33	25.99
Recall	90	100.00	0.00	30	46.67	46.81
Language	90	100.00	0.00	30	60.37	30.56

Note: N=no. of participants

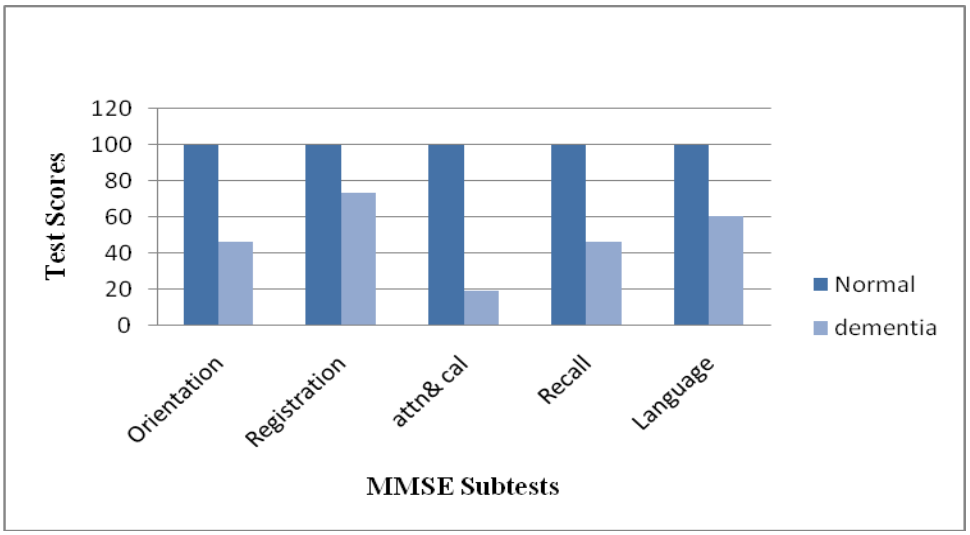

Figure1: Mean scores of normal vs. dementia participants

A comparison of all the percentage scores of subtests of MMSE in normal population was carried out. As it can be seen from table 2, the mean values of the groups are same, therefore comparison cannot be made. This shows that there is no difference between the normal groups on all the tasks but dementia population showed a significant difference in the mean scores

(ranged from 19.3 to 73.3) and S.D. Since there are significant differences seen, non parametric tests like Friedman's test and Wilcoxon signed rank test was carried out which will be discussed further.

Similarly to MMSE, percentage scores of DAB-K test in normal participants and persons with Dementia was done which is as follows,

Table 3: *DAB-K percentage scores of Normal vs. Dementia participants*

DAB-K subtests	Normal			Dementia		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Memory	90	93.53	8.16	30	56.00	20.85
Linguistic expression	90	99.17	1.81	30	66.54	26.12
Linguistic comprehension	90	99.95	0.312	30	61.40	34.29
Visuo-spatial Construction	90	92.86	14.47	30	30.53	28.97

Note: N=no. of participants

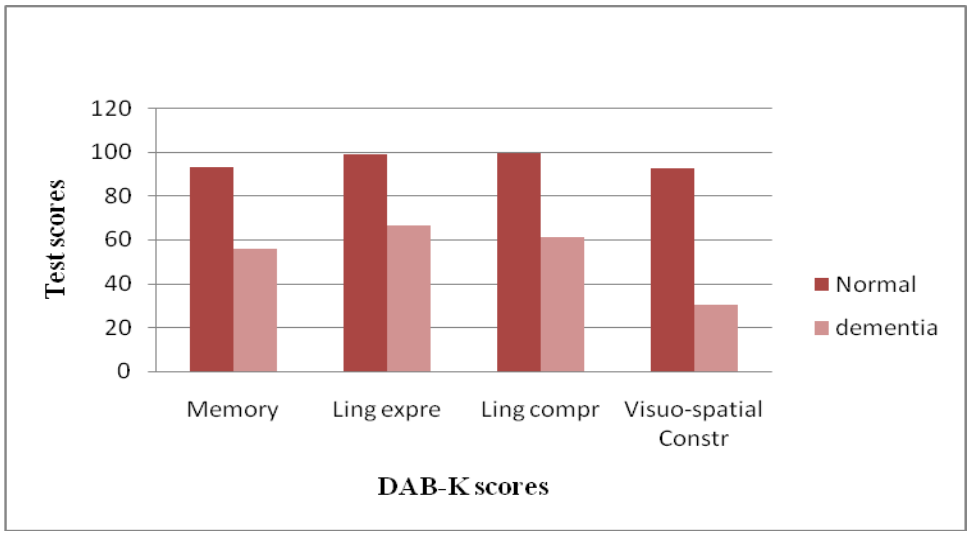

Figure2: Mean scores of normal vs. dementia participants

A comparison of all the percentage scores of subtests of DAB-K in normal population was carried out. As it can be seen from table 3, there are differences between the groups.

Table 4: *MMSE raw scores across age groups in normal participants*

MMSE	Normal			Dementia		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Orientation	90	10.00	0.00	30	4.63	2.73
Registration	90	3.00	0.00	30	2.20	1.21
Attention & Calculation	90	5.00	0.00	30	0.96	1.29
Recall	90	3.00	0.00	30	1.40	1.40
Language	90	9.00	0.00	30	5.43	2.75
Total -MMSE	90	30.00	0.00	30	14.40	7.20

Note: N=no. of participants

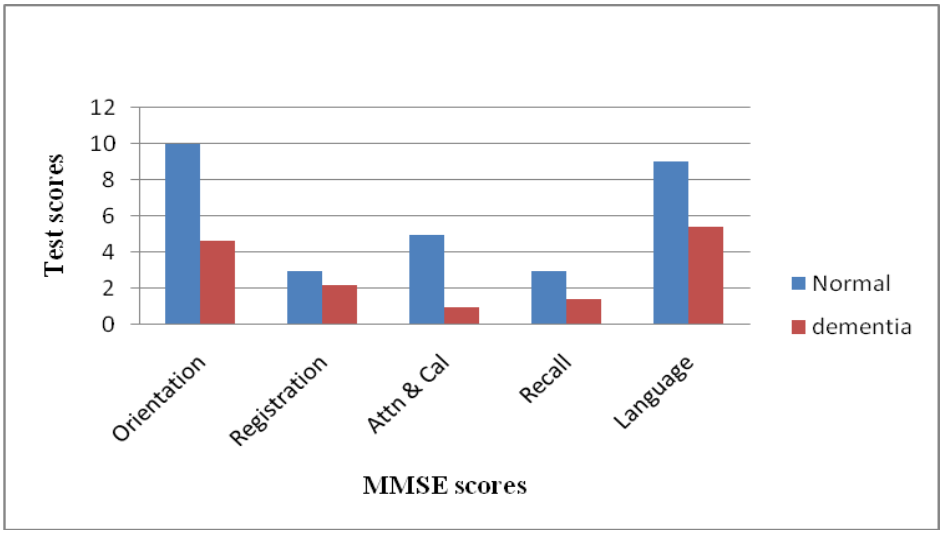

Figure3: Mean scores of normal participants in different age groups

The table 4 and figure 3 shows the raw scores for MMSE with respect to groups. Comparison cannot be made in MMSE test as all the participants have scored full.

Table 5: *Mean scores of MMSE along with age groups in normal population*

MMSE	Group	N	Mean	Std. Deviation
Orientation	20-40yrs	30	10.00	0.00
	40-60yrs	30	10.00	0.00
	60 above	30	10.00	0.00
	Total	90	10.00	0.00
Registration	20-40yrs	30	3.00	0.00
	40-60yrs	30	3.00	0.00
	60 above	30	3.00	0.00
	Total	90	3.00	0.00
Attention & Calculation	20-40yrs	30	5.00	0.00
	40-60yrs	30	5.00	0.00
	60 above	30	5.00	0.00
	Total	90	5.00	0.00
Recall	20-40yrs	30	3.00	0.00
	40-60yrs	30	3.00	0.00
	60 above	30	3.00	0.00
	Total	90	3.00	0.00
Language	20-40yrs	30	9.00	0.00
	40-60yrs	30	9.00	0.00
	60 above	30	9.00	0.00
	Total	90	9.00	0.00
Total -MMSE	20-40yrs	30	30.00	0.00
	40-60yrs	30	30.00	0.00
	60 above	30	30.00	0.00
	Total	90	30.00	0.00

Note: N=no. of participants

Table 6: *MMSE percentage scores across age groups in normal participants*

MMSE	Group	N	Mean	Std. Deviation
Orientation	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00
Registration	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00
Attention & Calculation	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00
Recall	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00
Language	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00
Percentage	20-40yrs	30	100.00	0.00
	40-60yrs	30	100.00	0.00
	60 above	30	100.00	0.00
	Total	90	100.00	0.00

Note: N=no. of participants

The tables 5 and 6 show the mean and percentage scores for MMSE with respect to age groups. Age –wise comparison of the participants was not done as the all have full scores in the test which is clearly seen in the above table.

Table 7: *DAB-K mean scores across age groups in normal participants*

DAB-K	Max. scores	Normal			Dementia		
		N	Mean	Std. Deviation	N	Mean	Std. Deviation
Memory	100	90	93.53	8.16	30	56.00	20.85
Linguistic Expression	250	90	247.94	4.54	30	166.37	65.31
Linguistic Comprehension	150	90	149.93	0.46	30	92.10	51.44
Visuo-spatial construction	50	90	46.43	7.23	30	15.26	14.48
Total	550	90	537.50	14.32	30	327.06	136.42

Note: N=no. of participants

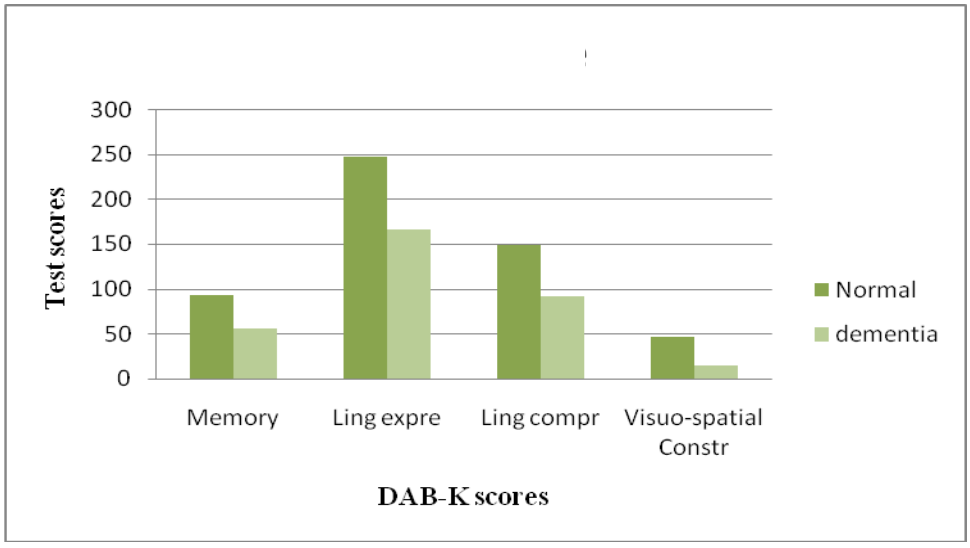

Figure 4: Mean scores of normal participants in different age groups

The table 7 and figure 4 shows the raw scores for DAB-K with respect to groups. Since there is difference in the scores, within group comparison was carried out which will be discussed further.

Table 8: *Mean scores of DAB-K along with age groups in normal population*

DAB-K	Group	N	Mean	Std. Deviation
Memory	20-40yrs	30	99.66	1.06
	40-60yrs	30	95.26	3.60
	60 above	30	85.66	9.19
	Total	90	93.53	8.16
Linguistic Expression	20-40yrs	30	250.00	0.00
	40-60yrs	30	247.13	3.49
	60 above	30	246.70	6.67
	Total	90	247.94	4.54
Linguistic Comprehension	20-40yrs	30	150.00	0.00
	40-60yrs	30	150.00	0.00
	60 above	30	149.80	0.80
	Total	90	149.93	0.46
Visuo-spatial construction	20-40yrs	30	50.00	0.00
	40-60yrs	30	47.20	3.80
	60 above	30	42.10	10.62
	Total	90	46.43	7.23
Total –DAB-K	20-40yrs	30	549.66	1.06
	40-60yrs	30	539.10	7.44
	60 above	30	523.73	14.88
	Total	90	537.50	14.32

Note: N=no. of participants

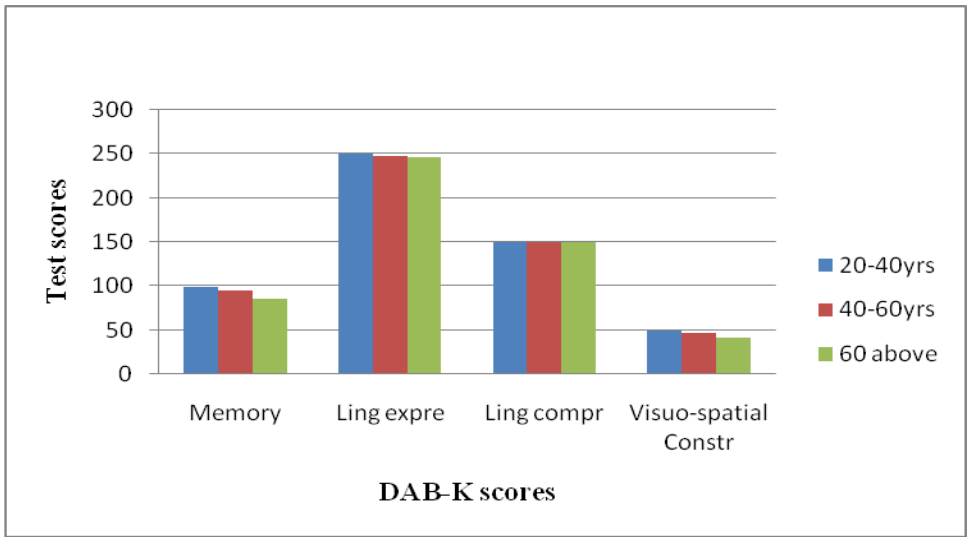

Figure 5: Mean DAB-K scores across age groups

PART I: Across group comparison

A comparison of scores of MMSE and DAB-K across the 2 groups (normal participants and persons with Dementia) was done.

1: Comparison of normal participants and persons with Dementia across subtests and total score of MMSE.

A comparison of subtests and total score of MMSE across normal participants and persons with Dementia was carried out using Mann-Whitney U test. The percentage scores are shown in table 1.

Table 9: *MMSE /Z/ values of Normal vs. Dementia participants*

MMSE subsections	|Z|
Orientation	10.30***
Registration	5.99**
Attention & Calculation	10.79***
Recall	8.17***
Language	9.84***
Total -MMSE	10.76***

Note: *Significant difference of < 0.05, **significant difference of < 0.01, ***significant difference of <0.001

The table 9 shows MMSE scores which were analyzed for normal population and persons with Dementia using Mann-Whitney U test and it was seen that there was significant difference between the two groups. This indicates that normal participants scored better whereas persons with Dementia scored poorer in MMSE, this is because normal participants have better language and cognition than persons with Dementia as their language and cognition is affected.

2: Comparison of normal participants and persons with Dementia across subtests and total scores of DAB-K.

A comparison of subtests and total score of DAB-K across normal participants and persons with Dementia was carried out using Mann-Whitney U test.

Table 10: *DAB-K /Z/ values of Normal vs. Dementia participants*

DAB-K	|Z|
Memory	8.01***
Linguistic Expression	8.21***
Linguistic Comprehension	9.11***
Visuo-spatial construction	7.96***
Total –DAB-K	8.24***

Note: *Significant difference of < 0.05, **significant difference of < 0.01, ***significant difference of <0.001

The table 10 shows DAB-K scores which were analyzed for normal population and persons with Dementia using Mann-Whitney U test and it was seen that there was significant difference in the mean scores. This indicates that normal participants scored better whereas persons with Dementia scored poorer in DAB-K.

Verbal skills, particularly the well learned skills of reading, writing, vocabulary and word usage tend to be maintained (Botwinick, 1977) and the general intellectual status of healthy older people, as measured by neuropsychological tests tends to remain within normal limits through the eighties(Benton, Eslinger & Damasio, 1981). Arithmatic ability is also generally stable among older people (Kramer & Jarvik, 1979; William, 1970). Arithmetic and memory tests that show decreased performance in older people. Contrary to conventional belief, normal ageing processes do not affect the immediate memory span in older people (Williams, 1970).

Kempler, Curtiss, and Jackson, (1987) evaluated the spontaneous speech of 10 DAT patients and 10 normal controls, and demonstrated that the spontaneous speech of DAT patients contained few syntactic errors and also few lexical semantic errors. More importantly, the range

and frequency of sentence types were almost identical to the normal controls and there was no difference between the DAT patients and the control population on a measure of structural complexity.

Formal assessment of syntactical ability in AD has been conducted by Emery (1988) using the tests for syntactic complexity and Chomsky's test of syntax. This shows that early AD patients are unable to process complex syntactic structures. They were also unable to interpret correctly sentences in which the grammatical relations that held among the words in a sentence were not expressed in the surface structure.

This finding replicates the study done by Ravi, S. K (2009) who developed and standardized a test battery which could be used by Speech Language Pathologists to assess and diagnose the individuals with dementia in Kannada language. The developed test battery called Dementia Assessment Battery – Kannada (DAB – K) consisted of four major domains namely Memory, Linguistic Expression, Linguistic Comprehension and Visuospatial construction and several subtests within them. Results of the study revealed significant deficits in individuals with dementia in memory, linguistic expression and linguistic comprehension. Results also revealed significant deterioration in the performance of normal individuals as the age increased. Performance of geriatric group was poor compared to young adults and adults.

3: Comparison of subgroups (ages) of normal participants across subtests and total scores of MMSE.

The mean scores along with age groups (3 groups-20-40 years, 40-60 years and 60 & above) in normal population were analyzed using MANOVA. As shown in table 4 and 5, age – wise comparison was not done as the participants have obtained full scores in the MMSE. This proves that all the age groups in normal participants scored better whereas persons with Dementia scored poorer in MMSE, this is because normal participants have better language and cognition than persons with Dementia.

4: Comparison of subgroups (ages) of normal participants across subtests of DAB-K.

The mean scores along with age groups (3 groups-20-40 years, 40-60 years and 60 & above) in normal population were analyzed using pairwise t-test. As shown in table 7 and 8, age –wise comparison was not done as the participants have obtained full scores in DAB-K test. This is again because normal participants have better language and cognition than persons with Dementia.

Verbal skills, particularly the well learned skills of reading, writing, vocabulary and word usage tend to be maintained (Botwinick, 1977) and the general intellectual status of healthy older people, as measured by neuropsychological tests tends to remain within normal limits through the eighties(Benton, Eslinger & damasio, 1981). Arithmatic ability is also generally stable among older people (Kramer & Jarvik, 1979; William, 1970). Arithmetic and memory tests that show decreased performance in older people. Contrary to conventional belief, normal ageing processes do not affect the immediate memory span in older people (Williams, 1970).

The findings support the study done by Kempler, Curtiss, & Jackson, (1987) who concluded that the range and frequency of sentence types were almost identical to the normal controls and there was no difference between the DAT patients and the control population on a measure of structural complexity.

Formal assessment of syntactical ability in AD has been conducted by Emery (1988) using the tests for syntactic complexity and Chomsky's test of syntax. This shows that early AD patients are unable to process complex syntactic structures. They were also unable to interpret correctly sentences in which the grammatical relations that held among the words in a sentence were not expressed in the surface structure.

Since the comparison of both the groups revealed significant difference, and especially persons with Dementia revealed significant difference, within group comparison was carried out to compare the language performances of MMSE and DAB-K tests by both the groups and normal subgroups.

PART II: Within group comparison

Within group comparisons of scores of MMSE and DAB-K was carried out in the following stages.

5a: Comparison of subtests of MMSE in persons with Dementia.

A comparison was made for subtests of MMSE in persons with Dementia using Friedman's test. Friedman's test showed significant difference between subtests of MMSE in persons with Dementia. [χ^2 (4) =42, p<0.001]. The table 11 shows the percentage scores of MMSE subtest in persons with dementia.

Table 11: *Comparison of subtests of MMSE in persons with Dementia*

MMSE subtests	|Z|
Registration - Orientation	3.33**
Attention & calculation - Orientation	4.11***
Recall - Orientation	0.21
Language - Orientation	2.45*
Attention & calculation - Recall	4.29***
Recall - Registration	2.56**
Language - Registration	2.15*
Recall - Attention & calculation	2.84**
Language - Attention & calculation	4.40***
Language - Recall	1.84

Note: *Significant difference of < 0.05, **significant difference of < 0.01, ***significant difference of <0.001

The pairwise comparisons of subtests are administered with the help of Wilcoxon's signed rank test. The above table shows the result of Wilcoxon's signed rank test. It was observed that there was no significant difference between subtests recall - orientation and language- recall, but there was significant difference in other subtests.

This finding is not in consonance with the study of Wilson R. S et al (1981) where he examined Ribot's hypothesis that the probability of forgetting an event is inversely related to the time since the occurrence of that event. Patients with senile dementia and normal controls were

given two tests of memory, the results indicated that patients with senile dementia do have significant ($p < 0.001$) difficulty recalling information from remote memory. The results do not support Ribot's hypothesis, however. The dementia patients show a relatively consistent recall deficit over the time period examined.

Cognitive and neuroscience studies point to a selective impairment of attentional functions in Alzheimer's disease (AD). Parasuraman et al (1993) pointed that prominent deficits occur in the shifting and division of attention, whereas phasic arousal and focused attention to stimulus features are only minimally affected in the early stages of AD. This analysis suggests that attention represents the first cognitive indicator of neocortical dysfunction in early AD.

Current evidence suggests that after an initial amnesic stage in Alzheimer's disease, attention is the first non-memory domain to be affected, before deficits in language and visuospatial functions. In a study done by Perry, R. J (1999), he summarized the progress that has been made in the research on attentional and executive deficits in Alzheimer's disease. He also stated that this is consistent with the possibility that difficulties with activities of daily living, which occur in even mildly demented patients, may be related to attentional deficits. He also concluded that divided attention and aspects of selective attention, such as set-shifting and response selection, are particularly vulnerable while sustained attention is relatively preserved in the early stages.

Also, Grober (2000) estimated the relative rates of dementia in initially non-demented participants with and without memory impairment defined by baseline free recall from the Free and Cued Selective Reminding (FCSR) test and concluded that poor performance on free recall from FCSR predicts future dementia. These findings support the existence of a preclinical phase of dementia characterized by memory impairment, which is present for at least 5 years before diagnosis.

This finding replicates the study of Calderona, (2001) visuoperceptual and attentional abilities were tested in patients having dementia with Lewy Bodies (DLB) and Alzheimer's disease (AD) and concluded that patients with DLB have substantially greater impairment of

attention, working memory, and visuoperceptual ability than patients with AD matched for overall dementia severity. Semantic memory seems to be equally affected in DLB and AD, unlike episodic memory, which is worse in AD.

5b: Comparison of subtests of DAB-K in persons with Dementia.

A comparison was made for subtests of DAB-K in persons with Dementia using Friedman's test. Friedman's test showed significant difference between subtests of DAB-K (memory-episodic, working, semantic memory and delayed story telling task; linguistic expression-picture naming, generative naming, sentence completion, responsive speech, spontaneous speech, repetition; linguistic comprehension-comparative questions, following commands, reading comprehension of sentences, reading commands; visuo-spatial construction-generative drawing, figure copying) in persons with Dementia. [χ^2 (3) =46, p<0.001]

The findings of the study is in consonance with the study done by Kempler, Curtiss, & Jackson, (1987) and a formal assessment of syntactical ability in AD conducted by Emery (1988) also were unable to interpret correctly sentences in which the grammatical relations that held among the words in a sentence were not expressed in the surface structure.

Episodic memory

When a comparison was made for episodic memory subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. This finding is in consonance with study done by Herlitz, Hill, Fratiglioni and Backman (1995) who reported that the episodic memory abilities of participants with mild dementia are 88.9% and participants with moderate dementia are 77.8%. And they have also reported that cognitively supported measures assessing episodic memory may be particularly useful in the detection of dementia. Also, LeMoal, Reymann, Thomas, Cattenoz, Lieury, and Allain (1997) reported that manifestations of episodic memory deficit in AD patients were shown not only by lower performance scores than in elderly controls, but also by the lack of any effect of semantic cues and the production of a large number of extra-list intrusions. Automatic processes underlying dual coding appear to be

spared in AD, although more time is needed to process information than in young or elderly participants.

Backman, L (2001) also sought to determine the course of preclinical episodic memory deficit in Alzheimer's disease. Participants were tested on tasks on tasks assessing episodic memory (free recall and recognition of words) and short term memory (digit span). The results indicate that Alzheimer's disease is characterized by a long preclinical period during which episodic memory deficits are detectable.

Working memory

When a comparison was made for working memory subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. This finding is in consonance with study carried out by Baddeley, Bressi, Sala, Logie and Spinner (1991) who has studied the performance of dementia of Alzheimer type (DAT) participants on working memory task and reported that patients suffering from DAT are particularly impaired in the functioning of the central executive component of working memory. They have also reported that when patients are required to perform two concurrent tasks simultaneously, the DAT patients are particularly impaired, even when the level of performance on the individual tasks is equated with that of age matched controls. They also found a clear effect of number of categories on performance and a systematic decline in performance over time. There was, however, no interaction between task difficulty as measured by number of alternatives and rate of deterioration, suggesting that the progressive deterioration in performance shown by DAT patients is function of whether single or dual task performance is required, and is not dependant on simple level of task difficulty.

Lamar, Price, Libon, Penney, Kaplan, Grossman and Heilman (2007) have used modified digit span backward task consisting of 3-, 4-, 5- span trials measured specific components of working memory of dementia of Leukoaraiosis (LA) under neuroimaging procedure of MRI. They reported that high degrees of LA do not interfere with immediate (digit) recall but do interfere with disengagement and temporal re-ordering. The possible reason given for this is that LA may disconnect the frontal lobes from subcortical and cortical structures that form the

neuronal networks critical for these working memory functions. The results of the present study were in accordance with the above studies, which reports poor performance of dementia participants on working memory tasks.

Semantic memory

When a comparison was made for semantic memory subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. Hodges, Patterson, Garrard, Bak, Perry and Gregory (1999) have reported that DAT participants exhibited severe deficits in episodic memory with more subtle, but significant, impairments in semantic memory and visuospatial skills; patients with semantic dementia exhibited profound semantic memory breakdown with anomia and surface dyslexia; dementia of frontal type group were the least impaired and showed mild deficits in episodic memory and verbal fluency but normal semantic memory. They also reported that semantic memory task can be used to distinguish the types of dementia, Dementia of Alzheimer's Type (DAT), Dementia of Frontotemporal Type (DFT), Semantic dementia, etc. The results of the present study also showed that the dementic group performed poorly on this task, which are in accordance with the above two studies which indicates that the semantic memory task is an important task in detecting and differentiating the type of dementia and the severity of dementia.

Also, Hough and Givens (2004) have reported that non brain damaged (NBD) participants produced significantly more exemplars for both common and goal directed categories than mild and moderate DAT groups. However, the moderate DAT group produced them significantly less accurate than the mild DAT and NBD groups. They have concluded that DAT may, to some extent, adversely affect sensitivity to the general process of category construction, regardless of category type. This pervasive deficit is apparent even in milder stages of the disease process and supports the hypothesis that as severity of DAT increases, there is an accompanying increase in the deterioration of semantic memory. This greater deterioration appears to result in increased problems with creation and ordering of ideas, one of the primary bases for exemplar generation.

Delayed story recall

Holm, Lepp and Ringsberg (2005) have reported poor story telling abilities in individuals with dementia and that this can be used as an effective management strategy for individuals with dementia. In the present study too, we found poor story recall abilities in individuals with dementia.

Linguistic expression

When a comparison was made for linguistic expression subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. Kempler, Curtiss, & Jackson, (1987) evaluated the spontaneous speech of 10 DAT patients and 10 normal controls, and demonstrated that the spontaneous speech of DAT patients contained few syntactic errors and also few lexical semantic errors. More importantly, the range and frequency of sentence types were almost identical to the normal controls and there was no difference between the DAT patients and the control population on a measure of structural complexity. But the results of the present study contradict the results of above study by Kempler, Curtiss, & Jackson (1987).

But when formal assessment of syntactical ability in AD was conducted by Emery (1988) using the tests for syntactic complexity and Chomsky's test of syntax, this showed that early AD patients are unable to process complex syntactic structures. They were also unable to interpret correctly sentences in which the grammatical relations that held among the words in a sentence were not expressed in the surface structure. In the present study too, we found poor linguistic expression abilities in individuals with dementia.

Picture naming

Kledaras, McIlvane and Mackay (1989) conducted a study to monitor the picture naming abilities longitudinally in a 59 yr old Down syndrome man diagnosed to have dementia. On the test, they found that the performance of the participant was inferior on the naming task. The results of their study and the present study suggest that naming tests may ultimately prove useful in defining and documenting the nature of deterioration in dementia.

Generative naming

Jacobs, Marder, Cote, Sano, Stern, and Mayeux (1995) carried out a study to characterize the changes in cognition associated with the earliest, or preclinical, stages of dementia in Parkinson's disease (PD). They administered a comprehensive neuropsychological test battery to a group of dementia of Parkinson's disease (PD) patients. Results showed that the performance on two verbal fluency tasks (letter fluency and category fluency) was significantly impaired and independently associated with incident dementia. They have also reported that the tests of memory, orientation, abstract reasoning, naming, and constructional skill were less sensitive predictors of subsequent dementia. These results indicate that poor performance on tests of verbal fluency may represent a distinct characteristic of the preclinical phase of dementia in PD. The present study also revealed deficits in generative naming in individuals with dementia when compared with normal adults and geriatrics.

Sentence completion

Stevens, Harvey, Kelly, Nicholl, and Pitt (1996) have done a study, in which; they compared the performance of four groups of patients attending memory clinic on language abilities. They have reported significant deficits in sentence completion task compared to normal group.

Responsive speech

Chengappa, Ravi, and Jennifer (2008) have reported significant such deficits in multi infarct dementia (vascular dementia). The present study also revealed the deficits in all varieties of dementia and all the levels of severity of dementia

Spontaneous speech

Thomas, Keselj, Cercone, Rockwood and Asp (2005) reported significant deficits in spontaneous speech skills in DAT participants and they have also reported that one of the most significant areas affected by the disease is the capacity for functional communication as linguistic skills break down. Chengappa, Ravi and Jennifer (2008) in their study on multi infarct dementia in a single client, did not find any kind of deficits in spontaneous speech skills. But the results of the present study contradict the results of above study by Chengappa, et al (2008). In

the present study, significant deficits were found in spontaneous speech skills in individuals with dementia.

Repetition

When a comparison was made for repitition subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. Heun, Burkart and Benkert (1997) have studied the effects of repetition as a management option in treating picture naming skills and found significant improvement in picture naming skills. Rosselli, Ardila, Araujo, Weekes, Caracciolo, Padilla and Ostrosky-Sol (2000) have reported the equal extent of repetition skills in both the languages of bilingual adults.

Following commands

Grossman, Deposito, Hughes, Onishi, Biassou, White-Devine and Robinson (1996) have studied language comprehension profiles in Alzheimer's disease (AD), multi infarct dementia (MID) and frontotemporal degeneration (FD) and reported that patients with AD are significantly impaired in their judgments of single word and picture naming, whereas patients with FD had sentence comprehension difficulty due to impaired processing of grammatical phrase structure. Patients with MID did not differ from control participants in their performance on comprehension. They have also reported that selective patterns of comprehension difficulty in patients with different forms of dementia emphasize that language deficits cannot be explained entirely by the compromised memory associated with a progressive neurodegenerative illness. The present study also showed varied levels of deficits in individuals with dementia.

Reading comprehension of sentences

Cummings, Houlihan, and Hill (1986) have studied reading aloud and reading comprehension skills of dementia of the Alzheimer type (DAT). And they have reported that the reading aloud was intact in all except the most severely impaired cases and was found to be relatively independent of intellectual deterioration. Reading comprehension declined progressively with increasing dementia severity and correlated well with quantitative mental status assessments. The results suggest that the pattern of reading deterioration may aid in the clinical identification of DAT, in that the disturbance of reading comprehension is a linguistic deficit rather than a product of visual-perceptual disturbances, and that the alexia is more

consistent with an instrumental loss than a developmental model of dementia. The present study also showed decline in the performance of individuals with dementia.

Generative drawing

When a comparison was made for visuospatial subtest of DAB-K in persons with Dementia using Friedman's test, a significant deficit was observed. This finding is in consonance with study done by Bennett, Piguet, Grayson, Creasey, Waite, Broe and Halliday (2003) who studied the spatial function in individuals with dementia with lewy bodies (DLB) by using pentagon copying (PC) task of mini mental state examination (MMSE). Results showed that poor copying skills were found in DLB than non demented elderly. In elderly with no dementia, PC was selectively related to tests of spatial function. Poor PC was not significantly different in DLB and non – DLB groups at any assessment time, however, it became more prevalent as dementia severity increased. Memory function and verbal fluency were also more impaired in the DLB group in the early stages of the disorder. Hodges et al (1999) have also reported poor visuospatial skills in patients with AD.

The total percentage scores for MMSE and DAB-K in persons with Dementia was analyzed using Wilcoxon's Signed rank test and significant difference was seen of $|z| = 3.517$ $p<0.001$.

6a: Comparison of subtests of MMSE in normal participants.

Comparison of MMSE subtests in normal participants was not done as they obtained full scores in all the subtests. The mean scores are shown in table 3. Hence MANOVA was carried out to compare age groups within normal population (20-40 years, 40-60 years and 60 years & above) for subtests of DAB-K which is discussed below.

6b: Comparison of subtests of DAB-K in normal participants.

Comparison of DAB-K subtests in normal participants was not done as they obtained almost full scores in all the subtests and there is no significant difference seen. The mean scores are shown in table 6. Hence a comparison in each normal subgroups (20-40 years, 40-60 years and 60 years & above) was carried out.

Table 12: *Comparison of age groups within normal population for subtests of DAB-K*

	Value Label	N
Group 1	20-40yrs	30
2	40-60yrs	30
3	60 above	30

Dependent Variable	F(2,87)
Memory	46.78***
Linguistic Expression	5.10**
Linguistic Comprehension	1.85
Visuo-spatial construction	11.32***
Total –DAB-K	55.00***

Note: *Significant difference of < 0.05

**significant difference of < 0.01

***significant difference of <0.001

N= no. of participants

It can be seen clearly from the table 12 that there is significant difference in the subtests of DAB-K in normal participants. Duncan's test was carried out further to compare the performance of each normal subgroups (20-40 years, 40-60 years and 60 years & above) in each DAB-K subtest.

After carrying out Duncan's test for each subtest it was seen that,

a) **Memory**: All the normal subgroups (20-40 years, 40-60 years and 60 years & above) showed significant difference at 0.1% level of significance.

Light et al (1987) compared young and older adults on both implicit and explicit memory tasks and concluded that age-related decrements in performance were obtained in free recall, cued recall, and recognition. These results, suggest that older adults are impaired on tasks which require conscious recollection but that memory which depends on automatic activation processes is relatively unaffected by age. Also Park, D. C (2000) stated that in case of normal ageing, older

adults (typically between the ages of 60 and 85) are typically impaired relative to younger control participants (typically age 20 to 30) in free recall tasks, and in their ability to remember details of where and when events occur.

b) **Linguistic expression**: 40-60 years and 60 years & above subgroups did not show any significant difference but 20-40 years subgroup showed significant difference at 1% level of significance.

c) **Linguistic comprehension**: there was no significant difference seen in any of the three subgroups.

According to Cohen G (1979) where he conducted three experiments examined the effects of aging on comprehension of spoken language. Integrative and constructive aspects of comprehension showed much more marked age-related deficits than registration of surface meaning. Experiment 1 showed that old participants had difficulty in making inferences based on presented facts. Experiment 2 revealed a similar deficit in old people's ability to detect anomalies in newly presented information by reference to prior everyday knowledge. And Experiment 3, which tested story recall, showed that old participants were less well able to extract and retain gist information than younger participants.

But the finding of the our study is in consonance with the study done by Belmore (1981) where participants after reading short prose passages, older and younger adults verified the meaning of a test sentence which represented either a paraphrase or an inference from the preceding passage. There were no age differences in accuracy of verification performance with immediate testing, but older participants made significantly more errors on a delayed test. Verification latency was longer for inference than paraphrase test sentences for both age groups, and older participants were slower than younger for both types of information. There was no evidence for a selective deficit in processing implicit versus explicit meaning. It was concluded that older persons may be deficient in the retention of meaningful information, but that this deficit is not based on an inability to comprehend linguistic meaning.

d) **Visuo-spatial construction**: 40-60 years and 20-40 years subgroups did not show any significant difference but subgroup 60 years & above showed significant difference at 0.1% level of significance.

Bennett, Piguet, Grayson, Creasey, Waite, Broe and Halliday (2003) have studied the spatial function in individuals with dementia with lewy bodies (DLB) by using pentagon copying (PC) task of mini mental state examination (MMSE). Results showed that poor copying skills were found in DLB than non demented elderly. In elderly with no dementia, PC was selectively related to tests of spatial function. Poor PC was not significantly different in DLB and non – DLB groups at any assessment time, however, it became more prevalent as dementia severity increased. Memory function and verbal fluency were also more impaired in the DLB group in the early stages of the disorder.

Since there is differences seen in mean scores of normal subgroups, age-wise statistical analysis was done which is explained in the following stages.

7: Comparison of subtests of DAB-K within normal subgroup of 20-40 years.

Firstly age group 20-40 years were taken and it was observed that in DAB-K all the subtests except for memory had the same scores, therefore repeated measure ANOVA could not be done. Hence, paired t-test was carried out where Memory subtest was compared with each subtest in pairs.

After paired t-test was carried out it was seen that there was no significant differences [$t(29) = 1.72$, $p < 0.01$] because the participants have obtained full scores in all the subtests.

8: Comparison of subtests of DAB-K within normal subgroup of 40-60 years.

In the age group 40-60 years, no comparison was done for MMSE test, as all the participants have scored full in all the subtests. Hence repeated measure ANOVA was done for DAB-K.

It was seen that there was significant difference of $F(3,87) = 12.512$, $p<0.001$ for DAB-K subtests in participants aged 40-60 years. However, when Bonferroni pair-wise t-test was carried out, it was observed that except for subtests such as Memory and Visuospatial skills all other subtests showed significant differences in mean scores. This may be because of decline in linguistic comprehension and expression as age progresses.

Again this finding is in consonance with study done by Cohen G (1979) as discussed earlier where he conducted three experiments examined the effects of aging on comprehension of spoken language.

A paired t-test for MMSE percentile total score vs. DAB-K percentile total score was carried which showed significant difference of $t(29) = 8.016$, $p<0.001$ in the mean scores. This may be because of the increase in complexity of the test items from MMSE to DAB-K.

9: Comparison of subtests of DAB-K within normal subgroup of 60 years & above.

Lastly age group 60 years and above was analyzed and no comparison was done for MMSE test, as all the participants have scored full in all the subtests. A repeated measure ANOVA was done for DAB-K. It was seen that there was significant difference of $F(3,87) = 14.779$, $p<0.001$ for DAB-K subtests in participants above 60 years. However, when Bonferroni pair-wise t-test was carried out, it was observed that there was no significant difference seen between Memory-Visuospatial construction and Linguistic expression-Linguistic comprehension as pairs but other subtests had significant differences in their mean scores.

Again this finding is in accordance with study done by Cohen G (1979) where he conducted three experiments examined the effects of aging on comprehension of spoken language as discussed earlier.

A paired t-test for MMSE percentile total score vs. DAB-K percentile total score was carried which showed significant difference of $t(29) = 9.66$, $p < 0.001$ in the mean scores. This may be because of the increase in complexity of the test items from MMSE to DAB-K.

Lastly, an overall analysis for normal participants using repeated measure ANOVA for all the age groups for DAB-K subtests was carried out. It was seen that there was significant difference of $F(3, 28) = 19.38$, $p < 0.001$ for DAB-K subtests. However, when Bonferroni pair-wise t-test was carried out, it was observed that there was significant difference seen only between Memory - Visuospatial construction but other subtests did not show significant differences in their mean scores.

A paired t-test for MMSE percentile total score vs. DAB-K percentile total score was carried which showed significant difference of $t(89) = 8.27$, $p < 0.001$ level of significance in the mean scores. This may be because of the increase in complexity of the test items from MMSE to DAB-K.

SUMMARY AND CONCLUSIONS

The current project was taken up to study the language performance in Kannada-English bilingual speakers using Dementia Assessment Battery- Kannada (Sunil Kumar & Shyamala, 2009) on normal bilingual population and bilingual dementia population. For this, the test materials namely, Mini Mental Status Examination (MMSE), Dementia Assessment Battery – Kannada (DAB-K) and Australian second language performance ratings (ASLPR) were administered on 90 normal participants in the age range of 20-40 years, 40-60 years and 60 years & above and 30 Persons with Dementia (moderate severity) aged between 60-80 years.

Results of the present study revealed significant deficits in all the subtests of DAB-K in individuals with dementia namely; memory-episodic memory, working memory, semantic memory and delayed story telling task; linguistic expression with respect to-picture naming, generative naming, sentence completion, responsive speech, spontaneous speech, repetition; linguistic comprehension-comparative questions, following commands, reading comprehension of sentences, reading commands; visuo-spatial construction-generative drawing, figure copying, when compared to normal population. Also there were significant deficits in Mini Mental State Examination (MMSE) subtests-orientation, registration, attention and calculation, recall and language in individuals with Dementia when compared to normal population but when within group comparison was done the results showed significant deficits in subtests registration, attention and calculation only.

Results also revealed significant deficits in memory, linguistic expression and visuo-spatial construction of DAB-K test except for linguistic comprehension when all the 3 normal subgroups (20-40 years, 40-60 years and 60 years & above) were compared. Further each of the subgroups was analyzed and it was found that 20-40 years participants did not show any significant deficit in any of the DAB-K subtests, but 40-60 years participants showed significant deficits in memory and visuospatial construction subtests of DAB-K. Finally participants of 60 years and above showed significant deficits in all the subtests except for Memory-Visuospatial construction and Linguistic expression-Linguistic comprehension subtests when paired t test was administered.

On overall analysis of normal participants for all the age groups for DAB-K subtests, it was observed that there was significant deficit in Memory –Visuospatial construction while other subtests did not show any differences.

Implications of the study:

- As the most frequently used speech and language test batteries are basically developed and standardized on western population, those tests may not be appropriate for Indian population due to variations in language and cultures. Therefore, the present study will become a standardized test material for the clinical population of Indian bilingual Kannada-English speakers with dementia.

- This test can be used along with the regular speech and language test batteries in the assessment of neurogenic communication disorders.

- As the stimuli for this test is being selected by considering the cultural and language influences, this test will be more appropriate for the respective cultures and language groups.

- This test battery can be used to differentiate between normal aging and pathological aging.

- This test battery can also be used to plan therapy programs for individuals with dementia and related disorders.

Limitations of the study:

- This test battery is only limited to Kannada-English speakers assessing only one of the language i.e. Kannada.

- Some variables like socioeconomic status, multilingualism were not monitored in this study.

- Individuals with Dementia of different severities were not included in the study.

- Individuals with dementia had different pathologies like DAT, Parkinson's, multi-infarct dementia, etc. it would have been better if all the participants had same pathology.

Future directions:

- Since English has become common second language in most of urban population, this test may also be developed in Indian English language.
- This test battery can be developed and standardized in different Indian languages.
- Test battery can be standardized on different clinical populations, like DAT, MID, Parkinson's, etc.
- DAB – K can be standardized on large population with control on variables like socioeconomic status, multilingualism etc.
- This test battery can be standardized on different categories of normal aging by taking large number of samples.
- Treatment protocol for individuals with dementia can be developed based on the present study results.

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APPENDIX – A

DEMENTIA ASSESSMENT BATTERY – KANNADA

TEST BOOKLET

Case Name: No: Date:

Age: Gender: Examiner:

Mother Tongue: Educational Qualification:

Domain – 1: Memory.

I. Episodic Memory

Instructions: Instruct the participant to answer the following questions with appropriate answers. The questions may be given orally or in writing. Accept corrections only if the participant is very certain. Score 2 for each correct response.

S. No.	Test Items	Stimulus		Response	
		Verbal	Graphic	Verbal	Graphic
1	ನಿಮ್ಮ ಹೆಸರು ಏನು?				
2	ನಿಮ್ಮ ಊರು ಯಾವುದು?				
3	ನಿಮ್ಮ ಕುಟುಂಬದಲ್ಲಿ ಯಾರು ಯಾರು ಇದ್ದಾರೆ?				
4	ನೀವು ಯಾವ ಕೆಲಸದಲ್ಲಿದ್ದಿರಿ?				
5	ನಿನ್ನೆ ಯಾವ ದಿನ?				
6	ಈವಾಗ ಗಂಟೆ ಎಷ್ಟು?				
7	ಬೆಳಗೆ ಏನು ತಿಂಡಿ ತಿಂದಿರಿ?				
8	ಸ್ವಾತಂತ್ರ ದಿನಾಚರಣೆ ಯಾವಾಗ?				
9	ಈಗ ಬೆಳಗ್ಗೆನಾ?				
10	ನಿಮ್ಮ ಬಟ್ಟೆಯ ಬಣ್ಣ ಯಾವುದು?				
11	ಭಾರತ ದೇಶದ ಪ್ರಧಾನ ಮಂತ್ರಿ ಯಾರು?				

12	ಈ ಕೋಣೆಯಲ್ಲಿ ಎಷ್ಟು ಜನ ಇದ್ದಾರೆ?				
13	ಕೋಣೆಯ ಬಾಗಿಲು ಮುಚ್ಚಿದಿಯಾ?				
14	ನಿಮ್ಮ ಮನೆಯ ದೂರವಾಣಿ ಸಂಖ್ಯೆ ಏನು?				
15	ನಿಮ್ಮ ಗಂಡನ/ ಹೆಂಡತಿಯ ಹೆಸರೇನು?				

Maximum Score: 30. Patient's Score: _____

II. Working Memory

Digit Forward Task:

Instructions: Say the list of the following numbers in same order and ask the individual to listen and ask him to repeat those numbers in the same order. Give a score of 1 for every correctly repeated sequence. Do not give any points if repeated in wrong order.

S. No.	Test Items	Stimulus		Response	
		Verbal	Graphic	Verbal	Graphic
1	3, 6, 8.				
2	4, 8, 1.				
3	5, 9, 2.				
4	9, 3, 7, 1				
5	8, 7, 4, 3.				
6	3, 1, 4, 7.				
7	6, 8, 7, 4, 3.				
8	3, 1, 5, 7, 9.				
9	2, 4, 8, 9, 3.				
10	7, 4, 1, 3, 6, 4.				
11	3, 1, 7, 4, 8, 9.				
12	2, 1, 4, 5, 2, 4.				
13	3, 5, 4, 1, 1, 3, 6.				
14	8, 9, 5, 4, 1, 5, 6.				
15	5, 1, 4, 6, 2, 4, 3.				

Digit Backward Task: Say the following numbers as in the list in same order and ask the individual to hear and ask him to repeat those numbers in the reverse order. Give a score of 1 for every correctly repeated sequence. Do not give any points if repeated in wrong order.

S. No.	Test Items	Stimulus		Response	
		Verbal	Graphic	Verbal	Graphic
1	9, 7, 2				
2	8, 7, 4				
3	3, 2, 6				
4	2, 4, 9, 8				
5	3, 1, 4, 9				
6	3, 7, 3, 8				
7	9, 4, 8, 3, 7				
8	1, 0, 3, 7, 4				
9	5, 7, 4, 1, 3				
10	3, 6, 0, 1, 6, 9				
11	3, 1, 2, 4, 0, 1				
12	9, 7, 2, 0, 3, 1				
13	1, 4, 7, 9, 3, 6, 2				
14	7, 6, 1, 5, 7, 2, 9				
15	3, 6, 4, 8, 9, 6, 1				

Maximum Score: 30. Patient's Score: _____

III. Semantic Memory

Co-ordinate naming:

Instructions: Ask the patient to name at least 2 objects that we use for following activities. Give a score of 2 for each correctly named object.

S. No	Test Items	Response 1	Response 2
1	ಬರೆಯುವುದು		
2	ಅಡಿಗೆ ಮಾಡುವುದು		
3	ಕೃಷಿ ಗಾರಿಕೆ		
4	ಸ್ನಾನ ಮಾಡುವುದು		
5	ತೊಳೆಯುವುದು		

Maximum Score: 20. Patient's Score: _____

Super-ordinate naming:

Instructions: Give a list of items belonging to a particular class as in the following list, for e.g., 'table, chair, duster, blackboard and window' and ask him to identify the class to which the given items may be classified. Give a score of 2 for each correctly named class.

S. No	Test Items	Expected Answer
1	ಬಸ್ಸು, ಹಡಗು, ಆಟೋ, ವಿಮಾನ	
2	ಬಾಳೆ, ಸೇಬು, ಮಾವು, ಕಿತ್ತಳೆ.	
3	ಕ್ಯಾರೆಟ್, ಆಲು ಗಡ್ಡೆ, ಎಲೆ ಕೋಸು, ಟಮೋಟ.	
4	ಆನೆ, ನಾಯಿ, ಹುಲಿ, ಕೋತಿ.	
5	ಕಣ್ಣು, ಕೈ, ಕಾಲು, ಮೂಗು.	

Maximum Score: 10. Patient's Score: _____

IV. Delayed Story Retelling.

Instructions: Ask the patient to listen the following story carefully and the client has to answer the following five questions after 45 minutes. Give a score of 2 for each correct response.

Story:

ಒಂದು ಕಾಡಿನಲ್ಲಿ ಒಂದು ದೊಡ್ಡ ಕೊಳ ಇತ್ತು. ಕೊಳದಲ್ಲಿ ಹಲವಾರು ಮೀನುಗಳು, ಕಪ್ಪೆಗಳು ಹಾಗು ಏಡಿಗಳು ವಾಸಿಸುತ್ತಿದವು. ಒಂದು ವರ್ಷ ಮಳೆ ಆಗಲಿಲ್ಲ ಹಾಗು ತುಂಬಾ ಬಿಸಿಲಿತ್ತು. ಕೊಳವು ಬತ್ತಿ ಹೋಗುತಿತ್ತು. ಕೊಳದ ಹತ್ತಿರ ಒಂದು

ಕೊಕ್ಕರೆ ವಾಸಿಸುತ್ತಿತ್ತು. ಆ ಕೊಕ್ಕರೆಗೆ ಮೀನು ತಿನ್ನಲು ಬಹಳ ಆಶೆ ಇತ್ತು. ಆ ಕೊಕ್ಕರೆ ಒಂದು ಉಪಾಯವನ್ನು ಯೋಚಿಸಿ, ಕೊಳದ ಹತ್ತಿರ ಹೋಗಿ ಅಲ್ಲಿದ್ದ ಮೀನುಗಳಿಗೆ ಹೀಗೆ ಹೇಳಿತು "ಪ್ರಿಯ ಗೆಳೆಯರೆ, ಈ ವರ್ಷ ಮಳೆ ಆಗುವುದಿಲ್ಲ ಎಂದು ನಾನು ಕೇಳಿರುವೆ. ಕೊಳದಲ್ಲಿ ಹೆಚ್ಚು ನೀರು ಉಳಿದಿಲ್ಲ. ಮಳೆ ಬರದಿದ್ದರೆ ನೀರೆಲ್ಲಾ ಪೂರ್ತಿಯಾಗಿ ಶಿಘ್ರದಲ್ಲೇ ಬತ್ತಿ ಹೋಗುವುದು. ಆವಾಗ ನೀವೆಲ್ಲರೂ ಸತ್ತು ಹೋಗ್ತಿರಿ. ಅದನ್ನು ಕೇಳಿದ ಎಲ್ಲಾ ಕಪ್ಪೆಗಳು ಹಾಗು ಮೀನುಗಳು ಒಟ್ಟಿಗೆ ಹೀಗೆ ಹೆಳಿದರು, "ದಯವಿಟ್ಟು ನಮ್ಮ ಪ್ರಾಣವನ್ನು ಹೇಗೆ ಕಾಪಾಡಿಕೊಳ್ಳುವುದು ಎಂದು ಹೇಳು". ಆಗ ಚತುರ ಕೊಕ್ಕರೆ ಹೇಳಿತು, "ಪಕ್ಕದಲ್ಲೇ ತುಂಬಾ ನೀರುಳ್ಳ ಒಂದು ದೊಡ್ಡ ಕೆರೆ ಇದೆ. ನಿಮಗೆ ಬೇಕಾದಲ್ಲಿ ನಾನು ನಿಮ್ಮೆಲ್ಲರನ್ನೂ ಒಬ್ಬೊಬ್ಬರಾಗಿ ನನ್ನ ಕೊಕ್ಕಿನಲ್ಲಿ ಎತ್ತಿಕೊಂಡು ಹೋಗಿ ಕೆರೆಯಲ್ಲಿ ಬಿಡಬಲ್ಲೆ"

ಎಲ್ಲಾ ಮೀನುಗಳು ಒಪ್ಪಿಕೊಂಡವು. ಕೊಕ್ಕರೆಯು ಮೀನುಗಳನ್ನು ಒಂದಾದ ಮೇಲೊಂದು ತನ್ನ ಕೊಕ್ಕಿ ನಲ್ಲಿ ಎತ್ತಿಕೊಂಡು ಹಾರಿ ಹೋಯಿತು. ಅದು ಅವುಗಳನ್ನು ಪಕ್ಕದಲ್ಲಿ ಇದ್ದ ಬಂಡೆಯ ಹತ್ತಿರ ತಗೆದು ಕೊಂಡು ಹೋಗಿ ತಿಂದು ಹಾಕಿತು. ಪ್ರತಿ ದಿನವೂ ಅದು ಒಂದು ಬಾರಿಗೆ ಒಂದು ಮೀನನ್ನು ಬಂಡೆ ಹತ್ತಿರ ಎತ್ತುಕೊಂಡು ಹೋಗಿ ತಿನ್ನುತ್ತಿತ್ತು. ಹೀಗೆ ಅದು ಕೊಳದಲ್ಲಿದ್ದ ಎಲ್ಲಾ ಮೀನುಗಳನ್ನು ತಿಂದು ಹಾಕಿತು.

Questions:

1. ಕೊಳದಲ್ಲಿ ಯಾರು ವಾಸಿಸುತ್ತಿದ್ದರು?
2. ಕೊಳದಲ್ಲಿ ನೀರು ಏಕೆ ಬತ್ತಿ ಹೋಯಿತು?
3. ಕೊಕ್ಕರೆಯು ಮೀನುಗಳಿಗೆ ಏನು ಹೇಳಿತು?
4. ಕೊಕ್ಕರೆಯು ಮೀನುಗಳನ್ನು ಎಲ್ಲಿ ಎತ್ತಿಕೊಂಡು ಹೋಯಿತು?
5. ಕೊಕ್ಕರೆಯು ಮೀನುಗಳನ್ನು ಏನು ಮಾಡಿತು?

Maximum Score: 10. Patient's Score: _____

Domain - 2: Linguistic Expression.

I. Picture Naming

Instructions: Ask the participant to name the picture presented. Score 3 for each correct response. Accept mild paraphasias. Pictures are given in Appendix – A (1).

1. ಹುಡುಗ
2. ಗಂಟೆ
3. ಪುಸ್ತಕ
4. ಟೋಪಿ

5. ಕಾರು

6. ಹಸು

7. ಮೀನು

8. ಇಲಿ

9. ಸೂರ್ಯ

10. ಚೆಂಡು

11. ಬೀಗದ ಕೈ

12. ಹಡಗು

13. ಫ್ಯಾನ್

14. ಲೋಟ

15. ಪೆನ್ನು

16. ಮಂಚ

17. ಬಾಗಿಲು

18. ಚಂದ್ರ

19. ಪಿಸ್ತೋಲ್

20. ಚಮಚ

21. ಕಪ್ಪೆ

22. ಬಲೆ

23. ಸ್ಟೂಲು

24. ಗಡಿಯಾರ

25. ಬ್ಯಾಗ್

26. ಶೂ

27. ಹೂ ಕುಂಡ

28. ಕೋಳಿ

29. ಬ್ಯಾಟ್

30. ಜಗ್

Maximum Score: 90. Patient's Score: _____

II. Generative Naming

Instructions: Ask the patient to name as many animals as he can in one minute. Score 1 point for each animal named correctly. Maximum score is 20.

Maximum Score: 20. Patient's Score: _____

III. Sentence Completion

Instructions: Ask the patient to fill the blanks. Give a score of 1 point for each correct response.

1. ಸಕ್ಕರೆ _____ ಯಾಗಿರುತ್ತದೆ (ಸಿಹಿ, ಬಿಳಿ).
2. ಗುಲಾಬಿ ಕೆಂಪು ಬಣ್ಣ, ಮಲ್ಲಿಗೆ _____ (ಬಿಳಿ).
3. ಹುಲ್ಲಿನ ಬಣ್ಣ _____ (ಹಸಿರು).
4. ಮಂಜುಗಡ್ಡೆ _____ ಇರುತ್ತದೆ (ತಣ್ಣಗೆ).
5. ಬೆಂಕಿ _____ಯಾಗಿರುತ್ತದೆ (ಬಿಸಿ).
6. ಒಂದು _____ ವನ್ನು ಓದಿ (ಪುಸ್ತಕ).
7. ಒಂದು ಹಾಡನ್ನು _____ (ಹಾಡಿ).
8. ವಾಸನೆ ಗ್ರಹಿಸುವುದು ಮೂಗಿನಿಂದ, ನೋಡುವುದು _____ ಇಂದ (ಕಣ್ಣು).
9. ಮೀನು ಈಜುತ್ತದೆ, ಹಕ್ಕಿ _____ (ಹಾರುತ್ತದೆ).
10. ಬರೆಯುವುದು ಪೆನ್ ನಿಂದ, ಕತ್ತರಿಸುವುದು _____ ಇಂದ (ಚಾಕು).

Maximum Score: 10. Patient's Score: _____

IV. Responsive speech.

Instructions: Ask the patient to fill the blanks. Give a score of 1 point for each correct response.

1. ಹಾಲಿನ ಬಣ್ಣ ಏನು?

2. ಒಂದು ವರ್ಷದಲ್ಲಿ ಎಷ್ಟು ತಿಂಗಳಿವೆ?

3. ವರ್ಷದ ಕೊನೆಯ ತಿಂಗಳು ಯಾವುದು?

4. ಯಾವುದರಿಂದ ಚಪ್ಪಾಳೆ ತಟ್ಟುತ್ತಿರ?

5. ಸಕ್ಕರೆ ಸವಿಯಲು ಹೇಗಿರುತ್ತದೆ?

6. ಯಾವುದರಿಂದ ಬರೆಯುತ್ತೀರ?

7. ನಿಮ್ಮ ಕುಟುಂಬದಲ್ಲಿ ಎಷ್ಟು ಸದಸ್ಯರಿದ್ದಾರೆ?

8. ಛತ್ರಿಯನ್ನು ಯಾವಾಗ ಬಳಸುತ್ತೀರ?

9. ಒಂದು ವಾರದಲ್ಲಿ ಎಷ್ಟು ದಿನಗಳು ಇರುತ್ತದೆ?

10. ಈ ಸ್ಥಳದ ಹೆಸರೇನು?

Maximum Score: 10. Patient's Score: _____

V. Spontaneous speech

Instructions: Ask the patient to tell about him/ her and his/her family. Check for the both information content and fluency in patient's response. Rate the responses on a 10 point scale for both information content and also on fluency aspects.

Maximum Score: 10 + 10 = 20. Patient's Score: _____

VI. Repetition

Instructions: Ask the patient to repeat the words and sentences listed below. You may repeat items once if the patient asks or does not seem to hear. Minor errors in articulation are scored as correct. Take 1 point off for errors in order of word sequence or for each literal paraphasia.

Sl. No	Stimulus	Score
1	ಹಾಸಿಗೆ	2

2	ಮೂಗು	2
3	ಪೈಪು	2
4	ಕಿಟಕಿ	2
5	ಬಾಳೆ ಹಣ್ಣು	2
6	ಮಂಚಿನ ಗಡ್ಡೆ	4
7	ನಲವತ್ತೈದು	4
8	ತೊಂಬತ್ತೈದು ಪ್ರತಿಶಕ	6
9	ಅರವತ್ತೆರಡುವರೆ	8
10	ದೂರವಾಣಿ ಕರೆ ಬರುತ್ತಿದೆ.	10
11	ಅವನು ಇವತ್ತು ಬೆಂಗಳೂರಿನಿಂದ ಹಿಂತಿರುಗುತ್ತಿಲ್ಲ.	10
12	ರವಿ ಈವತ್ತು ಬಂದರೆ, ನಾವು ಹೊರಗೆ ಹೋಗೋಣ.	10
13	ಶಿಕ್ಷಕರು ನೀಮೆಸುಣ್ಣದಿಂದ ಕಪ್ಪು ಹಲಗೆಯ ಮೇಲೆ ಬರೆದರು.	11
14	ನಮ್ಮೆಲ್ಲರಲ್ಲಿ ಸುನೀತಾಗೆ ಮೊದಲು ಕೆಲಸ ಸಿಕ್ಕಿತ್ತು.	12
15	ಐದು ಡಜನ್ ಮೊಟ್ಟೆಗಳನ್ನು ಒಂದು ಡಬ್ಬದಲ್ಲಿ ಹಾಕಿ ನಮ್ಮ ಮನೆಗೆ ಸಂಜೆಯ ಒಳಗೆ ಕಳಿಸಿ.	15

Maximum Score: 100. Patient's Score: _____

Domain – 3: Linguistic Comprehension.

I. Comparative Questions

Instructions: Ask the patient to say either 'yes' or 'no' for the following questions. Give a score of 2 for every correct response.

1. ನಾಯಿಯು ಕುದುರೆಗಿಂತ ದೊಡ್ಡದ?
2. ಪಟ್ಟಣವು ಹಳ್ಳಿಗಿಂತ ದೊಡ್ಡದ?
3. ಐದು ಹದಿನೈದಕ್ಕಿಂತ ಹೆಚ್ಚಾ?
4. ಮಗನು ಅಪ್ಪನಿಗಿಂತ ದೊಡ್ಡವನ?

5. ಎಂಟು ಒಂಬತ್ತುಕ್ಕಿಂತ ದೊಡ್ಡದ?

6. ಸೇಬು ದ್ರಾಕ್ಷಿಗಿಂತ ದೊಡ್ಡದ?

7. ನದಿಯು ಸಮುದ್ರಕ್ಕಿಂತ ದೊಡ್ಡದ?

8. ರೈಲು ಬಸ್ಸಿಗಿಂತ ಉದ್ದ ಇರುತ್ತದ?

9. ಆನೆಯು ಹುಲಿಗಿಂತ ದೊಡ್ಡದ?

10. ತೆಂಗಿನಮರ ಮಾವಿನಮರಗಿಂತ ಉದ್ದ ಇರುತ್ತದ?

Maximum Score: 20. Patient's Score: _____

II. Following Commands

Instructions: Ask the patient to follow the given commands. Score for partial execution of the commands according to the numbers above each segment that is correctly executed. If the patient requests repetition or looks confused, repeat the command as a full sentence.

Sl. No	Stimulus	Score
1	ನಿಮ್ಮ ಕೈಯನ್ನು ಮೇಲೆತ್ತಿ.	2
2	ನಿಮ್ಮ ಕಣ್ಣುಗಳನ್ನು ಮುಚ್ಚಿ.	2
3	ಫ್ಲಾನ್ ತೋರಿಸಿ.	2
4	ಬಾಗಿಲನ್ನು ತೋರಿಸಿ ನಂತರ ಕಿಟಕಿಯನ್ನು ತೋರಿಸಿ.	4
5	ಪೆನ್ನು ಮತ್ತು ಪೇಪರನ್ನು ತೋರಿಸಿ.	4
6	ಪೆನ್ನಿಂದ ಪೇಪರನ್ನು ತೋರಿಸಿ.	8
7	ಪೇಪರಿಂದ ಪೆನ್ನನ್ನು ತೋರಿಸಿ.	8
8	ಪೆನ್ನಿಂದ ಗಡಿಯಾರವನ್ನು ತೋರಿಸಿ.	8
9	ಪೇಪರಿಂದ ಗಡಿಯಾರವನ್ನು ತೋರಿಸಿ.	8
10	ಪೆನ್ನನ್ನು ಪುಸ್ತಕದ ಮೇಲಿಟ್ಟು ನನಗೆ ಕೊಡಿ.	14
11	ಕೈ ಗಡಿಯಾರವನ್ನು ಪೆನ್ನಿನ ಪಕ್ಕದಲ್ಲಿಟ್ಟು ಪೇಪರವನ್ನು ತಿರುಗಿಸಿಡಿ.	20

Maximum Score: 80. Patient's Score: _____

III. Reading Comprehension of Sentences

Instructions: Present the each card and say "I want you to read the statement and fill the blank with appropriate answer". Give a score of 5 for each correct response.

Sl. No	Stimulus	Score
1	ಪೋಲಿಸ್ _____ ಅನ್ನು ಹಿಡಿದಿರುತ್ತಾನೆ. 1. ಪುಸ್ತಕ 2. ಪಿಸ್ತೋಲು 3. ಬಾವುಟ 4. ಹೂವು	5
2	ಮಳೆಯು _____. 1. ಹಸಿರು 2. ಒದ್ದೆ 3. ಬಿಸಿ 4. ಸಮುದ್ರ	5
3	ರಾಜೇಶ್ ಅವರು ಕಾರುಗಳು ಮತ್ತು ಲಾರಿಗಳನ್ನು ರಿಪೇರಿ ಮಾಡುತ್ತಾರೆ. ಅವರು ಒಬ್ಬ _____. 1. ದರ್ಜಿ 2. ಯಂತ್ರ 3. ಮೆಕಾನಿಕ್ 4. ಚಾಲಕ	5
4	ಶಿಕ್ಷಕರು ಶಾಲೆಗೆ ಬಿಸಿಗೆಯ ನಂತರ ಹಿಂತಿರುಗುತ್ತಾರೆ. ಅವರು _____ ಗೆ ಕಲಿಸುತ್ತಾರೆ. 1. ಎಲೆಗಳು 2. ಮಕ್ಕಳು 3. ವಸಂತ ಮಾಸ	5

	4. ಪುಸ್ತಕಗಳು	
5	ಮಾರ್ಚ್ ತಿಂಗಳು ಯಾವಾಗ ಬರುತ್ತದೆ? 1. ಜನವರಿಯ ನಂತರ 2. ಜೂನಿನ ನಂತರ 3. ಎಪ್ರಿಲ್ ಮುಂಚೆ 4. ಆಗಷ್ಟು ಮುಂಚೆ	5
6	ರೈತರು ಹೆಚ್ಚಾಗಿ ಗೋಧಿ, ಜೋಳ, ಕಾಳುಗಳು ಹಾಗೂ _____ ಬೆಳಯುತ್ತಾರೆ. 1. ಇದ್ದಿಲು 2. ಟ್ರಾಕ್ಟರ್ ಗಳು 3. ಭೂಮಿ 4. ತರಕಾರಿಗಳು.	5
7	ಕಾರು, ಬಸ್ಸು, ಲಾರಿ, ವಿಮಾನ ಎಲ್ಲಾ _____ ಗುಂಪಿಗೆ ಸೇರುತ್ತವೆ. 1. ತರಕಾರಿಗಳು 2. ಪ್ರಾಣಿಗಳು 3. ಸಾಮಾನ್ಯ ವಸ್ತುಗಳು 4. ವಾಹನಗಳು	5
8	ಬರೆಯಲು ನಿಮಗೆ _____ ಬೇಕು. 1. ಸ್ಟೇಪ್ಲರ್ 2. ಚಾಕು 3. ಪೆನ್ನು 4. ಹೂವು	5

Maximum Score: 40. Patient's Score: _____

IV. Reading commands

Instructions: present the each card and say "I want you to read the instruction and do what it says". Give a score of 2 for each correct response.

1. ನಿಮ್ಮ ಎಡಗೈಯನ್ನು ಮೇಲೆತ್ತಿ
2. ನಿಮ್ಮ ಕಣ್ಣುಗಳನ್ನು ಮುಚ್ಚಿ.
3. ನಿಮ್ಮ ಕಾಲಿನಿಂದ ಒಂದು ಕ್ರಾಸ್ ಬರೆಯರಿ.
4. ಕುರ್ಚಿಯನ್ನು ತೋರಿಸಿ ನಂತರ ಬಾಗಿಲನ್ನು ತೋರಿಸಿ.
5. ಪೆನ್ನನ್ನು ಎತ್ತಿಕ್ಕೊಂಡು ಮೂರುಬಾರಿ ಅದರಿಂದ ಕುಟ್ಟಿ ಹಾಗೂ ವಾಪಸ್ ಅಲ್ಲೇ ಇಡಿ.

Maximum Score: 10. Patient's Score: _____

Domain – 4: Visuo – Spatial Construction

I. Generative Drawing

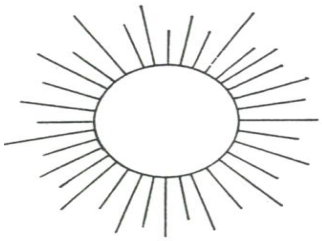
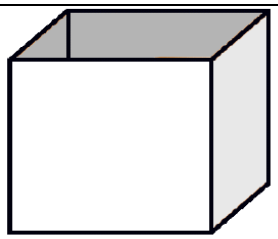
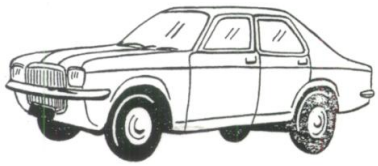
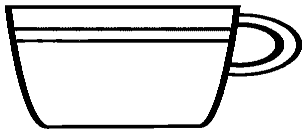
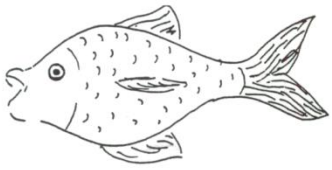
Instructions: The participant is asked to freehandedly draw the figures listed below on a separate sheet of paper. Score for each figure is given below.

Sl. No	Stimulus	Score
1	ಒಂದು ಗೋಲಾಕಾರ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	2
2	ಒಂದು ಚೌಕ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	2
3	ಒಂದು ಮರದ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	3
4	ಒಂದು ಮನುಷ್ಯನ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	5
5	ಒಂದು ಹೂವಿನ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	5
6	ಒಂದು ಗಡಿಯಾರ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	5
7	ಒಂದು ಮನೆಯ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	5
8	ಒಂದು ಸೇಬಿನ ಚಿತ್ರವನ್ನು ಬರೆಯರಿ.	3

Maximum Score: 30. Patient's Score: _____

II. **Figure Copying.**

Instructions: Ask the participant to copy the following figures on a separate sheet. Each correct response gets a score of 4. Maximum score is 20.

Sl. No	Stimulus
1	
2	
3	
4	
5	

Maximum Score: 20. Patient's Score: _____

DEMENTIA ASSESSMENT BATTERY – SCORE SHEET

Case Name: No: Date:
Age: Gender: Examiner:
Mother Tongue: Educational Qualification:

Score on Mini Mental Status Examination:
Score on FAST:
Score on BCRS:

Domain	Subtests	Max. Score	Patient's Score	Maximum Score of Domain	Patient's total score of domain
Memory	Episodic Memory	30		100	
	Working Memory	30			
	Semantic Memory	30			
	Delayed Story Telling task (Wh – questions)	10			
Linguistic Expression	Picture Naming	90		250	
	Generative Naming	20			
	Sentence Completion	10			
	Responsive Speech	10			
	Spontaneous Speech	20			
	Repetition	100			
Linguistic Comprehension	Comparative Questions	20		150	
	Following Commands	80			
	Reading Comprehension of Sentences	40			
	Reading Commands	10			
Visuo-spatial Construction	Generative Drawing	30		50	
	Figure Copying	20			
Total Score				**550**	

Provisional Diagnosis:

Signature of the staff **Signature of the Clinician**

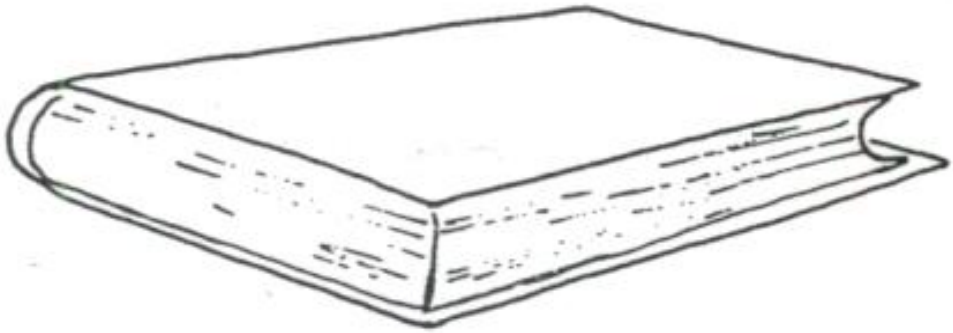
APPENDIX – A (1)

Stimulus for Picture Naming Task

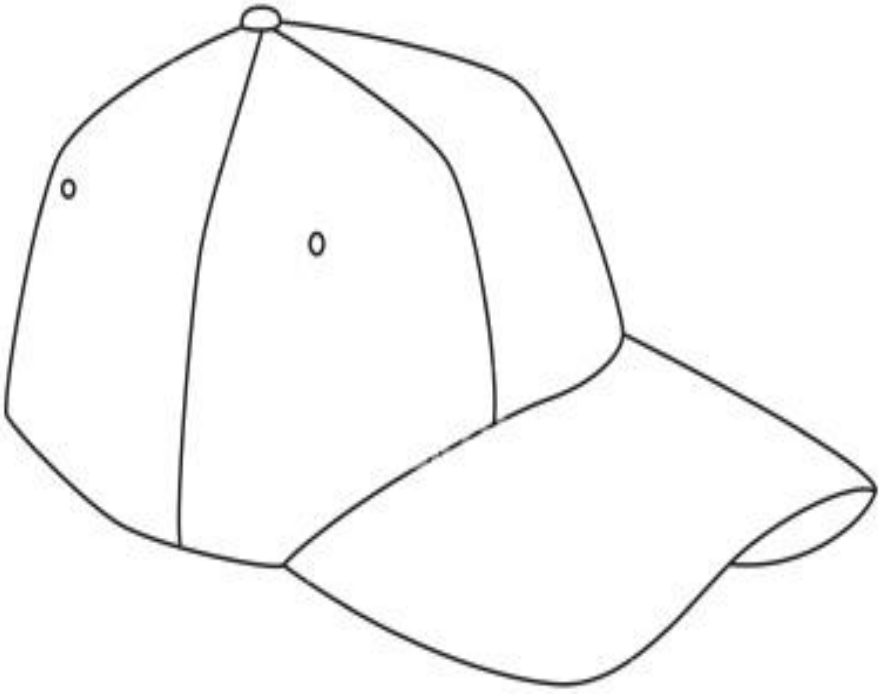
PN – 1

PN – 2

PN – 3

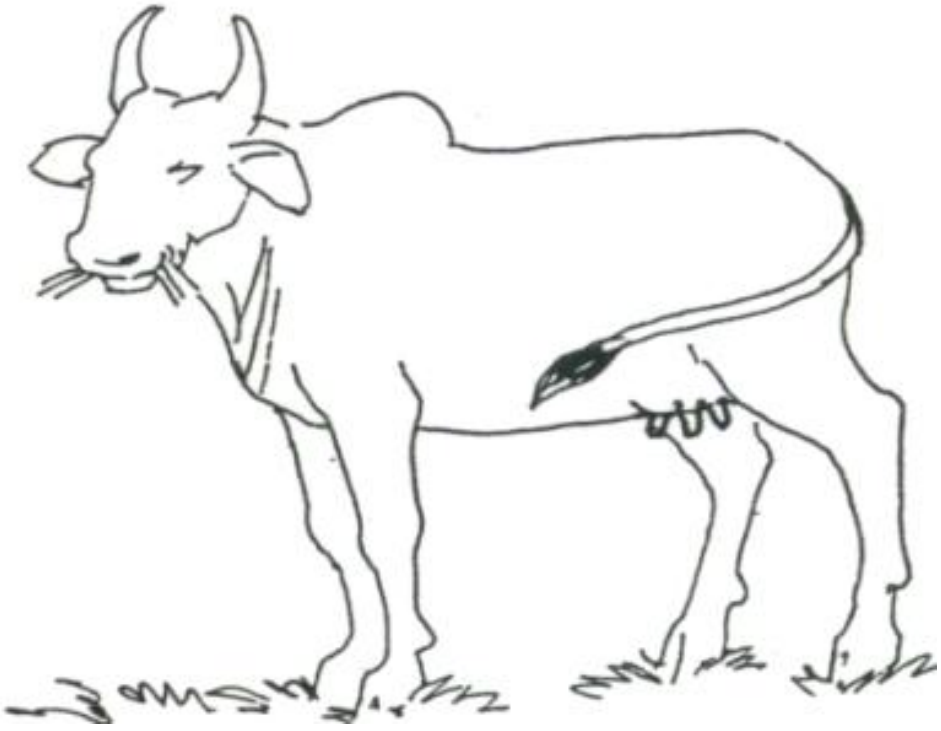


PN – 4

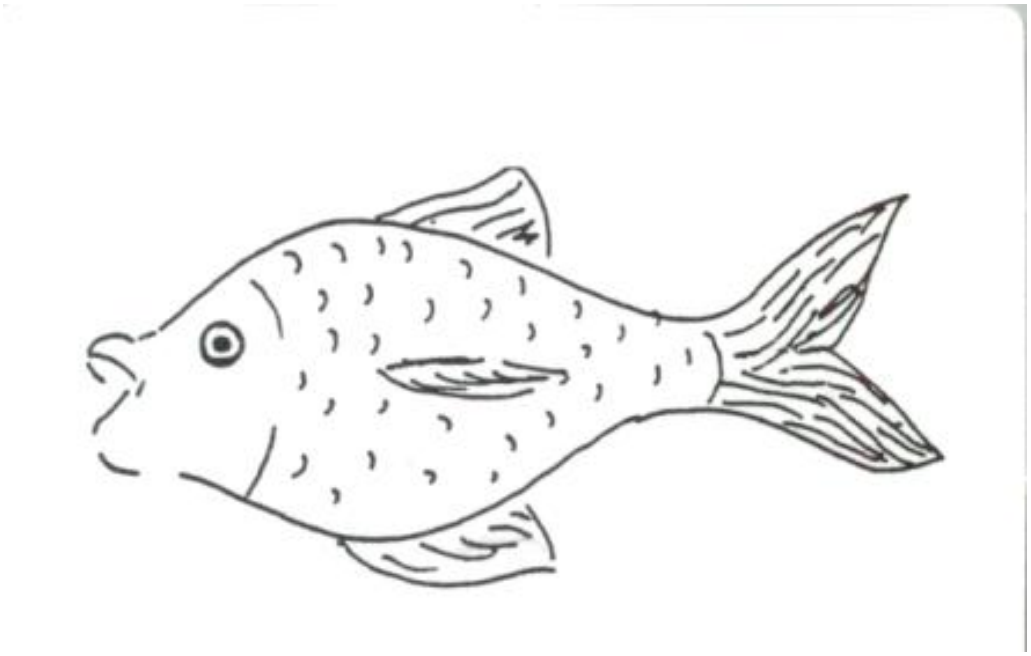


PN – 5

PN – 6

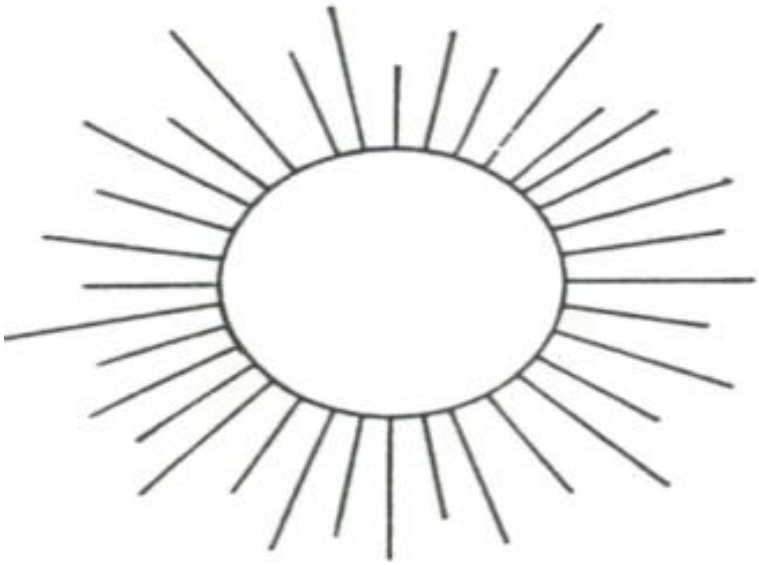


PN – 7



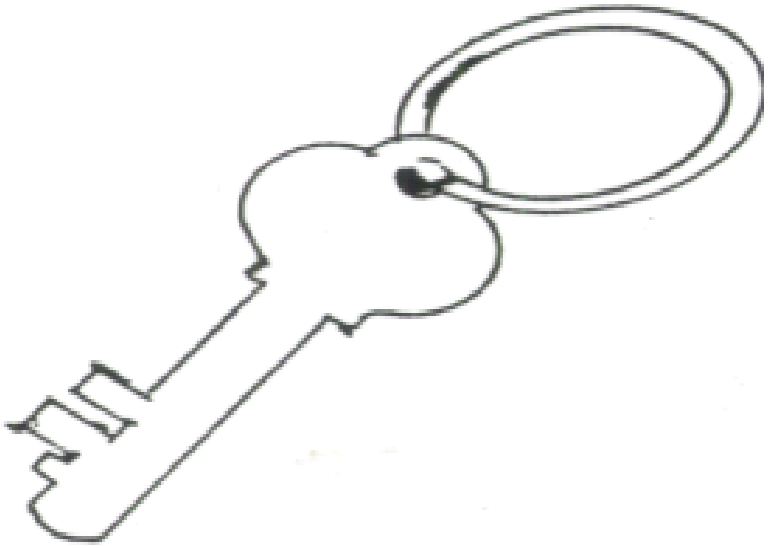
PN – 8

PN – 9



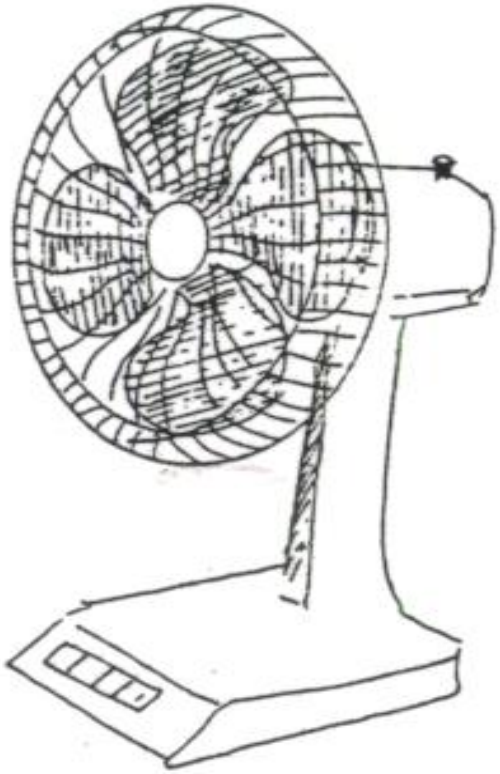
PN – 10

PN – 11



PN – 12

PN – 13



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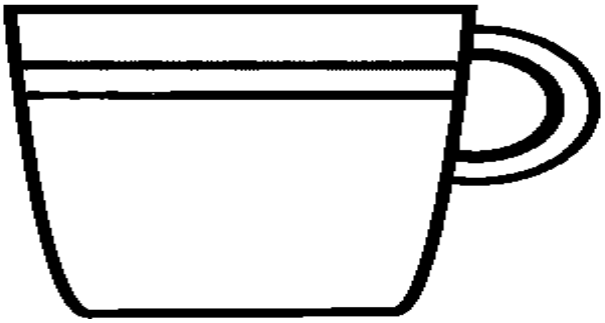

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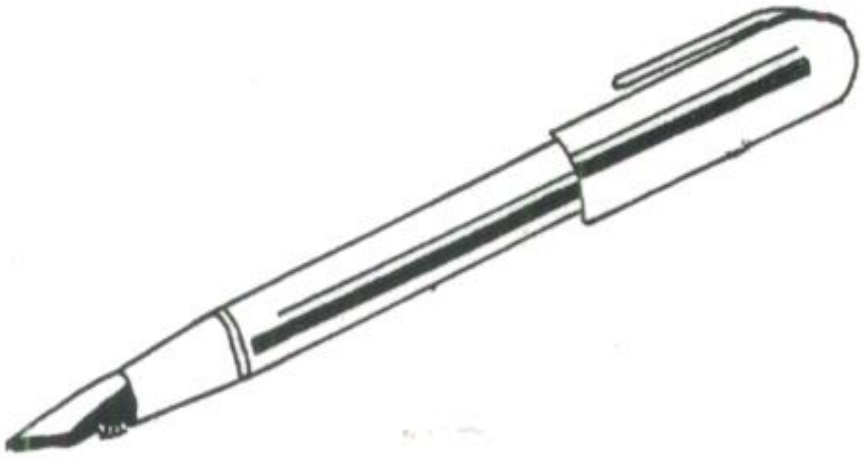

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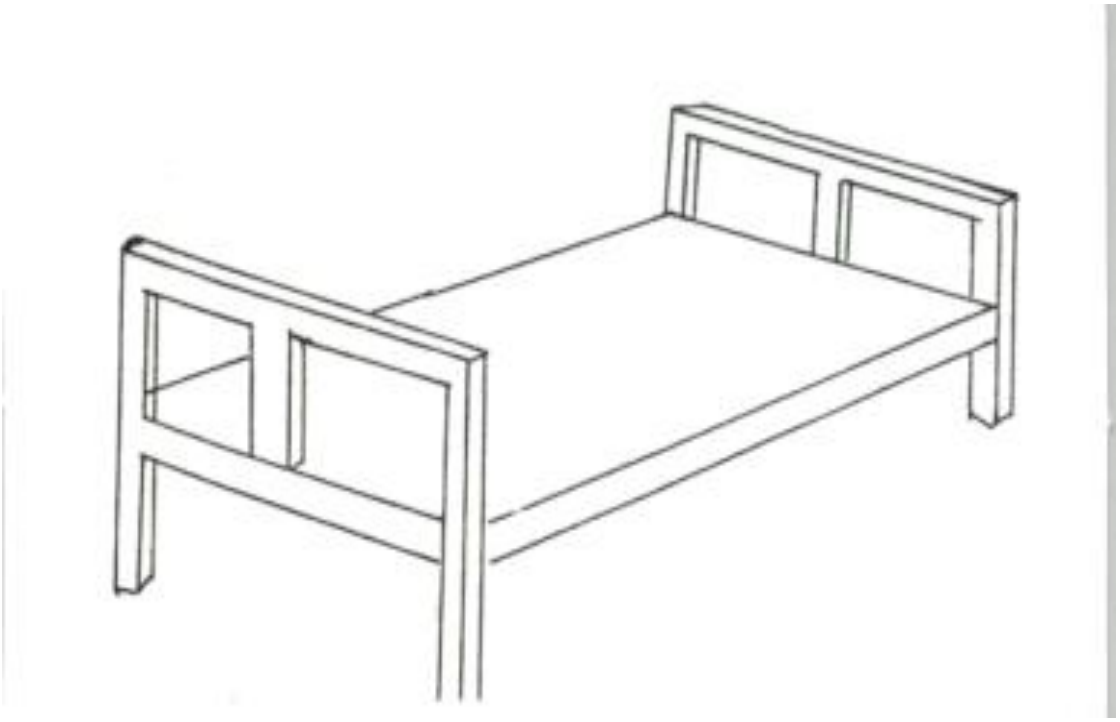

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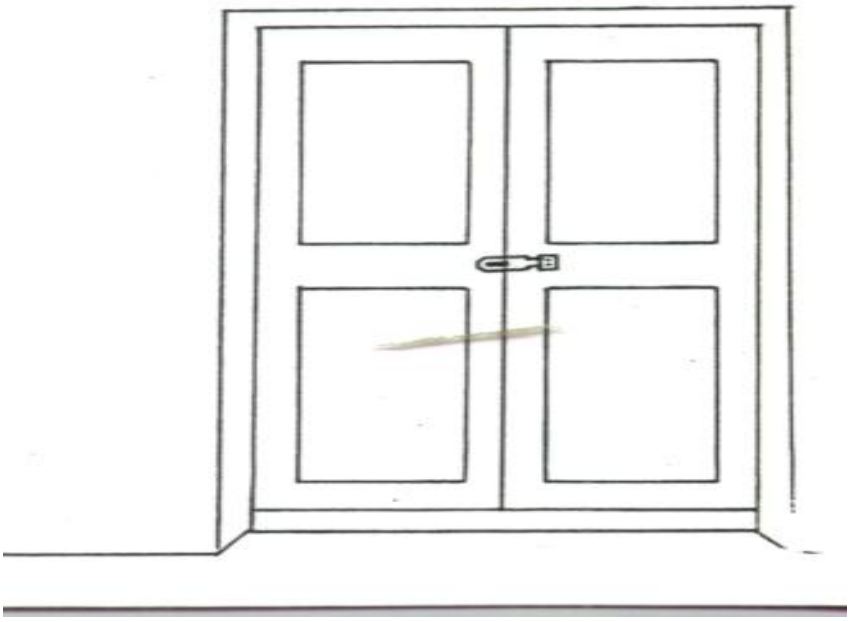

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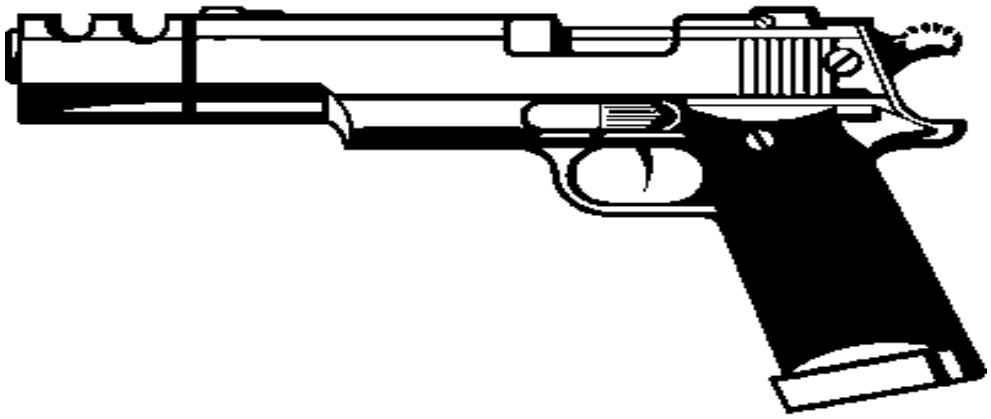

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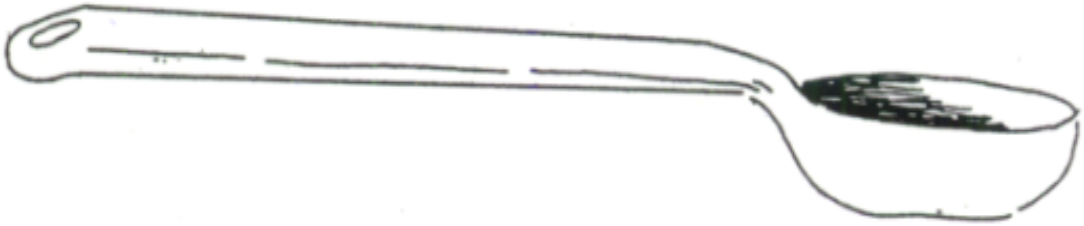

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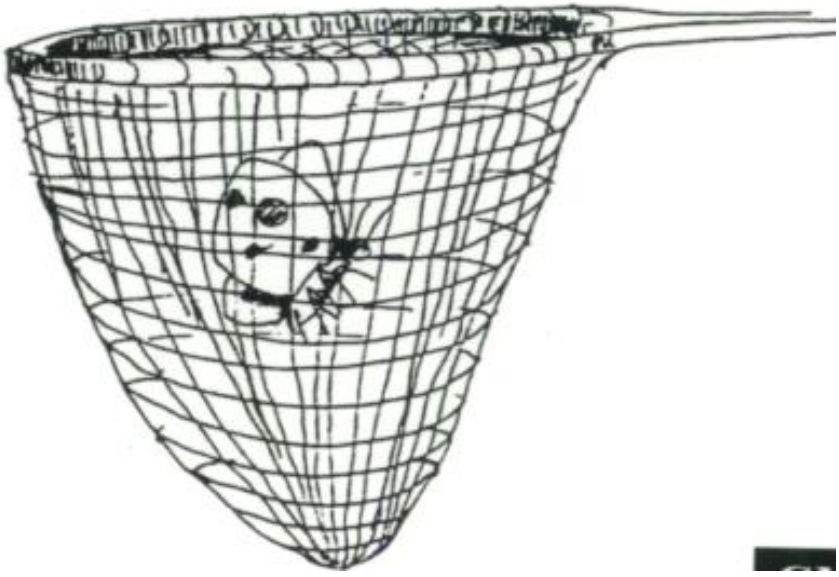

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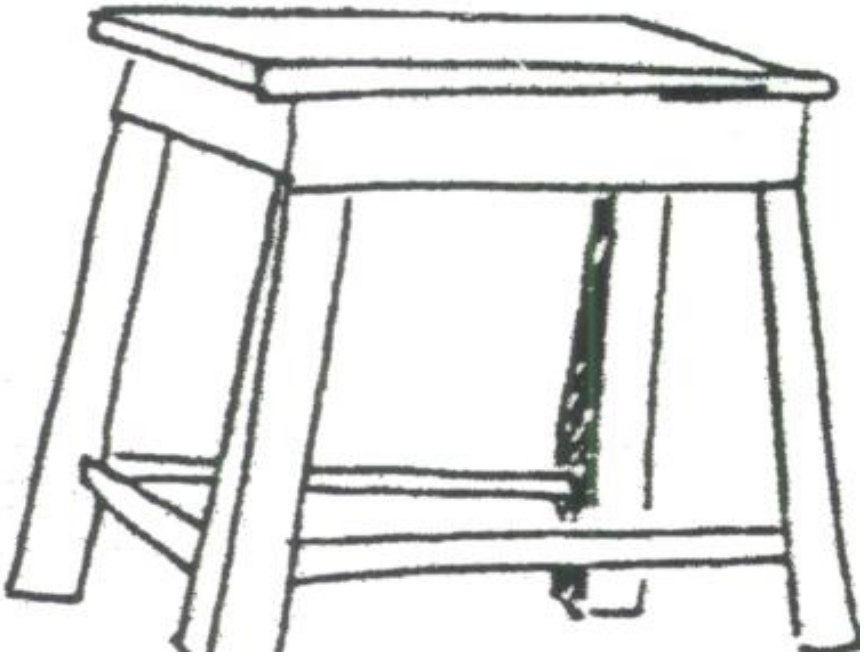

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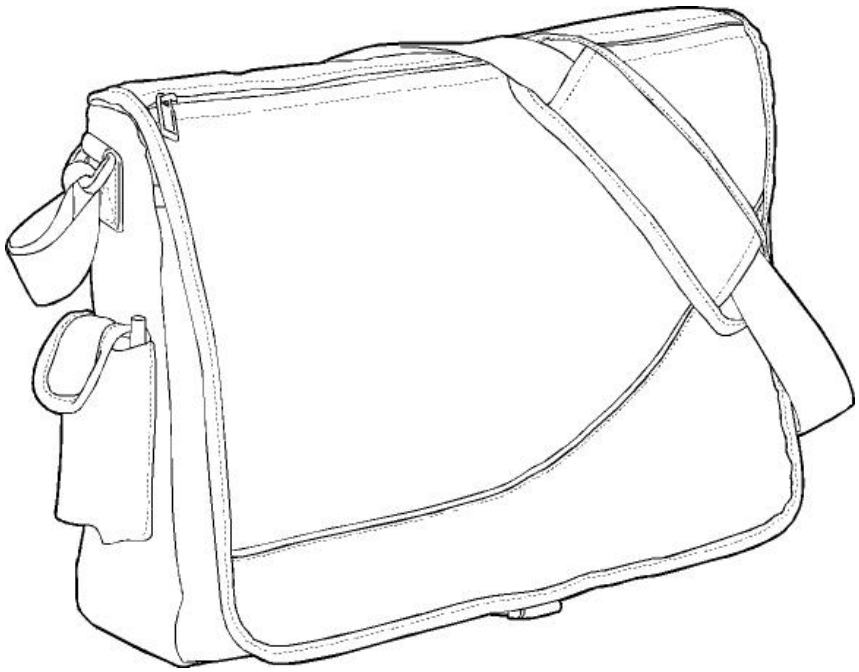

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PN – 27

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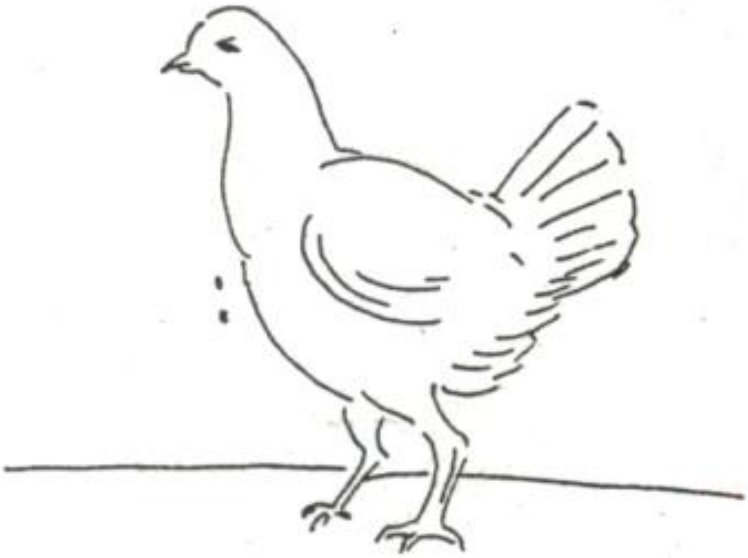

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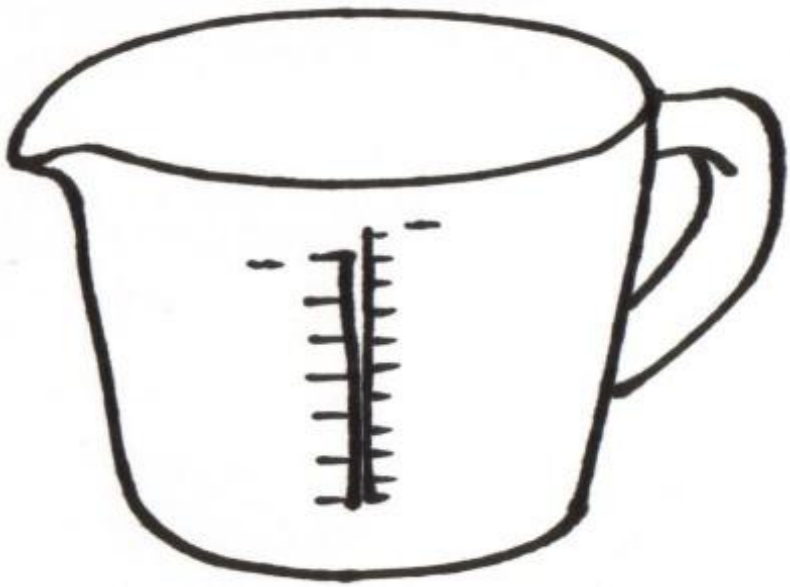

APPENDIX - B

MINI-MENTAL STATE EXAMINATION (MMSE)

Patient's Name: Date:

Instructions: Score one point for each correct response within each question or activity.

Maximum Score	Patient's Score	Questions
5		"What is the year? Season? Date? Day? Month?"
5		"Where are we now? State? County? Town/city? Hospital? Floor?"
3		The examiner names three unrelated objects clearly and slowly, then the instructor asks the patient to name all three of them. The patient's response is used for scoring. The examiner repeats them until patient learns all of them, if possible.
5		"I would like you to count backward from 100 by sevens." (93, 86, 79, 72, 65, …) Alternative: "Spell WORLD backwards." (D-L-R-O-W)
3		"Earlier I told you the names of three things. Can you tell me what those were?"
2		Show the patient two simple objects, such as a wristwatch and a pencil, and ask the patient to name them.
1		"Repeat the phrase: 'No ifs, ands, or buts.'"
3		"Take the paper in your right hand, fold it in half, and put it on the floor." (The examiner gives the patient a piece of blank paper.)
1		"Please read this and do what it says." (Written instruction is "Close your eyes.")
1		"Make up and write a sentence about anything." (This sentence must contain a noun and a verb.)
1		"Please copy this picture." (The examiner gives the patient a blank piece of paper and asks him/her to draw the symbol below. All 10 angles must be present and two must intersect.)
30		TOTAL

Interpretation of the MMSE:

Method	Score	Interpretation
Single Cutoff	<24	Abnormal
Range	<21 >25	Increased odds of dementia Decreased odds of dementia
Education	21 <23 <24	Abnormal for 8thgrade education Abnormal for high school education Abnormal for college education
Severity	24-30 18-23 0-17	No cognitive impairment Mild cognitive impairment Severe cognitive impairment

Interpretation of MMSE Scores:

Score	Degree of Impairment	Formal Psychometric Assessment	Day-to-Day Functioning
25-30	Questionably significant	If clinical signs of cognitive impairment are present, formal assessment of cognition may be valuable.	May have clinically significant but mild deficits. Likely to affect only most demanding activities of daily living.
20-25	Mild	Formal assessment may be helpful to better determine pattern and extent of deficits.	Significant effect. May require some supervision, support and assistance.
10-20	Moderate	Formal assessment may be helpful if there are specific clinical indications.	Clear impairment. May require 24-hour supervision.
0-10	Severe	Patient not likely to be testable.	Marked impairment. Likely to require 24-hour supervision and assistance with ADL.