DEMENTIA ASSESSMENT BATTERY – KANNADA

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A dissertation submitted in part fulfilment for the degree of

Master of Science (Speech – Language Pathology)

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ALL INDIA INSTITUTE OF SPEECH & HEARING,

MANSAGANGOTHRI, MYSORE-570006

MAY 2009.

DEDICATED TO

DAD, MOM AND BROTHER

&

"IN REMEMBRANCE OF ALL THE DEMENTICS WHO CANNOT REMEMBER US"

CERTIFICATE

This is to certify that this dissertation entitled ***"Dementia Assessment Battery – Kannada"*** is a bonafide work in part of fulfillment for the degree of Master of Science (Speech – Language Pathology) of the student Registration No: 07SLP019. This has been carried under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award of any diploma or degree.

Dr. Vijayalakshmi Basavaraj
Director
All India Institute of Speech & Hearing,
Manasagangothri, Mysore – 570 006.

Mysore
May, 2009

CERTIFICATE

This is to certify that this dissertation entitled ***"Dementia Assessment Battery – Kannada"*** has been prepared under my supervision & guidance. It is also certified that this dissertation has not been submitted earlier to any other university for the award of any diploma or degree.

Dr. Shyamala. K. Chengappa
Guide
Professor in Language Pathology & HOD (DMD),
Department of Speech – Language Pathology,
All India Institute of Speech & Hearing,
Mansagangothri, Mysore-570006.

Mysore
May, 2009

DECLARATION

This is to certify that this master's dissertation entitled "***Dementia Assessment Battery – Kannada***" is the result of my own study under the guidance of Dr. Shyamala. K. Chengappa, Professor, Department of Speech – Language pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier to any other university for the award of any degree or diploma.

Mysore **Registration No: 07SLP019**

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CHAPTER – 1

INTRODUCTION

Dementia is a common clinical syndrome characterized by a decline in cognitive function and memory from previously attained intellectual levels, which is sustained over a period of months or years. The deterioration is of such severity that it impairs the affected individual's ability to work and to perform activities of daily living, including communication. Cummings and Benson (1992) state that at least three of the following five areas of mental activity must be involved: 1. Language; 2. Memory; 3.Visuospatial skills; 4. Emotion or personality; and 5. Cognition (ex: abstraction, calculation, and judgment).

Dementia is an umbrella term that encompasses many distinct subtypes. There are least 11 principal dementia syndromes: (1) degenerative disorders; (2) vascular disorders; (3) myelinoclastic disorders; (4) traumatic conditions; (5) neoplastic disorders; (6) hydrocephalic dementias; (7) inflammatory conditions; (8) infection related dementias; (9) toxic conditions; (10) metabolic disorders; (11) psychiatric disorders. These categories can be further subdivided into dozens of specific types.

The *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM – IV)*; American Psychiatric Association, 1994 states that the essential feature in dementia is 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.

According to Alzheimer's & Related Disorders Society of India (ARDSI), in India, approximately 3 to 4 million people have been affected by dementia. According to the WHO (2003) study, about 4% of the population over 65 years is afflicted with dementia; it is expected that around 10 million people will be afflicted with Alzheimer's disease by 2010. And it is expected to be 36 million by 2020 (WHO, 2003).

In the Asian subcontinent and specifically in the Indian context, prevalence of dementia has not been estimated widely. In a single study, the prevalence of dementia in Kerala was found 33.6 per 1000. Alzheimer's disease was the most common type (54%) followed by vascular dementia (39%), and 7% of cases were due to other causes such as infection, tumor and trauma. Family history of dementia was a risk factor for Alzheimer's disease and history of hypertension was a risk factor for vascular dementia (Shaji & Bose, 2005).

The nature and course of dementia will vary depending upon the etiology. Most dementias are progressive, but some are static. 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.

Stages of Progression

Identifying the course of dementia in stages or phases has been found helpful in understanding the evolution of the condition. Reisberg and Ferris (1974) have reported the course of dementia into seven clinical phases with corresponding global deterioration stages. The stages range from no cognitive decline to very severe decline. The clinical stages are characterized as normal, forgetful, confused and demented.

Early Dementia

In early dementia, the individual's behavior is characterized by moderate cognitive decline. Deficits may be noted during assessment of the mental status as well as in daily life. The patient may be disoriented to time and place and may be unable to recall personal information such address or telephone number. The person may need assistance in activities of daily living, such as getting dressed, etc… Communication deficits are present and characterized by disjointed conversation that is reduced in its cohesion and information content (Reisberg, et al, 1974).

Middle dementia

Middle dementia is characterized by severe cognitive decline. The dementing individual may forget a spouse's name and be unaware of recent events. More assistance is needed with daily living activities. Communication skills become increasingly impaired and verbal output becomes less informative with frequent word finding problems. Personality and emotional changes are seen in this stage. These may include

delusional behavior, such as talking to imaginary figures, obsessive symptoms, anxiety (Reisberg, et al, 1974).

Late dementia

Very severe cognitive decline is seen in late dementia. In this stage, all verbal abilities are reported to be lost. Patients may be mute, perseverative, echolalic, or palilalic (with excessive reiterative utterances) (Reisberg, et al, 1974).

CLINICAL FEATURES

Although the core features are the same for all dementias, the onset and course may vary. Alzheimer's disease is usually insidious in onset. The time from the onset of clinical features to presentation for evaluation varies considerably and depends on the etiology of the dementia, as well as personal and social factors, including individual and cultural attitudes and beliefs about aging, premorbid personality, and intelligence.

Cognitive Impairment: The core symptoms of cognitive dysfunction in dementia, as defined in the DSM-IV-TR (2004), are described as follows

1. **Memory:** Loss of short-term memory is often the first clinical feature that comes to the notice of patients and their relatives. Typically, memory impairment is manifested by difficulty in learning new information. As dementia progresses, retrieval of highly learned information (long-term memory) also becomes impaired. Memory deficits maybe reflected in repetitiveness, missing appointments, misplacing objects etc. Topographical memory is also commonly affected, and patients may get lost. In mid-

stage dementia, disorientation is usually confined to unfamiliar places. As the disease progresses, this impairment can occur in familiar environments as well. Confabulation may also occur and may manifest itself as insertion of false memories.

2. **Language**: Aphasia may present as impoverished speech and can eventually progress to mutism in the severe stage. Nominal aphasia is common in the mild stage. Typically, this presents as word-finding difficulty, initially for low frequency words but later for higher frequency words. Later, fluent and non-fluent aphasias and jargon aphasia (meaningless phrases) may occur. Receptive aphasia is also common and is severely disabling. An important clinical point to note is that, even when language has disintegrated completely, patients may understand nonverbal communication, such as gestures and pictures.
3. **Praxis**: Apraxia is the loss or diminished ability to perform coordinated motor tasks, assuming that there is no neurological or other damage to the peripheral motor apparatus. It reflects dominant parietal involvement in the dementia process. Apraxia is a major cause of loss of independence inpatients, as it is reflected in the initiality to cook, to dress, to wash, to go to the toilet, and to eat.
4. **Gnosis**: Agnosia, is the failure to accurately recognize sensory stimuli in the absence of sensory (eg. visual or olfactory) deficits.

- Visual agnosia maybe reflected in the functional misuse of everyday objects (eg. urinating in the sink).
- Prosopagnosia is the inability to recognize faces, even of friends and relatives.

Agnosias can occur in all sensory modalities. Some demented patients may, for example, be unable to recognize familiar smells.

5. **Executive Functioning**: Executive functioning is defined as the ability to plan, to sequence, to abstract, and to carry through complex tasks. Deficits in executive functioning are seen particularly in disorders affecting the frontal lobes. Executive functioning can be assessed by reviewing the patient's ability to perform at work, to pay bills, and to plan activities. Neuropsychological tests directly address executive functioning by asking the person to have flexibility in how they approach an organizational task (i.e. the ability to shift sets) or to copy complex figures, drawing a clock. These latter tests are not specific to executive functioning but can demonstrate how the patient addresses a task that involves planning and organization.
6. **Personality and Behavioral Changes**: Individuals with dementia become indecisive and introverted. The spectrum of emotions displayed maybe narrowed, with the loss of warmth and humor. This constellation of symptoms, often called negative symptoms, is usually characterized by prominent apathy. It is important to differentiate these latter symptoms from depression, which characteristically has prominent sadness, tearfulness, neuro-vegetative changes, suicidal tendency, and inappropriate guilt, among other characteristics. The negative symptoms do not respond to antidepressant medication. Abnormalities of mood are well described in the early stages of dementia. In addition, severe depression may mimic or exacerbate dementia. Mania is also occasionally seen.

In other patients, changes in behavior are reflected in agitation or disinhibition. Social skills may be lost, and there may be sexual disinhibition, use of inappropriate language, or both. Agitation may include irritability, angry outbursts, and threatening or aggressive behavior, as well as pacing and purposeless behaviors (eg. packing and

unpacking). Patients may wander, including leaving their homes in the middle of the night.

COURSE AND PROGNOSIS

Depending on etiology and severity at the time of presentation, the course and prognosis of dementia vary. Correcting potentially reversible causes is crucial, such as profound hypothyroidism, vitamin B_{12} deficiency, chronic subdural hematoma, or severe major depression. However, treatment of these reversible causes of dementia may not completely restore cognitive function. Most dementias are progressive and therefore inevitably have a poor prognosis. Modifying identifiable risk factors, such as poorly controlled hypertension in a vascular dementia, can alter progression of the illness. The time from diagnosis to death in Alzheimer's disease is usually estimated to be 8 to 10 years, and the morbidity and mortality of vascular dementia maybe worse than Alzheimer's disease, presumably because of risk of further cerebrovascular events, as well as other atherosclerotic disease.

The progression of dementia maybe complicated by other medical illnesses, such as stroke complicating the course of Alzheimer's disease. In general, degenerative dementias have an insidious onset and are gradually progressive. The pattern may initially include periods of more gradual decline, followed by a more rapid progression. Vascular dementia tends to have an abrupt onset and a more stepwise pattern, associated with further vascular insults, but may have a gradual and progressive course. Radiation induced dementia may present months after radiation exposure and may have a progressive course.

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 of 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.

Considering the incidence of dementia related communication disorders is increasing in India, there is a need to develop test batteries for identification and diagnose dementia by speech language pathologists. We need to have a test battery which will be

used for differential diagnosis between normal aging and several types of dementia. Currently, there are no specific treatment programs available for individuals with dementia as there is a lack of information on language deficits in individuals with various types of dementia. Therefore, there is a need to develop a test battery on which we can plan individual treatment programmes depending upon the type of dementia and severity of dementia in early stages itself. There are some assessment tools available in western countries but no suitable tests are available for dementia in Indian context. So, we need to have appropriate tests to identify the persons with dementia in Indian context.

CHAPTER – 2

REVIEW OF LITERATURE

Dementia is not a disease, it is a symptom complex caused by a disease. The term dementia will be used to refer to the impairment in short and long term memory associated with impairment in abstract thinking, impaired judgment, and other disturbances of higher cortical function or personality change. The disturbance is severe enough to interfere significantly with work or usual social activities or relationships with others (DSM – III, 1987).

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 SUBCORTICAL 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 subcortical 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 neurochemical and neuropathologic relationships between areas (Whitehouse, 1986). Nevertheless, the cortical and subcortical distinction provides a neuroanatomic organization that is useful in sorting out the syndromes causing dementia. In the cortical dementias, the dementia is the primary dysfunction, whereas in the subcortical dementias, the dementia occurs as a secondary feature of the symptom complex. The following table provides the characteristics of cortical, subcortical and mixed dementias, as well as related disorders.

Table – 1: Cortical dementias – DAT Vs Pick's disease (Ripich, 1995).

	DAT	**Pick's disease**
Onset	Gradual	Gradual
Etiology	Diffuse damage: neurofibrillary tangles, senile plaques, granulovascular degeneration	Pick bodies, inflated neurons, atrophy of the anterior portions of the frontal and temporal lobes
Course	Progressive and irreversible	Progressive and irreversible
Language and	Semantics and pragmatics	Slow, deliberate speech,

Speech	impaired early, syntax and phonology impaired later, speech impaired very late	anomia, breakdown in syntax, defect in auditory comprehension
Memory	Impaired early, worse for remote events	Impaired recent memory
Performance characteristics	Tries to perform, alert, consistent level of performance	Emotional liability and apathy, loss of tact and judgment
Physical characteristics	Normal (some pacing)	Motor involvement in later stages

Table – 2: Subcortical dementias – Parkinson's disease Vs Huntington's disease (Ripich, 1995).

	Parkinson's disease	**Huntington's disease**
Onset	Sporadic	Insidious
Etiology	Autosomal dominant, degenerative disease of the nervous system especially in the substantia nigra	Variety of causes: autosomal dominant trait, idiopathic, drug induced, postencephalitic, loss of golgi cells in corpus callosum

Course	Progressive & irreversible	Progressive & irreversible
Language and Speech	Language minimally impaired, speech impaired, weak, breathy voice, abnormal pitch rate and loudness, inappropriate silences	Dysarthria worsens, language organization, sequencing and naming abilities impaired as the disease progresses
Memory	Forgetful, impaired recall, slowed response	Impaired, especially for remote events in the disease
Performance characteristics	Slowness of responses	Early stages: irritability, apathy, untidiness, impulsiveness
Physical characteristics	Abnormal, slow, tremor, rigidity, bradykinesia	Abnormal, shuffling gait, jerky gait, festinating, choreic

Table – 3: Subcortical dementias – Supranuclear palsy Vs Wilson's disease (Ripich, 1995).

	Supranuclear Palsy	**Wilson's disease**
Onset	Gradual	Gradual
Etiology	Related to changes in the reticular formation, thalamus or hypothalamus	Inherited autosomal recessive trait, basal ganglia, Excessive levels of copper in the brain

		and lever
Course	Progressive	Progressive
Language and Speech	Dysarthria, speech becomes inaudible and unintelligible with gurgling, harsh guttural sounds	Dysarthria, irregeular articulatory breakdown, hypernasality, inappropriate silences
Memory	Impaired	Impaired
Performance characteristics		
Physical characteristics	Pseudobulbar palsy, dystonia, severe rigidity of head and neck producing a backward retracted head position	Slowness, tremors, rigidity, bradykinesia or involuntary movements, severe ataxia and dysphagia in the later stages

Table – 4: Mixed dementias – Korsakoff's disease Vs Creutzfeldt – Jakob disease Vs MID (Ripich, 1995).

	Korsakoff's disease	**Creutzfeldt – Jakob disease**	**MID**
Onset	Gradual	Variable: gradual or	Sudden

		sudden	
Etiology	Cortical atrophy resulting from chronic alcohol abuse	Infectious, transmissible, unconventional virus, results in degenerative cortical tissue, i.e, spongiform encephalopathy and nonspecific atrophy	Multiple lesions, softening of brain tissue, alteration in cerebral blood vessels
Course	Stable or minimally progressive	Rapidly progressive	Stepwise, irreversible
Language and Speech		In stage – 2: aphasia, apraxia, agnosia; In stage – 3: mutism	Impaired pattern, dependent on site of lesion
Memory	Decreased skills, poor attention, amnesia	Forgetfulness in initial phase	Impaired, depends on site of lesion
Performance characteristics	Affective lability	Apathetic	Variable performance based on focal lesions

Physical characteristics	May show disturbances	Sensory and visual impairments, cranial nerve palsies, rigidity, myoclonus, tremors, cerebellar disturbances	May be abnormal dependant on site of lesion

LANGUAGE PROCESSES IN INDIVIDUALS WITH DEMENTIA

Changes in communicative function with advancing age may signal the beginning of serious neurological conditions (e.g., dementia) that significantly impact functional independence (Bayles & Kaszniak, 1987). The ultimate purpose of the research studies are to develop sensitive and reliable measures of cognitive linguistic change that can be used to periodically assess speech, language, and cognitive abilities as part of a comprehensive adult illness prevention and health maintenance protocol. Early detection of cognitive-linguistic disorders with sensitive, reliable assessment tools may be expected to result in timely intervention thereby reducing disability and enhancing rehabilitation.

Numerous studies have investigated diagnostic markers for early identification of dementia and mild cognitive decline with advancing age, (Albert, Blacker, Moss, Tanzi, & McArdle, 2007; Cunje, Molloy, Standish, & Lewis, 2007). Mainly, these protocols focus on dementia rating scales and neuropsychological test batteries to assess normally functioning older adults and individuals with cognitive deficits. The long-term goal of these studies was to identify measures sensitive to cognitive decline.

Language measures such as verbal fluency may be sensitive to cognitive decline (Ostberg, Fernaeus, Hellstrom, Bogdanovic, & Wahlund, 2005), and studies have explored language as well as cognitive variables for signs of pathological aging. For example, the Barnes Language Assessment (Bryan, Binder, Dann, Funnell, Ramsey, & Stevens, 2001) was developed to assess language and associated cognitive abilities in older individuals. It includes tasks that examine language expression, comprehension, reading, writing, executive function, and memory that were adapted from existing measures.

A prominent disturbance in language functions is a commonly observed feature of the cognitive impairment associated with dementia. In the typical case, the DAT patients' spontaneous speech is characterized by word finding difficulties that result in phrases that are circumlocutory in definite and empty of content.

Confrontation naming deficits may or may not be evident early in the course of DAT, but are invariably present by the later stages. When asked to name real items or items that are pictured in outline drawings, DAT patients often are completely unable to name them, or they commit semantic errors, such as producing the name of the super ordinate category to which the item belongs (e.g. animal for horse) or an incorrect name from the same semantic category (e.g. cow for horse). This impairment in naming ability becomes more severe as dementia progresses. In contrast to DAT, confrontation naming remains relatively unaffected in some other dementing disorders. Hodges, Salmon, and Butters (1991) and Bayles, Tomoeda (1983) reported that both mildly and moderately demented HD (Huntington's disease) patients were unimpaired on the Boston naming Test.

A number of investigators have reported that patients with DAT have an impaired ability to verbally generate words (lexical-generative naming). Several studies have demonstrated that in the earliest stages of DAT, the impairment of category fluency is greater than that of letter fluency. Hodges, Salmon, and Butters (1991) found that DAT patients who performed equivalently to age matched controls on the letter fluency task were impaired relative to these control subjects on the category fluency task. As dementia progresses and patients become moderately impaired, this letter category fluency discrepancy becomes less prominent and patients perform equally poorly on both tasks.

Despite the DAT patient's deficits in these semantic aspects of language, grammatical and syntactic processes remain relatively preserved until the later stages of the disease. Mild to moderately impaired DAT patients make few syntactic errors and are similar to normal individuals in the grammatical complexity of their speech. Because the language dysfunction evident in DAT appears to result primarily from semantic rather than grammatical deficits, the impaired confrontation naming the fluency exhibited by DAT patients early in the course of the disease have important implications for the nature of their semantic memory disorder (Hodges, et al, 1991).

EARLY STAGE DEFICITS

The earliest language deficit observed in DAT is anomia. DAT patients have difficulty coming up with words of structured tasks such as vocalist generation as well as in elicited narratives and spontaneous conversation. Semantically empty words are scattered throughout the DAT patients' utterances in place of competent words, thereby

maintaining fluency and sacrificing informational content. Language comprehension for simple structured concrete manual appears intact during this early stage. However comprehension of abstract language that does not rely on meaning of single word in syntactic structures, but rather requires inference is poor even in the earlier stages of DAT. Also early on patient have a difficult time generating spontaneous language via writing although the mechanics of writing and reading remain intact. At this point DAT patients can communicate sufficiently for most social situations, although they may not be able to follow complex conversations and may tend to degrees or repeat themselves. Although the DAT patient is often initially aware of his or her own language deficits, this awareness appears to wane by the end of the early phase (Reisberg, Ferris, 1974).

MODERATE STAGE DEFICITS

By the moderate stages of DAT, patients begin to have more difficulty with both production and comprehension of language. In production, anomia worsens and word finding deficits are made more obvious by copious substitutions of empty words and circumlocutions for information bearing nouns and verbs. The utterances of moderate DAT patients are often difficult follow because of pragmatic deficits, including poor topic maintenance and poor use of pronouns. Certain other discourse skills, such as turn taking in conversation remain undisturbed. Comprehension for complex material (e.g. sequential instructions) is often impaired by this stage. Although the mechanics of reading aloud and writing remain unimpaired deficits in producing well formed coherent writing and reading for comprehension parallel problems observed in auditory spoken language. In the moderate stages DAT patients conversations become difficult to follow and that patients may withdraw slightly from social situations in which communication

demands many occur. They often appear unaware of their communicative deficits at this point.

The more severe language deficits associated with this stage illustrated by another narrative description of the cookie theft picture. At this point the empty words and paraphasias render the narrative largely uninterruptible. The patient's uses of descriptive phrases that have no direct relationship to the picture elicit several requests for clarification from the examiner. However the patient appears unable to clarify the narrative (Reisberg, Ferris, 1974).

LATE STAGE DEFICITS

By the later stages of the disease venue production become uninterpretable because of paraphasias (word and sound substitutions) and lack of coherence. Late in the course of the disease dysarthria may impair speech intelligibility equally the patients' manifest echolalia (repetition of others) palilalia (repetition of self). At this point comprehension is impaired all modalities even for single words and the patients are no longer successfully participating it official interaction through language or any other communicative modalities (Reisberg, Ferris, 1974).

INTERPRETING LANGUAGE DEFICITS IN DEMENTIA

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

1. First there are language impairments that do not occur in DAT. For instance, there are no reports agrammatism of the type associated with Broad 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. And finally there are no description phonologic disturbance that is DAT patients do not violate the phonotactic consume of their native language (using nonnative 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 morphosyntactic deficits are rare and phonologic deficits are rarer still.

2. Second many authors have attempted in describe 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 the 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 are the language disorders association of with it. The language deficits are continually changing and recovery has never been observed the language patterns of focal aphasia 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.

SEMANTIC IMPAIRMENTS IN DEMENTIA

The semantic memory system is a hierarchically organized network of conceptual knowledge that contains the permanent representation of the knowledge of objects, facts, and concepts as well as knowledge of words, their meanings and their relationships. Semantic memory is the highest faculty in the cognitive system and the point in the information processing chain where information from the perceptual system is interrelated and synthesized with factual information (Au & Bowles, 1991). An intact semantic memory is vital for accurate identification and naming of objects as well as the understanding and production of written and spoken words (Au & Bowles, 1991; Bayles et al, 1987).

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 PAD spontaneous speech progressively contains fewer nouns and more verbs and adverbs than that of controls (Blanken et al. 1987).

In the early stages of PAD, semantic difficulties are thought to be more influential on naming responses than perceptual responses and have attracted more investigation.

Semantically-related errors predominate in naming, suggesting that there is an underlying semantic disorder (Bayles and Tomoeda 1983; Hodges et al. 1991). Explanations for this have followed those proposed by Warrington and Shallice (1979) of either impaired access to semantic information or a degraded semantic store. Both the impaired access and impaired storage accounts have been applied to naming behavior in PAD.

The search for clue into the origin of anomia in DAT has continued beyond the visual perceptional theory and has focused on specifically semantic deficits that are problems in impaired lexical access and deterioration of lexical representations.

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.

Another source of support for this view comes from semantic priming data that indicate that sub conscious semantic associations may be intact in DAT. Several researchers have demonstrated that, like normal subjects. 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, & 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 subjects (Chertkow, Bub, & Seidenberg, 1989). In addition, 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).

SYNTACTIC DEFICITS IN DEMENTIA

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 subject, 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 may lexical semantic errors. More important 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 subjects 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.

Uneven profiles grammatical abilities across tasks have been observed in other forms of brain damage and explanations for these disassociations fall into two broad categories those that postulate modality specific blockage (e.g. a motor output problem in the case of preserved comprehension and impaired production in Broca's aphasia) and those that postulate selectively impaired independent processors for different

grammatical tasks. The dissociation between intact syntactic production and impaired comprehension in DAT may have another explanation. Over all memory and processing demands may have affected performance on comprehension tasks more than production tasks. It was argued against this explanation citing the finding that DAT patients were able to repeat all of the stimuli accurately even though they could not comprehend them suggesting that the problem is not necessarily one of the memory but more likely the result of deterioration of complex syntactic processing (Emery, 1988).

The research on syntactic abilities in DAT has more general implications for theories of mental functions. Dissociations between mental functions reveal the cognitive and neurologic independence of these abilities and have led scientists to many of the important discoveries of hemispheric specialization and localization of function. 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.

PRAGMATIC DEFICITS

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 extralinguistic 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.

By the moderate stages of the disease, the course of DAT patients often becomes irrelevant lacking in topical cohesion and grossly incensory to the needs of the listener. Still unaddressed are the underlying causes of the discourse problems in DAT. These deficits could be secondary to existing and document problems such as anomia, decreased attention for poor memory, etc. On the other hand, they may really originate from more general pragmatic deficits that imply the ability of the DAT patients to take the perspective of the listener and to judge what information is important in the particular discourse. Further, DAT may selectively affect specific discourse knowledge. Any of these deficits could create incoherent conversions.

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.

Further description of the discourse problems in DAT can be used to delineate which aspects of pragmatics are related to which aspects of linguistic & nonlinguistic cognition. For instance it can be hypothesized that some aspects of discourse (e.g. topic maintenance) dependent on recent memory and be deficient early on in the disease. Conversely some aspects of discourse are more structural (e.g. the use of definite and indefinite articles to signal new versus old topics) and may be retained with morphosyntactic abilities. Other aspects of pragmatics may be unrelated to either memory or morphosyntax (e.g. politeness and use of speech registers) and therefore should be considered separately.

During the last decades, the discourse abilities of persons suffering from senile dementia of Alzheimer's type (DAT) have elicited a large amount of research. A 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, and 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. In that study, both groups of persons with DAT or fluent aphasia showed a significant impairment of lexical encoding of information. 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.

Compensation through informative gestures was also more frequent in persons with aphasia than in those with DAT. A Principal Component Analysis supported the idea that the performance of the patients depended on two distinct components of the speech production system: the lexical encoding of information, and the elaboration of message content with respect to the listener's perspective. 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.

ABSTRATCTION OF PROBLEM SOLVING PROCESSES

An impairment of the abstract thinking and problem solving and a deficient ability to shift or maintain set is often a prominent clinical feature of DAT. These deficits are usually ascribed to the neuropathologic changes that occur in the prefrontal association cortex of patients with DAT. Although these deficits may emerge at different stages in various patients, they are invariable present by the middle stages of the disorder.

Freedman and Berman (1986) have reported that the impaired performance of the DAT patients on these tasks presumably results from deficiency in cognitive flexibility that is required to alternate responses and shift mental set.

VISUOSPATIAL PROCESSES

Patients with DAT appear to suffer a selective impairment of visuospatial processing independent of lower level visual functioning. The higher level visuospatial dysfunction of patients with DAT is most evident on tests of constructional apraxia, including tests such as the Block design subtest from the Wechsler Adult intelligence Scale Revised (WAIS-R) and drawing tasks. The block design subtest requires patients to reproduce pictured red and white designs with three dimensional blocks that are red on two sides, white on two sides, and half and half white on two sides. Drawing tests usually involve spontaneously drawing to command or copying abstract complex figures, clocks and two dimensional representations of a cube. In addition patients with DAT often have difficulty in visual discrimination and visual matching tests.

There is evidence that subgroups of DAT patients exhibit either primarily verbal or visuospatial deficits when tested clinically, and that these differential patterns correlate with greater glucose hypo metabolism in the left or right hemisphere respectively.

MEMORY PROCESSES

Although DAT involves significant deficits in a number of cognitive abilities, memory impairment is usually the most prominent feature throughout the course of the disease. Patients with DAT exhibit significant anterograde (i.e. recall of information acquired in the past) memory deficits that become progressively worse over time. Although memory impairment his traditionally been considered to be pervasive and global in DAT, several recent studies indicate that there are at least some preserved memory capacities in these patients and that the pattern of impaired and preserved

memory processes may be useful for differentiating DAT from others forms of dementing illness.

Recent studies of memory processes in demented patients have focused upon explicit and implicit memory.

Explicit Memory

Explicit memory refers to information that the subject specifically attempts to retain and subsequently recall or recognize, or to particular knowledge that can be consciously retrieved from an existing stores. Explicit memory tests can be further sub divided into those that assess episodic or semantic memory. Episodic memory consists of information for events and episodes that remain tightly linked to the spatial and temporal context in which they were originally acquired. Semantic memory on the other hand, comprises general knowledge, rules and procedures that are highly over learned and essentially context free. For example knowledge of the alphabet, rules of arithmetic and the words that make up one's vocabulary are all part of semantic memory.

The episodic memory impairment of DAT patients has been attributed, at least in part to a failure to consolidate new information. In studies of patients with circumscribed amnesia, rapid rates of forgetting have been associated with damage to the medial portions of the temporal lobes. Huppert and Piercy (1979) reported that an amnesic patient with bilateral medial temporal lobe damage forgot pictorial materials more rapidly than did intact controls and other amnesics with medial diencephalic lesions, even when the subjects' initial levels of recognition were made equivalent by increasing stimulus exposure for the amnesic patients. Because the medial temporal regions of the brain are

prominently affected in DAT it is anticipated that DAT patients would exhibit an unusually rapid rate of forgetting that would differentiate them from HD and other basal ganglia disorders.

Implicit memory

Implicit memory refers to information that does not require conscious recollection. In many tests of implicit memory, the subjects performance is unconsciously facilitated by the presentation of previous stimulus materials (eg priming) or by repeated memory tests with demented patients was spotted by recent demonstrations of preserved memory capacities in patients with circumscribed amnesia (i.e. memory disorder with no concomitant cognitive deficits)

Patients with DAT exhibit a unique pattern of impaired and preserved capacities on tests that assess implicit memory. Two types of implicit memory tests, verbal priming and motor skill learning have been extensively the evaluation of the dementias. Studies have demonstrated that DAT and HD patients differ greatly in their ability to perform their two types of implicit memory tests.

Heindel, Salmon, Shults, Walicke and Butters (1989) conducted a study to compare the performance of patients with DAT, HD and Parkinson's disease (PD) on both the motor and lexical priming tasks. The results of this study demonstrated a double dissociation between DAT and HD patients on the two implicit memory tasks. The DAT patients were severely impaired on verbal priming but showed normal acquisition of the pursuit motor task the HD patients showed the opposite relationship. The performance of the PD patients depended on whether they were demented of not. Demented PD patients

were impaired on both implicit memory tasks, where as the nondemented PD patients were intact on leads tests for both the HD and PD patients impairments on the motor skill learning task correlated with their degree of dementia, not with the severity of their motor deficits (i.e. chorea bradykinesia, rigidity and tremor.

DIAGNOSIS AND ASSESSMENT PREMISES

Despite our rapidly expanding knowledge of the dementias, the diagnosis and assessment of symptomatology in these syndromes remains a complex knowledge. Diagnosis and assessment of dementia have been complicated by a number of factors. Diagnosis is problematic in that presently a definitive diagnosis of DAT can only be made on histopathologic evidence of plaques and tangles found in the brain tissue after death (Moss & Albert, 1988). Clinical intervention must precede from a presumptive or probable diagnosis based on a case history and clinical profile of medical and behavioral test results. The assessment of symptomatology of dementia is complicated by a number of factors, including the lack of well developed instruments to study cognition in these syndromes, the overlap of common geriatric depression symptoms and dementia symptoms, and the paucity of clinical knowledge and criteria for description of certain syndromes with which dementia patients are likely to present (Reisberg, Ferris, Borenstein, 1986).

A correct diagnosis and comprehensive assessment of DAT and other forms of dementia are critical for prognosis, treatment and case management. There are three premises in diagnosis and assessment of dementia. First, the initial diagnostic work – up and assessment must be viewed as a dynamic and ongoing process (Sohlberg & Mateer,

1989). Because the rate of change is variable and the symptom complex heterogeneous, systematic reassessment is required.

Second, because dementia is a symptom complex that includes physical, social, cognitive, and communication features, multiple perspectives are required for adequate diagnosis and assessment. These perspectives can only be provided by an interdisciplinary team of professionals from medicine, nursing, speech – language pathology, psychology, social work and audiology. In addition, referral to a variety of other specialists may provide valuable information in a comprehensive evaluation. Referral should be made to those with geriatric expertise. Such professionals include but are not limited to occupational therapists, physiotherapists, ophthalmologists and nurses.

An overview of the appropriate case history, medical laboratory studies and neuropsychological tests and behavioral ratings as well as language and communication measures will be presented based on this collaborative perspective. As specialists in communication disorders, SLPS are often asked to provide consultation regarding communication competence of dementia patients. Although the results of the communication assessment may be used for differential diagnosis, it is more likely that results will be used to evaluate the patient's progression in the course of the dementia.

The third premise is that a communication assessment of dementia must be broadly based and move beyond traditional linguistics measures. There are several reasons that this premise is important. Communication is considered to be most complex organizational and interactive behavior of human beings. Breakdowns in the ability to use language successfully and appropriately offer insight into the underlying cognitive

decline of these persons (Ripich, Terrell, Spinelli, 1983; Ulatowska, Cannito, Hyashi, Fleming, 1985). Alzheimer's patients' communication abilities also may be closely tied to other abilities for functional living as well as to their rate of mortality (Kaszniak, Fox, Gandell, 1978). Loss of disruption of abilities in communication frequently leads to institutionalization. For these reasons, understanding of communication abilities would better enable us to ascertain and predict the course of the patient care needs.

Assessment and initial evaluation of dementia

A complete evaluation for dementia should include (1) a careful and through case history; (2) neurologic and medical diagnostic studies and examination; (3) behavioral assessment; and (4) communication assessment. The selection of tests should be judiciously made by an interdisciplinary team based on the patient's cognitive skills and ability to participate and tolerate the testing situation.

Case history interview

The case history may be taken by the physician, nurse, social worker, neuropsychologists, SLP or other qualified health care professional. It is crucial that the history be fully developed because of the role the information plays in the diagnosis. Because no peripheral marker for DAT is presently known, diagnosis depends upon a variety of different kinds of information that allows the exclusion of the other possible causes for the presenting symptoms. Historical data are important to the SLP in the assessment process because they provide information describing the communication contexts and communicative demands encountered by the patient on a daily basis.

Areas of Assessment

A complete history should include information in the areas of health, psychological, cognitive, social, and communication status, as well as any special problems that may be occurring. The areas like health status, cognitive – psychological status (Folstein, McHugh, 1978; Wells, 1979; Wells, 1980), social status (Zarit, Reever, Bach-Peterson, 1980; Kinney, Stephens, 1989), communication status (Chapey, 1986) and special problems should be taken into consideration during interview of any dementia patient.

Medical and Neurologic evaluation

Medical evaluation

In combination with a careful history, a physical and neurologic examination should be completed by the patient's primary physician or neurologist. The examination should include a series of diagnostic laboratory studies with certain ancillary studies when appropriate (NIHCC, 1987; NIATF, 1980). The recommended studies are listed in Table – 5.

Table – 5: Medical and Neurologic diagnostic studies.

S. No	Type of studies	Diagnostic studies
1	Blood Studies	Complete blood cell count
		Sedimentation rate
		Glucose

		Electrolytes
		Calcium and phosphorus
		Bilirubin
		Vitamin B12 and folate
2	Radiographic studies	Chest X – Ray
		Computed tomography of the brain
3	Other studies	Electrocardiogram
		Tests for syphilis
		Tests for AIDS
		Electroencephalogram
4	Optional studies	Magnetic resonance imaging
		Regional cerebral blood flow – positron emission tomography

This list should serve as guide to the SLP for the sorts of tests required initially to identify and differentiate among the various disease bases for dementia. Interpretation of these test results can only lead to a presumptive clinical diagnosis (McKhann, Drachman, Folstein, 1984). However, these results serve to rule out a variety of systematic diseases

and disorders, as well as cerebrovascular attacks and conditions that may produce symptoms similar to those associated with DAT.

Neurologic Evaluation

Test result information is valuable to SLPs and may guide their diagnostic assessment process. In return, language tests can prove valuable to neurologists and physicians in their diagnostic process. Recent research in neurologic aspects of DAT has indicated specific associations between loss of language abilities and neurologic alterations (Kirshner, Webb, Kelly, Wells, 1984; Obler, 1983; Albert, Naeser, Levine, Garvey, 1984). Kaszniak et al, (1978) indicated that poor expressive language scores may predict poor prognosis for survival in DAT. For some as yet unknown reason, early brain deterioration in the dominant hemisphere language areas appears to be a prognostically bleak sign. Improved specification of relationships between communication and neurologic changes may prove useful in the prediction of long – term care needs of DAT patients.

The neurologic examination can be valuable in differential diagnosis because neurologic tests explore the characteristics of cerebrovascular disease and can be crucial in differential diagnosis of MID and DAT. Also, computed tomography (CT) studies of DAT reveal that enlargement of the ventricles is a reflection of the presence of DAT. In some cases, CT scans are useful to identify individuals with DAT (Albert, Stafford, 1988). In addition, relationships between CT scan patterns and neuropsychologic tests and rating results are beginning to be identified (Moss et al, 1988). The narrower the range of scoring choices on the measure (ex GDS or MMSE) the more difficult is to

produce robust correlations. Regional cerebral blood flow studies and positron emission tomography studies have proved helpful in diagnosis of the different dementias.

BEHAVIORAL ASSESSMENT

Behavioral assessment can be completed using three approaches: 1. Performance on neuropsychological tests; 2. Observation of behavior in natural contexts; 3. Reports from family members, friends and care givers regarding the patient's behavior. These three approaches provide a multimodal perspective of behavior. They allow a comprehensive assessment as well as provide data for cross checking performance by looking for confirming evidence across multiple behavior assessment methods.

Behavior assessments conducted by neuropsychologists normally generate considerable direct information concerning memory, attention, orientation, etc. and more cursory information regarding communication, language and speech. In contrasts, SLPs comprehensively assess communication, language and speech functions and more generally examine the domains of overall cognitive status.

Collaborative work among SLPs, medical and social work professionals is generally not problematic. Porch and Haaland (1984), however, contend that neuropsychologists and SLPs are not well trained for interdisciplinary work, and the result is often duplication of efforts and a competitive rather than cooperative approach to working with adult brain impaired patients. It is important that SLPs be knowledgeable about behavioral tests and ratings scales for three reasons. First, results from these evaluations can help predict the course of the dementia. Second, these measures describe the patient's full range of communication assessment and intervention. Finally, these

results can support and aid the interpretation of language, communication, speech and or hearing findings. Table – 6 lists the behavioral assessment measures recommended for use with dementia patients.

Table – 6: Behavior assessment measures for use with dementia patients.

S. No	Behavior domain	Tests
1	Intelligence	Wechsler Adult Intelligence Scale – Revised (Wechsler, 1981).
2	Memory	Wechsler Memory scale – revised (Russel, 1975))
		Fuld object memory test (Fuld, 1980)
		California verbal learning test (Delis, Krmaer, Kaplan, 1987)
		Benton visual retention test (Benton, 1974)
3	Abstraction	Picture absurdies of Stanford – Binet (Terman, Merrill, 1973)
4	Mental status	Blessed Orientation and memory examination (Blessed, Tomlinson, Roth, 1968)
		Mini mental state – examination (Folstein, Folstein & McHugh, 1975)

		Mental status questionnaire (Kahn, Goldfarb, Pollack, Peck, 1960)
5	Behavior rating scales	Brief cognitive rating scale (Reisberg, 1983)
		Mattis dementia rating scale (Mattis, 1976)
		Global deterioration scale (Reisberg, Ferris, DeLeon, Crook, 1982)
		Functional assessment stages (Reisberg, Ferris, Anand, 1984)
		Clinical Dementia Rating (Hughes, Berg, Danzinger, Coben, Martin, 1982)

Neuropsychological assessment

Neuropsychological performance tests provide objective and precise measurement of cognitive function; however, a major problem with their use is that they do not relate directly to functioning in practical situations, i.e., they lack ecological validity. For this reason, behavioral ranting scales that illustrates/actual behavioral features are an important addition to the assessment protocol. A multimodal assessment provides various perspectives of the patient's behavioral abilities necessary for a comprehensive description of functional behavior.

Given the complex and diverse nature of cognitive disturbances in dementia, intelligence and memory should be assessed. At present there are no specific standardized comprehensive psychometric tests for dementia or DAT so that batteries of tests designed to assess cognitive functioning are most often used. Bayles and Kaszniak, (1987) provide a comprehensive review of neuropsychologic tests. A neuropsychologic tests battery should include assessments of all domains of intelligence and memory functioning with additional assessments of abstraction abilities. The Wechsler Adult Intelligence Scale – Revised (WAIS – R) is the most commonly used instrument for documenting intellectual functioning (Wechsler, 1981). Breakdown between verbally based abilities and visuospatial and visuomotor skills may reflect lateralized versus diffuse brain dysfunction (Sohlberg, Mateer, 1989). Individual subtest scores may reveal discrete areas of impairment such as construction or flexibility (Bayles, 1986).

Both the Wechsler memory scale (Wechsler, 1945) and revised Wechsler memory scale (Russell, 1975) are used to assess memory functioning. The revised WMS has been shown to differentiate normal and demented persons (Logue, Wyrick, 1979). Haaland, Linn, Hunt and Goodwin (1983) developed norms for ages 65 to 80 years for the revised WMS. Although there are certain limitations to the application of these norms in that volunteer subjects were better educated than the general population, they provide much – needed, age appropriate data for interpretation of memory performances (Bayles & Kaszniak, 1987).

In addition to the assessment of intelligence and memory, a neuropsychological battery should include tests to examine skills of abstraction, eg., comprehension of proverbs, picture absurdities, etc… both DAT Pick's disease demonstrate problems in

this area of cognitive functioning early in their course (Moss, et al, 1988). A complete neuropsychological assessment will generally evaluate visual field acuity and perception, fine motor skills, hearing acuity and discrimination and written and oral language skills. However, a comprehensive assessment of language requires the services of a speech – language pathologist.

Rating scales

Mental status assessment may be completed using the Blessed orientation and memory examination (Blessed, et al, 1968), or Fuld's modification of this examination (Fuld, 1978), the Mini mental status examination (Folstein, et al, 1978) or the mental status questionnaire (Goldfarb, 1975). In addition to mental status assessment, a series of cognitive functioning rating scales provide systematic guides for measuring loss and/ or maintenance of abilities.

The Brief Cognitive Rating Scale (BCRS) (Reisberg, 1983) is a rapid, structured instrument for assessing cognitive decline, regardless of etiology. Items are organized into five categories or axes. These include concentration and calculating ability, recent memory, remote memory, orientation and Functioning and self care. Within each axis behaviors are scored from one to seven, with one being the least impaired and seven being the most impaired. Each score is related to distinguishable levels of functioning within the category.

The global deterioration scale (GDS) for age related cognitive decline and Alzheimer's disease is a scale of seven stages designed to parallel the seven levels within each of the five axis categories of the brief cognitive rating scale (Reisberg, Ferris,

DeLeon, Crook, 1982). During stage – 1, there is no cognitive decline and this rating should be supported by normal WAIS vocabulary and Mini mental status examination scores. Stage – 2, very mild cognitive decline and forgetfulness, should be supported by normal mini mental status examination, slightly depressed Wechsler Adult Intelligence scale vocabulary scores, and in the language areas, the forgetting of names formerly well known. In stage – 3, the mild cognitive decline and early confusional phase, patients will still maintain at a borderline normal level on the MMSE, but Wechsler Adult Intelligence scale vocabulary scores are generally one standard deviation below normal. Word finding and naming deficits are apparent to intimates and memory for things read declines at this stage. Stage – 4, the moderate cognitive decline and late confusional phase, is sometimes termed as the pre dementia phase. Here the MMSE will generally show a slightly depressed score. Stage – 5 indicates moderately severe decline and early dementia. Almost all patients who reach this stage continue to decline. At stage – 6, patients show severe cognitive decline and middle dementia. In stage – 7, a very severe decline and late dementia generally correspond to the loss of all verbal abilities. Although there is a great variability in the presentation and progression of DAT, as well as difficulty differentiating the later stages of symptoms, developing distinct stages of the illness has utility (Moss, et al, 1988).

The Functional Assessment Stages (FAST) distinguishes 15 distinct progressive characteristics of the disease (Reisberg, et al, 1984). These characteristics can be related to the seven stages within Axis V, functioning and self care, of the brief cognitive rating scale. It is proposed that patients with uncomplicated DAT typically proceed on a linear course through the characteristics of decline. Recognition of these distinct stages of DAT

is clearly an advance in enabling clinicians to identify the precise magnitude of the impairment as well as help in the differential diagnosis of DAT. FAST is particularly useful in the later stages of the disease when other measures may not carefully identify the magnitude of the breakdown.

Clinical dementia rating (CDR) offers a rating from 0 (healthy), 0.5 (questionable), 1 (mild dementia), 2 (moderate dementia) to 3 (severe dementia) across six categories: memory, orientation, judgment, community affairs, home and hobbies and personal care. This scale is frequently used to stage patients for subject groups in dementia research. However, it is interesting to note that this scale does not include communication as a domain to be rated.

In summary, clinical assessment of behavior should include a comprehensive history and a series of recommended medical studies. In addition, neuropsychological instruments such as the WAIS- R and WMS – R, as well as abstract thinking, visual, motor and general hearing and language tests should be completed. Observational assessments of mental status are valuable. Rating of stage of decline in dementia can be accomplished using Global deterioration scale, functional assessment stages, and clinical dementia rating. These behavioral assessment tools provide information to complement the findings of the case histories and medical diagnostic studies.

LANGUAGE AND COMMUNICATION ASSESSMENT

Numerous investigations of aspects of language in dementia can be found in the literature. However, to date no comprehensive examinations of communication deficits or competence have been conducted (Bayles & Kaszniak, 1987). Additionally, no

normative data for evaluating the performance of individuals with dementia on functional communication tasks are available (Fromm and Holland, 1987; Holland, 1984). Although declines in phonology, syntax, and semantics have been well documented (Bayles, 1982; Bayles, Boone, Tomoeda, Slauson, Kaszniak, 1989; Murdoch, Chenery, Wilks, Boyle, 1987; Schwartz, et al, 1979), recent studies of communicative skills indicate that the degree of the decline in communication abilities seems to exceed the decline in specific language domains (Fromm, Holland, 1987; Ripich, Terrell, 1988; Ulatowska, Haynes, Donnell, 1986). Therefore, a complete description of communication impairments in DAT would require a shift to a view of communicative competence encompassing more than simply linguistic competence. A comprehensive, valid and reliable assessment of the breadth of communicative abilities should include evaluation of a range of pragmatic and discourse features (e.g., topic, repairs, cohesion, and coherence, communicative acts, propositions, and organizational schemas) in addition to assessment of phonologic, syntactic and semantic domains (Bayles, Kaszniak, 1987).

LANGUAGE AND COMMUNICATION MEASURES

Conceptual Model and Rationale

Many of the assessment batteries designed to address the communication abilities of dementia patients based on conceptual models of language processing that includes "top down" and "bottom up" organization (Danks, Glucksberg, 1980; Lemme, Danes, 1982). These models are relevant to the study of dementia because they consider the

language features more vulnerable to cognitive dissolution as well as those that are better maintained.

Assessment battery for dementia should be developed on the principle that communication should be assessed across variety of contexts or genres. In addition, it should meet the six principles for the composition of a test battery in dementia proposed by Bayles and Kaszniak (1987):

1. Measures should assess aspects of semantic memory (eg: concepts, schemas …)
2. The language tasks should include processing of inferences and generation of ideas
3. The units of language analyzed should be longer than a sentence
4. The assessment should include the study of discourse in an ecologically valid context such as conversation
5. Measures should test nonautomatic process, such as pragmatics and semantics versus the more automatic processes of syntax and phonology
6. The assessment should require active participation by the patient so that creative and generative communication occurs.

A comprehensive evaluation of communication decline should include a standardized test of linguistic competence that assesses oral and written language production and comprehension, as well as additional tests for specific language problems in pragmatics, semantics, syntax and phonology, and finally a language memory task. Table – 7 lists recommended assessment tools for measuring communication abilities.

Table – 7: Language and communication assessment measures for use with Dementia Patients.

S. No	Level	Behavior	Measure
1	Comprehensive	Receptive and expressive oral and written language	Arizona Battery for Communication Disorders of Dementia, (Bayles KA, Tomoeda CK, 1993) Boston Diagnostic Aphasia Examination, (Goodglass, H., Kaplan, E, 1983) Western Aphasia Battery, (Kertesz, 1982). Porch Index of Communication Ability, (Porch, B. E. 1967)
2	Pragmatics and discourse	Schemata, turn taking, topic management, conversational repair, speech act use, paralinguistic, nonlinguistic and cohesion and coherence	Discourse Abilities Profile (Terrell, B., Ripich, D. 1989).

3	Semantics	Lexical comprehension, confrontation naming, word fluency	Peabody Picture Vocabulary Test, (Dunn, L. M., Dunn, L. M, 1981) Boston Naming Test (Kaplan, Goodglass & Weintraub, 1983)
4	Syntax	Sentence comprehension, sentence formulation	Token test, (DeRenzi, E., Faglioni, P 1978) Auditory comprehension test for sentences, (Shewan, C. M. 1979)
5	Phonology	Word Production	Boston Diagnostic Aphasia Examination (subtest III) (Goodglass, H., Kaplan, E, 1983)
6	Memory and Language	Delayed Story Retelling	Completeness of novel story retold after 1 hour

COMPREHENSIVE LANGUAGE TESTS

Both general and detailed descriptions of the communication changes associated with various forms of dementia are now available (Bayles & Kaszniak, 1987; Gravell, 1988; Ross, Cummings & Benson, 1990; Bayles, Tomoeda R. Trosset, 1992). It is clear that language deterioration is one of the core symptoms of many types of dementia and is

prominent in one of the most common types: Alzheimer's disease (AD/DAT). Furthermore, several studies have shown that caregivers of people with dementia rate communication breakdown among their prime concerns (Rabins, Mace & Lucas, 1982).

However, the role of the speech and language therapist with the individual who has dementia remains ill defined. Bayles and Kaszniak (1987) list diagnosis, monitoring, therapy and counseling among the responsibilities of the speech and language therapist. Gravell (1988) suggested that there might be a varying role for speech and language therapy input at different stages of the disease process as well as a clear role in assessment and diagnosis. Griffiths and Baldwin (1989) used their own experience (of a new full-time speech and language therapist position as part of a multi-disciplinary team working in old age psychiatry) to include roles in assessment, advice on management, research and teaching. Bourgeois (1991), in evaluating the efficacy of different communication treatments for adults with dementia through a literature review, concluded that although there is evidence in the literature for the potential for positive outcomes, more research is required.

American Speech, Language and Hearing Association (2005) issued a position statement which highlights the SLPs role in dementia and other cognitive disorders. According to this, there are five major roles that the clinicians have with individuals with cognitive – communication impairments, namely identification/assessment, intervention, inter – professional collaboration, case management, and education/advocacy (Appendix – E).

Appropriate and dedicated assessment and therapy material for people with dementia are still limited. The Working Party on Dementia Report (College of Speech and Language Therapists, 1993) reported that therapists working with people who have dementia use assessments designed for other client groups, such as people with aphasia. Therefore, the working party suggested that there exists a 'clinical need for the development of conceptually strong and clinically appropriate evaluations of a diagnostic and/or descriptive nature'.

Such an assessment has already been developed and standardized in the USA and UK – Arizona Battery for Communication Disorders of Dementia (ABCD) (Bayles & Tomoeda, 1993) which can be used by SLPs to diagnose and assess the severity of dementia. This fulfills the criteria of working party in its conceptual strength and clinical appropriateness and in its primary aim to quantify the linguistic communication deficits associated with AD. Furthermore, the ABCD was designed to allow a differential diagnosis between normal aging and mild AD and between mild AD and moderate AD.

The ABCD comprises 14 subtests which comprehensively assess linguistic comprehension and expression, verbal episodic memory, visuospatial construction and mental status. The subtests of ABCD are listed in Table – 8 by construct. It also contains four tasks for identifying individuals with problems that might invalidate the test results, such as a hearing problem, illiteracy, a visual field defect, and visual agnosia. Tests of memory, mental status and visual perceptual and construction skills were included in the battery because by definition, dementing diseases produce deficits in memory, mental status and perception (Reisberg, Ferris, DeLeon & Crook, 1982; Cummings & Benson,

1992). Integrity of these processes and types of knowledge are essential for normal communicative function to occur.

Table – 8: ABCD subtests by constructs.

Mental Status	**Episodic Memory**	**Linguistic Expression**	**Linguistic Comprehension**	**Visuospatial Construction**
Mental status	Story Telling: Immediate	Object description	Following commands	Generative Drawing
	Word Learning: Free Recall, Total recall, Recognition	Generative naming	Comparative questions	Figure Copying
	Story retelling: Delayed	Confrontation naming	Repetition	.
		Concept definition	Reading comprehension: Words, Sentences	

To enable clinicians to identify individuals in the very early stages of dementia and to be able to document the progressive effects of dementing diseases, the ABCD

contains some relatively hard and easy subtests. The more difficult tests are those which require episodic memory, such as Story Retelling: Delayed and the Free Recall part of the Word Learning subtest. Results of the US standardization study demonstrated that between 84-100% of mild and moderate AD subjects scored below the scores that are at the fifth percentile of normals on these measures. The easiest subtests were Word Reading, Following Commands and Figure Copying. The ABCD was standardized on 272 individuals: 86 with AD; 70 with Parkinson's disease (PD); 86 age-matched normal old people, and 30 normal young people. All subjects lived in Arizona and spoke English as a first language, were literate, had no history of alcohol or drug abuse, or of previous psychiatric or neurologic problem.

They were able to read 18-point font print and to pass the ABCD Speech discrimination subtest with 80% or better accuracy. Subjects were evaluated for depression with the Hamilton Depression Rating Scale (HDRS) (Hamilton, 1960) and all passed with a score 42 (a value associated with depression: Lazarus et al., 1987). Although no formal measure was given to assess subjects' financial status, none was destitute and most considered their economic status to be middle income. Subjects with AD were diagnosed by a neurologist according to NINCDS-ADRDA diagnostic criteria for AD (McKann et al., 1984). Excluded were people with evidence or a history of epilepsy, diabetes, hypertension, myocardial infarction, stroke or focal brain lesion. All PD subjects were evaluated by a neurologist who specialized in movement disorders.

Finally, individuals who received a rating of 1 (no cognitive decline/normal) or 2 (very mild cognitive decline/forgetfulness) on the Global Deterioration Scale (GDS) (Reisberg et al., 1982) were excluded. Normal young subjects were recruited from

community high schools and the University of Arizona. Results of the analyses of standardization data indicated that the ABCD has test-retest reliability, high internal consistency, and is strongly positively correlated with performance on three measures which demonstrate sensitivity to dementia: the GDS (Reisberg et al., 1982); the 'Mini-mental state' examination (Folstein, Folstein & McHugh, 1975); and the Block Design subtest of the Wechsler Adult Intelligence Scale (WAIS) (Wechsler, 1981).

ABCD was standardized on UK population by Armstrong, Sheena E., Bayles, and Tomoeda, Cheryl K (1996). They had taken three groups of subjects: normal young adults (N = 19), normal older subjects (N = 20) and dementia subjects (N = 13). Results indicated that the overall performance of UK subjects was very similar to that of the original subjects from the USA. Therefore for this test, the source standardization data can be employed when examining the performance of a young person who has had a head injury with resultant memory and linguistic deficits; an older person who may be in an early stage of Alzheimer's disease; and an older person who has a diagnosis of probable Alzheimer's disease. From a total of 51 UK/USA pairings of mean scores on subtests, only four showed significant difference.

For the young and old normal subjects, UK subjects scored less than subjects from the USA on Object Description (in which subjects are required to describe a nail and score for each appropriate piece of new information provided). There are at least three possible reasons for this finding: either UK subjects were actually unable to say as much in their description of a nail; or their sociolinguistic style produce a less full verbal description; or perhaps scoring was more conservative for the UK subjects (as there was potential for unanticipated responses, the examiner had some flexibility in scoring).

Older normal UK subjects also scored significantly less well on Concept Definition, where they were required to provide three pieces of information (including one function and one attribute) for 20 words (those which were named in the previously presented confrontation naming test). The foretasted reasons can also be invoked here, alongside the possibility that lack of familiarity with some of the stimuli (e.g. 'porcupine', 'mail-box') could also be an age related influencing factor (because the performance of the young normal subjects did not show significant difference from that of the sample from the USA on this subtest).

For the moderate AD subjects, only the recognition subtest of Word learning produced a significant difference. This finding has been explained earlier as a result of a difference in test administration in the UK and the USA. As is indicated by the low mean scores for the moderate AD subjects (typical of the people with AD who might be referred for speech and language therapy in the UK), they had great difficulty in succeeding in many of the subtests of ABCD. This assessment therefore demonstrated for the present group of peoples their deficits rather than assets (the group was able to score two-thirds of the potential maximum score on only three of the subtests). Thus, although it shows clearly those areas of memory and linguistic performance which were affected, it may be less informative than an 'easier' test, on which a floor effect would not be found.

The authors of the ABCD have developed such a test: the Functional Linguistic Communication Inventory (FLCI) (Bayles & Tomoeda, 1994). The FLCI was designed for the assessment of the functional linguistic communication skills of people with moderate or severe dementia and is reported to take approximately 30 min to administer.

It has 10 components which evaluate: greeting and naming; question answering; writing; sign comprehension and object-to-picture matching; word reading and comprehension; ability to reminisce; following commands; pantomime; gesture; and conversation. The FLCI is unusual in its use of the same words as stimuli in various subtests. This organization will demonstrate clearly which functions are most vulnerable, e.g. naming, writing or reading.

The review of literature has focused on various aspects like definition, characteristics, and assessment aspects of dementia. Going through the literature on dementia, we see how there is gradual shift of interest towards research work and clinical work on dementia population. The present study was undertaken to develop and standardize a test battery on normal population and also on dementia population.

Need for the study

There are some assessment tools available in western countries but no suitable tests are available for dementia in Indian context. So, we need to have appropriate tests to identify the persons with dementia in Indian context. As the review of literature suggests, individuals with dementia have language deficits along with other cognitive deficits. Therefore, there is a need to develop a test battery to assess the language deficits and other cognitive deficits such as memory, etc… in these subjects. Considering that the incidence of dementia related disorders is increasing in India, there is a need to develop specific test batteries for identification and diagnosis of dementia. We need to have a test battery which will be used for differential diagnosis between normal aging and the

several types of dementia. Currently, there are no specific treatment programs available for individuals with dementia as there is a lack of information on language deficits in individuals with various types of dementia. Therefore, there is a need to develop a test battery on which we can plan initiation of individual treatment programmes depending upon the type of dementia and severity of dementia in early stages itself.

Aim of the study

1. To develop an assessment test battery for Kannada speaking individuals with dementia.
2. To standardize the test material on normal population and in individuals with various types of dementia.
3. To profile the language deficits of individuals with various types of dementia.

CHAPTER – 3

METHOD

The present study was undertaken to develop and standardize a test battery on normal population and also on dementia population.

Four groups of subjects were considered in which three groups of subjects were normal individuals (young adults, adults and geriatric groups) and another group included individuals with dementia.

Normal people were tested to form a baseline which will be considered as normative for this test. Normal 30 young adult subjects in the age range of 20 – 40 years, normal 30 adults in the age range of 40 – 60 years and normal 30 old subjects 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 the subjects were evaluated for their mental status on Mini Mental Status Examination (Folstein, Folstein & McHugh, 1975) 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 (Reisberg, Ferris, Anand, 1984) were included in this group. Demographic details of the participants of normal groups are given in the Table – 9.

Table 9: Demographic data of all the groups.

S. No	Group	Males (N)	Females (N)	Total no. of subjects (N)	Mean Age
1	Young adults (20 – 40 years)	20	10	30	33.2 years
2	Adults (40 – 60 years)	20	10	30	51.6 years
3	Geriatric group (above 60 years)	20	10	30	69. 3 years

30 subjects with various types of dementia, 10 subjects in each group, mild, moderate and severe dementia based on Functional Assessment Stages (Reisberg, Ferris, Anand, 1984) and Brief Cognitive Rating Scale (Riesberg, 1983) were taken for the present study. The subjects with dementia were identified through local hospitals, dementia associations and dementia clinics in Mysore and Bangalore cities. The selection criteria for this group 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 subjects were evaluated for their mental status on Mini Mental Status Examination (Folstein, Folstein & McHugh, 1975) 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 in this group. The demographic details of the dementia subjects are given in the table – 10.

Table 10: Demographic details of dementia subjects.

Subject Number	Age/ Gender	Diagnosis	MMSE Score	BCRS Rating	FAST Rating	Severity
S1	56/M	Probable AD	20	3	5	Mild Dementia
S2	61/M	Probable AD	19	3	5	Mild Dementia
S3	58/M	Probable AD	21	4	5	Mild Dementia
S4	58/M	Probable AD	17	3	5	Mild Dementia
S5	67/M	Dementia with AIDS complex	19	3	5	Mild Dementia
S6	55/M	Probable AD	17	4	5	Mild Dementia
S7	62/M	Probable AD	17	4	5	Mild Dementia

S8	65/M	Dementia with Parkinson's Disease	16	3	5	Mild Dementia
S9	61/F	Probable AD	20	3	5	Mild Dementia
S10	68/M	Probable AD	17	3	5	Mild Dementia
S11	70/M	Dementia with Parkinson's Disease	14	5	6	Moderate Dementia
S12	65/M	Probable AD	16	5	6	Moderate Dementia
S13	62/F	Multi Infarct Dementia	12	4	6	Moderate Dementia
S14	74/M	Probable AD	14	5	6	Moderate Dementia
S15	71/F	Probable AD	14	5	6	Moderate Dementia
S16	73/M	Probable AD	13	5	6	Moderate Dementia

S17	69/M	Multi Infarct Dementia	15	6	6	Moderate Dementia
S18	63/M	Probable AD	15	5	6	Moderate Dementia
S19	71/M	Probable AD	14	5	6	Moderate Dementia
S20	76/M	Probable AD	13	5	6	Moderate Dementia
S21	75/M	Probable AD	10	7	7	Severe Dementia
S22	81/F	Multi Infarct Dementia	8	7	7	Severe Dementia
S23	72/F	Probable AD	10	7	7	Severe Dementia
S24	76/M	Probable AD	10	6	7	Severe Dementia
S25	69/M	Multi Infarct Dementia	7	7	7	Severe Dementia
S26	72/M	Probable AD	9	7	7	Severe

						Dementia
S27	78/F	Probable AD	8	7	7	Severe Dementia
S28	81/M	Multi Infarct Dementia	8	7	7	Severe Dementia
S29	79/M	Multi Infarct Dementia	11	6	7	Severe Dementia
S30	75/F	Multi Infarct Dementia	7	7	7	Severe Dementia

Tests/ tools

All the subjects 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 – B.

2. **Brief Cognitive Rating Scale (BCRS) (Reisberg, 1983):** The BCRS is a rapid, structured instrument for assessing the cognitive decline, regardless of etiology. Items are organized into five categories or axes like concentration and calculation ability; recent memory; remote memory; orientation; functioning and self care. Within each axis behaviors are scored from one to seven, with one being least impaired and seven being the most impaired. The rating scale is given in Appendix – C.
3. **Functional Assessment Stages (FAST) (Reisberg, Ferris & Anand, 1984):** This test distinguishes 15 distinct progressive characteristics of the disease. These characteristics can be related to seven stages within the global deterioration scale and levels within axis 5 of Brief Cognitive Rating Scale (BCRS). The test material is given in Appendix – D.

4. Dementia Assessment Battery – Kannada.

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 – A.

Table 11: Domains and subtests of DAB – K.

Memory	**Linguistic**	**Linguistic**	**Visuospatial**

	Expression	**Comprehension**	**construction**
Episodic Memory	Picture Naming	Comparative Questions	Generative Drawing
Working Memory	Generative Naming	Following Commands	Figure Copying
Semantic Memory	Sentence completion	Reading Comprehension of Sentences	
Delayed Story Telling	Responsive Speech	Reading Commands	
	Spontaneous Speech		
	Repetition		

Domain – 1: Memory

First domain of DAB – K is memory. This domain consists of four subtests within it. They are episodic memory, working memory, semantic memory and delayed story recall. Total score of this domain is 100.

1. **Episodic Memory:** This subtest consists of 15 items which tests the individual's episodic memory. The questions may be given orally or in writing. Each correct answer will get a score of 2 and incorrect answer gets a score of 0. The maximum possible score of this subtest is 30.

2. **Working Memory:** this subtest consists of 30 items, 15 in each of digit forward task and digit backward task. In the digit forward task, the list of 3-, 4-, 5-, 6-, 7- digits are presented to the subject and subject is instructed to hear and repeat those numbers in the same order. Every correctly repeated sequence will carry a score of 1. No score will be given if the digits are repeated in wrong order. In the digit backward task, the list of 3-, 4-, 5-, 6-, 7- digits are presented to the subject and subject is instructed to hear and repeat those numbers in the reverse order. Every correctly repeated sequence will carry a score of 1. No score will be given if the digits are repeated in wrong order. The maximum possible score of this subtest is 30.
3. **Semantic Memory:** This subtest consists of two tasks, co-ordinate naming and super-ordinate naming. In co-ordinate naming, subject is instructed to name two items for the given activity. Each correct response carries a score of 2. And the total score is 20. In super-ordinate naming, subject will be given a list of items belonging to a particular class and the subject is instructed to identify the class/ category to which the given items may be classified. Give a score of 2 for each correctly named class. The maximum possible score of this subtest is 30.
4. **Delayed Story Recall:** in this subtest, the subject will be presented a story and will be asked to answer five questions after 45 minutes of the presentation of story. Each correct response gets a score of 2. The maximum possible score of this subtest is 10.

Domain – 2: Linguistic Expression

This domain consists of six subtests, picture naming, generative naming, confrontation naming, responsive speech, spontaneous speech and repetition tasks. The total maximum score of this domain is 250.

1. **Picture Naming:** In this subtest, subject will be presented with 30 pictures and subject will be asked to name the pictures. Each correct response gets a score of 3 and mild paraphasias can be accepted. The maximum possible score of this subtest is 90.

2. **Generative Naming:** In this subtest, subject will be asked to name animals as many as possible in one minute time. Each response carries 1 mark. And the maximum score of this subtest is 20.

3. **Sentence completion:** This subtest consists of ten items, where the subject is instructed to fill in the blanks with suitable answer. Each correct response carries a score of 1. And the maximum score of this subtest is 10.

4. **Responsive Speech:** In this subtest, subject is instructed to answer 10 questions with suitable answers. Each correct response carries a score of 1. And the maximum score of this subtest is 10.

5. **Spontaneous Speech:** in this test, subject will be asked 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 (with 1 being least and 10 being maximum score) for both information content and also on fluency aspects. The maximum possible score is 20.

6. **Repetition:** In this subtest, the subject will be asked to repeat the given words and sentences. Clinician 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. Scoring for each sentence is given in the test material and the maximum possible score possible is 100.

Domain – 3: Linguistic Comprehension

The third domain of DAB is linguistic comprehension and this domain consists of four subtests within it. They are comparative questions, following commands, reading comprehension of sentences and reading commands. The maximum score of this domain is 150.

1. **Comparative questions:** this subtest consists of 10 items which are presented to the subject and subject is instructed to answer either yes or no. Each correct answer carries a score of 2 and the maximum possible score is 20.

2. **Following Commands:** this subtest consists of 11 items which are arranged in increasing complexity. Subject is instructed to listen and follow the commands given. Score for each command is given in the test material. The maximum possible score is 80.

3. **Reading Comprehension of Sentences:** this subtest consists of 8 items, which will be presented to the subject in orthographic mode and the subject is asked to choose the correct answer from four answers. Each item carries a score of 5 and the maximum possible score is 40.

4. **Reading commands:** This subtest consists of 5 commands and will be presented to the subject in orthographic mode and the subject is instructed to read and follow the

commands. Each correct response will carry a score of 2 and the maximum possible score is 10.

Domain – 4: Visuospatial Construction

This domain consists of two subtests, namely, generative drawing and figure copying. The maximum possible score is 50.

1. **Generative drawing:** This subtest consists of 8 items, where the subject is asked to draw pictures of eight items free handedly and the total score of this subtest is 30.
2. **Figure copying:** This subtest consists of 5 figures and will be presented to the subject and the subject will be instructed to copy the figures. Each correct response carries a score of 4 and the maximum possible score is 20.

All the subjects were assessed using the above four tests. The results are analyzed and presented in the results and discussion section.

CHAPTER – 4

RESULTS AND DISCUSSION

The main objective of the study was to develop and standardize the Dementia Assessment Battery – Kannada test on normal population and also on individuals with dementia. For this, the test material was administered on different groups of subjects and the results of the each group on each subtest are given in this section.

The Dementia Assessment Battery – Kannada consists of four domains, memory, linguistic expression, linguistic comprehension, and visuospatial skills with several subtests in each domain. The mean and standard deviation (S.D) of each subtest and also for each domain are calculated and they are given in this section.

Domain – 1: MEMORY

The first domain in DAB – K is Memory. This domain consists of four subtests namely episodic memory, working memory, semantic memory and delayed story recall subtests.

Subtest – 1: Episodic Memory

This subtest consists of 15 items which assess the individual's episodic memory abilities. The mean and standard deviation scores of each group of subjects are given in Table – 12 and graphical representation of the same is shown in Figure – 1.

Table 12: Mean and S.D of each group on episodic memory subtest.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	30	29.86	28.53	15.7	9.8	5
S. D.	.00	.50	2.28	2.00	1.98	1.94

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 30, 0.00; 29.86, 0.50 and 28.53, 2.28 respectively. The mean scores of normal groups ranged from 28.53 to 30. This shows that there is not much difference between the three normal groups on episodic memory task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 15.7, 2.00; 9.8, 1.98 and 5, 1.94 respectively. The scores of dementia population ranged from 15.7 to 5. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group were degrading as the severity increases.

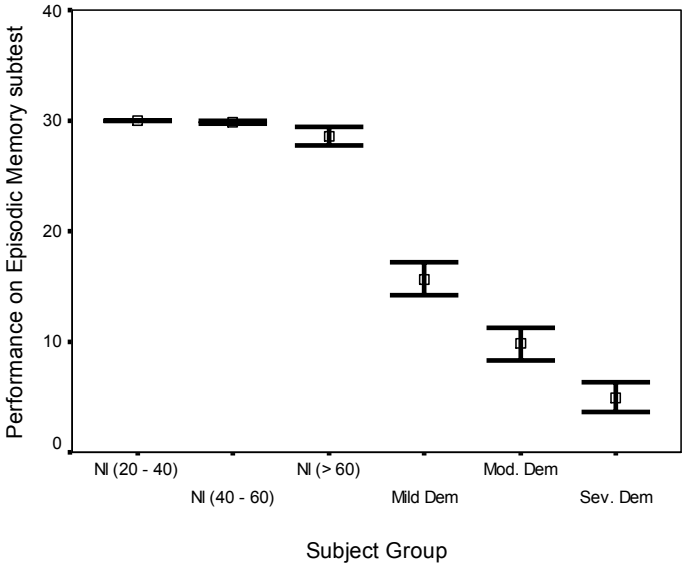

Figure 1: Error bar graph showing mean and S.D of all the groups on episodic memory task.

Performance of individuals with mild dementia is poor on questions like "Who is the prime minister of India?" "What did you have for breakfast?" etc. individuals with moderate dementia had difficulty in answering questions like "What is the color of your shirt or dress?" "Who all are there in your family?" etc. individuals with severe dementia had difficulty with almost all the questions in the task.

Herlitz, Hill, Fratiglioni and Backman (1995) reported that the episodic memory abilities of mild dementic subjects are 88.9% and moderate dementic subjects are 77.8%. And they have also reported that cognitively supported measures assessing episodic memory may be particularly useful in the detection of dementia. 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 subjects.

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 indicating that the episodic memory task is an important parameter in detecting dementia and the severity of dementia.

Subtest – 2: Working Memory

This subtest consists of 30 items (15 in each of digit forward and digit backward repetition) which assess the individual's working memory abilities. The mean and standard deviation scores of each group of subjects are given in Table – 13 and graphical representation of the same is shown in Figure – 2.

Table 13. Mean and S.D of each group on working memory subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	24.63	23.6	19.43	16.2	9.4	4.4
S. D.	1.97	2.02	2.93	1.61	1.6	1.50

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 24.63, 1.97; 23.6, 2.02 and 19.43, 2.93 respectively. The mean scores of normal groups ranged from 24.63 to 19.43. This shows that there is a decrease in the performance of normal geriatrics compared to young and middle adults on working memory abilities. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 16.2, 1.61; 9.4, 1.6 and 4.4, 1.5 respectively. The scores of dementia population ranged from 16.2 to 4.4. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group decreased as the severity increased.

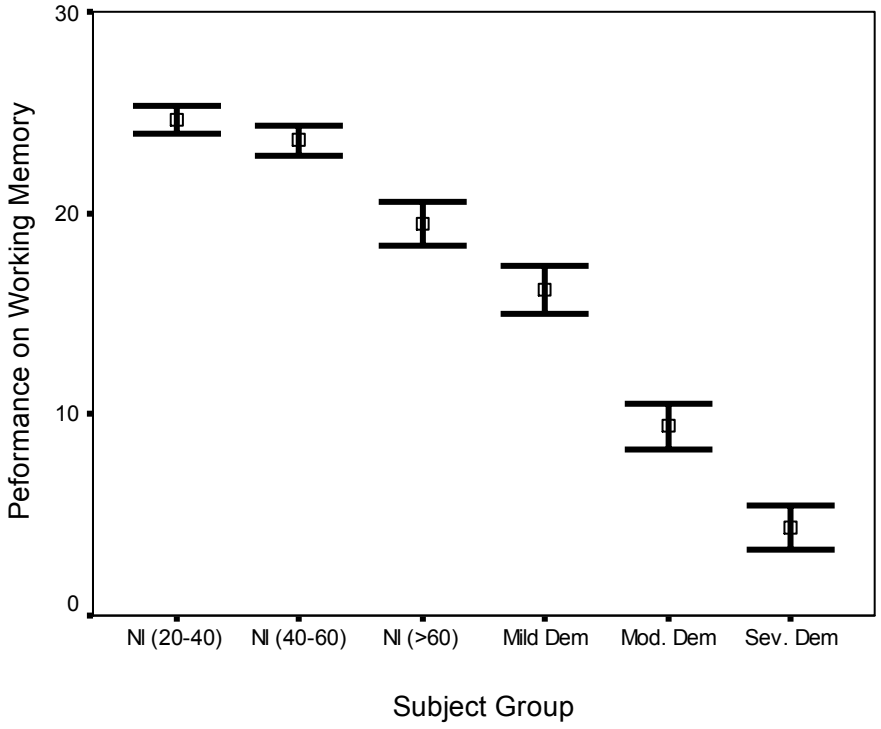

Figure 2: Error bar graph showing mean and S.D of all the groups on working memory task.

On digit forward task, mild dementics could recall five digits stimuli in the correct order, moderate dementics could recall three to four digits in the correct order and severe dementics could recall only three digits but in the wrong sequence. On digit backward task, mild dementics could recall only three digits; moderate dementics could recall three digits but in the wrong order. Severe dementics could not recall any of the stimuli.

Baddeley, Bressi, Sala, Logie and Spinner (1991) have studied the performance of dementia of Alzheimer type (DAT) subjects 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 two studies, which reports poor performance of dementia subjects on working memory tasks.

Subtest – 3: Semantic Memory

This subtest consists of 5 items each in co-ordinate naming and in super-ordinate naming, which assess the individual's semantic memory abilities. The mean and standard deviation scores of each group of subjects are given in Table – 14 and graphical representation of the same is shown in Figure – 3.

Table 14: Mean and S.D of each group on semantic memory subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	29.46	29.06	27.26	14.00	9.4	4.8
S. D.	.89	1.46	2.59	2.86	1.50	1.81

As it can be seen from the above table the mean and S.D of young adults; adults and geriatrics are 29.46, 0.89; 29.06, 1.46 and 27.26, 2.59 respectively. The mean scores of normal groups ranged from 29.46 to 27.26. This shows that there is not much difference between the three normal groups on semantic memory task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 14.00, 2.86; 9.4, 1.50 and 4.8, 1.81 respectively. The scores of dementia population ranged from 14.0 to 4.8. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of the dementia group decreased as the severity increased.

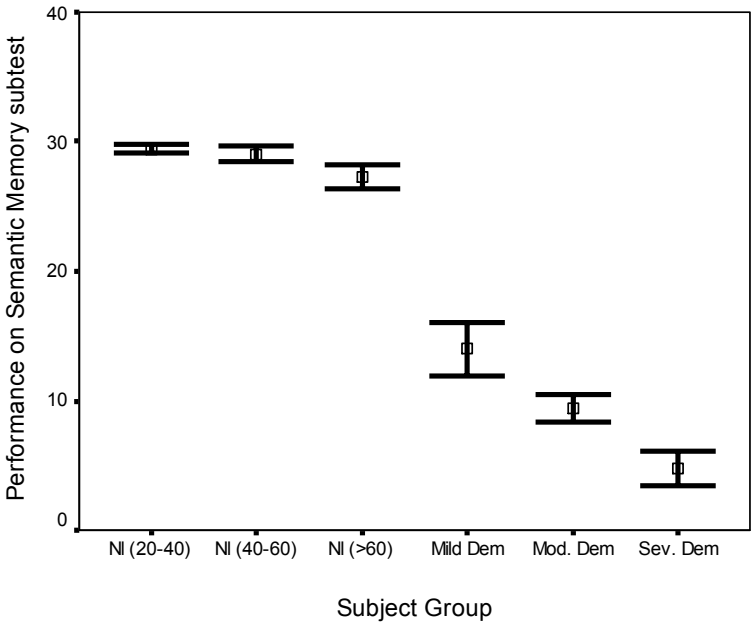

Figure 3: Error bar graph showing mean and S.D of all the groups on semantic memory task.

On coordinate naming task, most of the subjects had difficulty in naming the objects used for agriculture and cooking including some of the mild dementics.

Performance of dementics on super-ordinate naming was better compared to coordinate naming. However, the performance of severe dementics was similar in both the tasks.

Hough and Givens (2004) have reported that non brain damaged (NBD) subjects 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.

Hodges, Patterson, Garrard, Bak, Perry and Gregory (1999) have reported that DAT subjects 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.

Subtest – 4: Delayed Story Recall

This subtest consists of five questions which will be asked about a story, which will assess the individual's story recalling abilities. The mean and standard deviation scores of each group of subjects are given in Table – 15 and graphical representation of the same is shown in Figure – 4.

Table 15: Mean and S.D of each group on delayed story recall subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	9.8	9.46	7.06	4.8	4.0	1.6
S. D.	.61	1.04	1.63	2.34	1.33	.966

As it can be seen from the above table the mean and S.D of young adults; adults and geriatrics are 9.8, .61; 9.46, 1.04 and 7.06, 1.63 respectively. The mean scores of normal groups ranged from 9.8 to 7.06. This shows that there is significant difference between young, middle adult group and normal geriatric group on delayed story recall

task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 4.8, 2.34; 4.0, 1.33 and 1.6, 0.96 respectively. The scores of dementia population ranged from 4.8 to 1.6. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and that the performance of dementia group decreased as the severity increased.

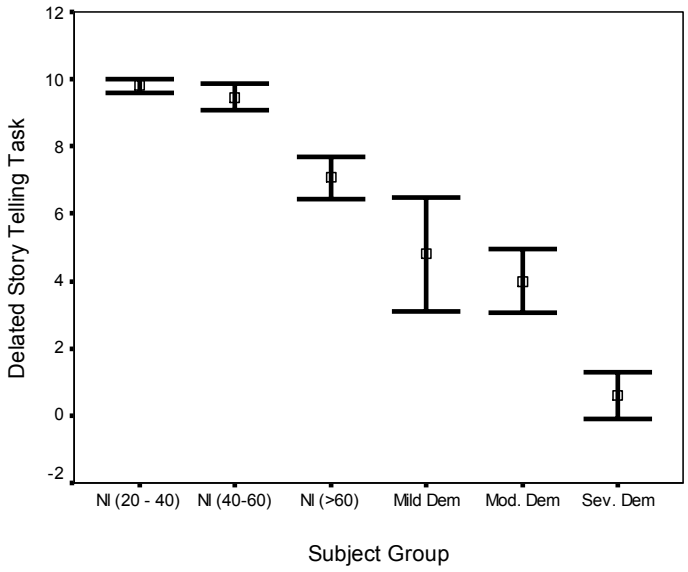

Figure 4: Error bar graph showing mean and S.D of all the groups on delayed story recall task.

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.

Domain – 2: LINGUISTIC EXPRESSION

The second domain in DAB – K is linguistic expression. This domain consists of six subtests namely picture naming, generative naming, Sentence completion, responsive speech, spontaneous speech and repetition subtests.

Subtest – 1: Picture Naming

This subtest consists of 30 items which assess the individual's picture naming abilities. The mean and standard deviation scores of each group of subjects are given in Table – 16 and graphical representation of the same is shown in Figure – 5.

Table 16: Mean and S.D of each group on picture naming subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	89.8	89.4	81.5	53.7	36.00	13.8
S. D.	.76	1.45	5.17	6.7	5.09	3.79

As it can be seen from the above table, the mean and S. D of young adults; adults and geriatrics are 89.8, 0.76; 89.4, 1.45 and 81.5, 5.17 respectively. The mean scores of normal groups ranged from 89.8 to 81.5. This shows that there is not much difference

between the three normal groups on picture naming task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 53.7, 6.7; 36.0, 5.09 and 13.8, 3.79 respectively. The scores of dementia population ranged from 53.7 to 13.8. This shows that there is a significant difference in the mean and S.D of normal groups as against dementia groups and that the performance of dementia group was deteriorating as the severity increased.

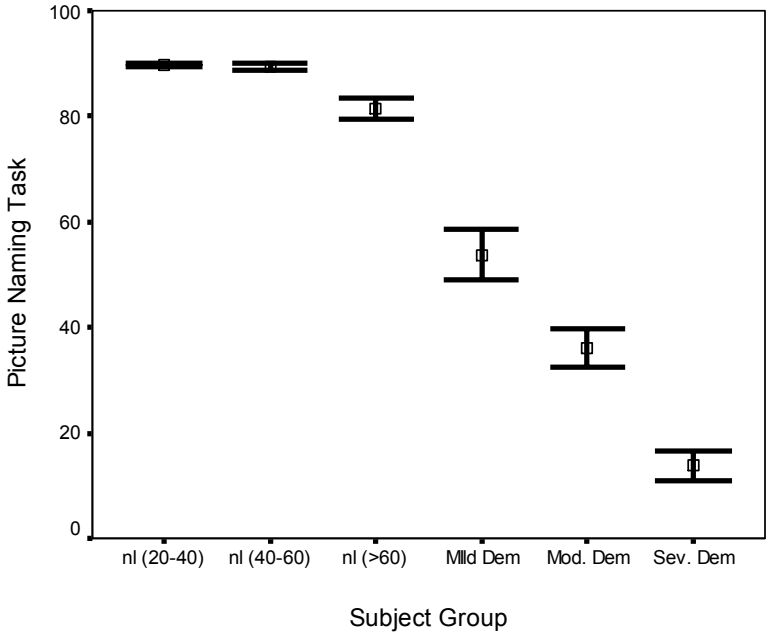

Figure 5: Error bar graph showing mean and S.D of all the groups on picture naming task.

Although the performance of mild individuals was better than moderate and sever dementics, all the groups exhibited semantic type of paraphasias (eg., sun for moon). Severe type of dementics could name pictures of some of the regularly used objects.

Small and Sandhu (2008) have studied the relationship between semantic and episodic memory as they support lexical access in healthy younger and older adults and individuals with DAT. They found that all the subjects named items that were common to both episodic periods more successfully than items unique to one period. These findings support the theoretical stance which proposes an enduring reciprocal link between semantic and episodic memory. 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 subject 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.

Subtest – 2: Generative Naming

This subtest consists of 20 items which assess the individual's generative naming abilities. The mean and standard deviation scores of each group of subjects are given in Table – 17 and graphical representation of the same is shown in Figure – 6.

Table 17: Mean and S.D of each group on generative naming subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10

Mean	18.13	16.5	15.13	7.5	5.8	2.5
S. D.	1.47	2.23	2.28	1.95	1.13	1.43

As it can be seen from the above table on the generative naming task, the mean and S. D of young adults, adults and geriatrics are 18.73, 1.47; 16.5, 2.23 and 15.13, 2.28 respectively. The mean scores of normal groups ranged from 18.73 to 15.13. This shows that there is difference between the three normal groups on generative naming task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 7.5, 1.95; 5.8, 1.13 and 2.5, 1.43 respectively. The scores of dementia population ranged from 7.5 to 2.5. This shows that there is a significant difference in the mean and S.D of normal groups on comparison with dementia groups.

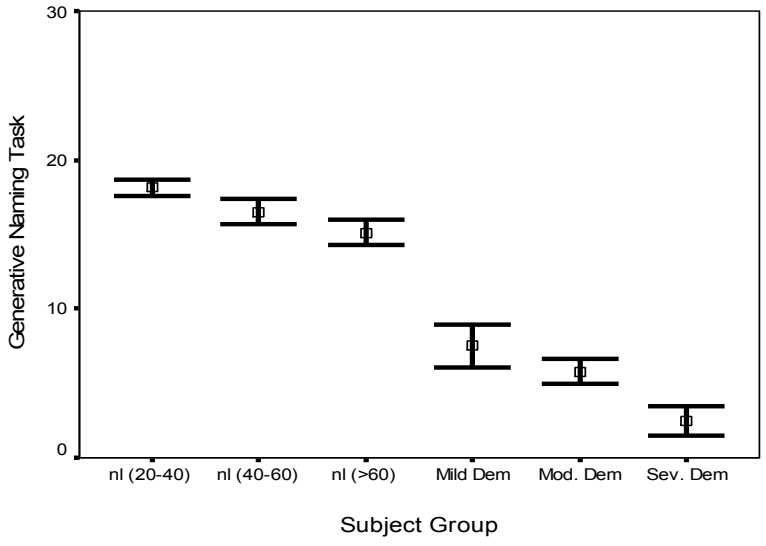

Figure 6: Error bar graph showing mean and S.D of all the groups on generative naming task.

Jacobs, Marder, Cote, Sano, Stern, 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.

Subtest – 3: Sentence completion

This subtest consists of 10 items which assess the individual's Sentence completion abilities. The mean and standard deviation scores of each group of subjects are given in Table – 18 and graphical representation of the same is shown in Figure – 7.

Table 18: Mean and S.D of each group on Sentence completion subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	9.76	9.03	8.4	5.3	3.9	2.3
S. D.	0.56	1.35	1.79	1.05	0.73	0.67

As it can be seen from the above table, the mean and S. D of young adults, adults and geriatrics are 9.76, 0.56; 9.03, 1.35 and 8.4, 1.79 respectively. The mean scores of normal groups ranged from 9.76 to 8.4. This shows that there is no difference between the three normal groups on Sentence completion task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 5.3, 1.05; 3.9, 0.73 and 2.3, 0.67 respectively. The scores of dementia population ranged from 5.3 to 2.3. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups.

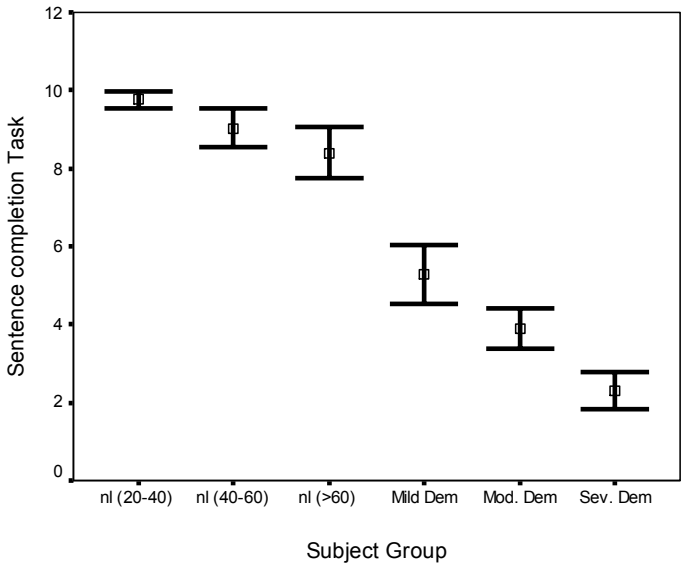

Figure 7: Error bar graph showing mean and S.D of all the groups on Sentence completion task.

Stevens, Harvey, Kelly, Nicholl, 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.

Subtest – 4: Responsive Speech

This subtest consists of 10 items which assess the individual's responsive speech abilities. The mean and standard deviation scores of each group of subjects are given in Table – 19 and graphical representation of the same is shown in Figure – 8.

Table 19: Mean and S.D of each group on responsive speech subtest.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	9.83	9.73	9.4	6	3.1	2.1
S. D.	0.53	0.63	1.0	0.66	1.2	0.99

As it can be seen from the above table, the mean and S. D of young adults, adults and geriatrics are 9.83, 0.53; 9.73, 0.63 and 9.4, 1.0 respectively. The mean scores of normal groups ranged from 9.83 to 9.4. This shows that there is no difference between the three normal groups on responsive speech task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 6, 0.66; 3.1, 1.2 and 2.1, 0.99 respectively. The scores of dementia population ranged from 6 to 2.1. This clearly shows that there is a significant difference and deterioration in the mean and S.D of dementia groups compared to normal groups on the responsive speech task.

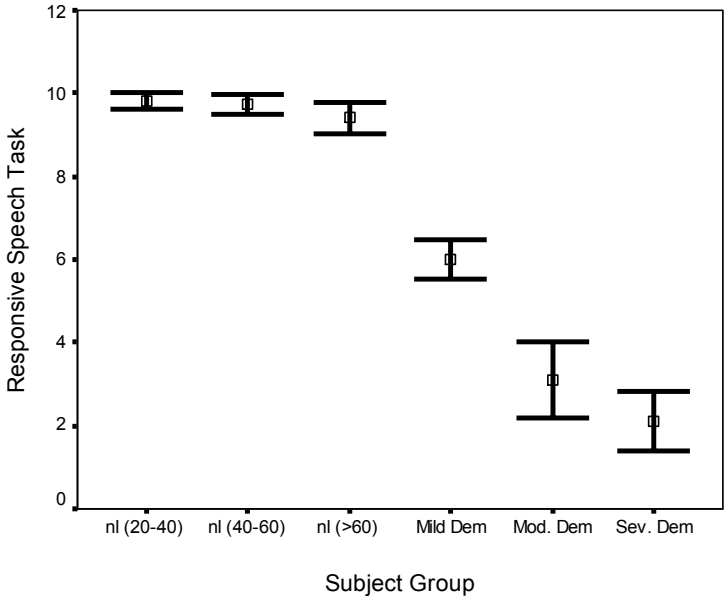

Figure 8: Error bar graph showing mean and S.D of all the groups on responsive speech task.

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.

Subtest – 5: Spontaneous Speech

This subtest consists of 7 items which assess the individual's spontaneous speech abilities in terms of fluency of speech and information content. The mean and standard deviation scores of each group of subjects are given in Table – 20 and graphical representation of the same is shown in Figure – 9.

Table 20: Mean and S.D of each group on spontaneous speech subtest.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	20	19.9	19.5	13.9	10.1	5.0
S. D.	0.00	.40	1.0	1.19	0.73	0.81

As it can be seen from the above table, the mean and S. D of young adults, adults and geriatrics are 20, 0.00; 19.9, 0.40 and 19.5, 1.0 respectively. The mean scores of normal groups ranged from 20 to 19.5. This shows that there is no difference between the three normal groups on spontaneous speech task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 13.9, 1.19; 10.1, 0.73 and 5.0, 0.81 respectively. The scores of dementia population ranged from 13.9 to 5.0. This shows that there is a significant difference and deterioration in the mean and S.D of dementia groups compared to normal groups.

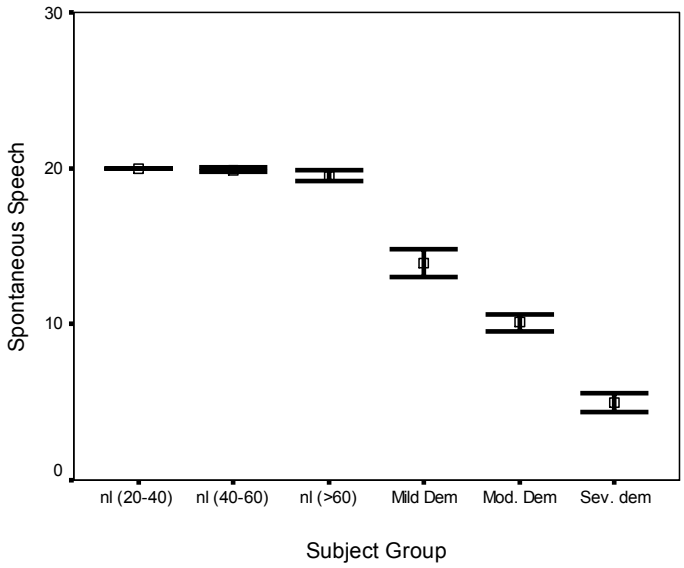

Figure 9: Error bar graph showing mean and S.D of all the groups on spontaneous speech task.

On fluency task, performance of mild and moderate dementics was better and near normal when compared to severe dementics. On information content, only mild dementics performed better compared to moderate and severe dementics. Both phonemic and verbal paraphasias were observed on this task.

Thomas, Keselj, Cercone, Rockwood and Asp (2005) reported significant deficits in spontaneous speech skills in DAT subjects 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 found 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 in all the stages.

Subtest – 6: Repetition

This subtest consists of 15 items which assess the individual's repetition skills of the subjects. The mean and standard deviation scores of each group of subjects are given in Table – 21 and graphical representation of the same is shown in Figure – 10.

Table 21: Mean and S.D of each group on repetition subtest.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	94.73	88.53	83.73	62.9	51.5	30.1
S. D.	4.03	5.64	6.82	5.85	4.03	3.72

As it can be seen from the above table the mean and S. D of young adults, adults and geriatrics are 94.73, 4.03; 88.53, 5.64 and 83.73, 6.82 respectively. The mean scores of normal groups ranged from 94.73 to 83.73. This shows that there is deterioration in performance as the age and the complexity of the stimuli increases in three normal groups on repetition task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 62.9, 5.85; 51.5, 4.03 and 30.1, 3.72 respectively. The scores of dementia population ranged from 62.9 to 30.1. This shows that there is a significant

difference and deterioration in mean and S.D of dementia groups compared to normal groups.

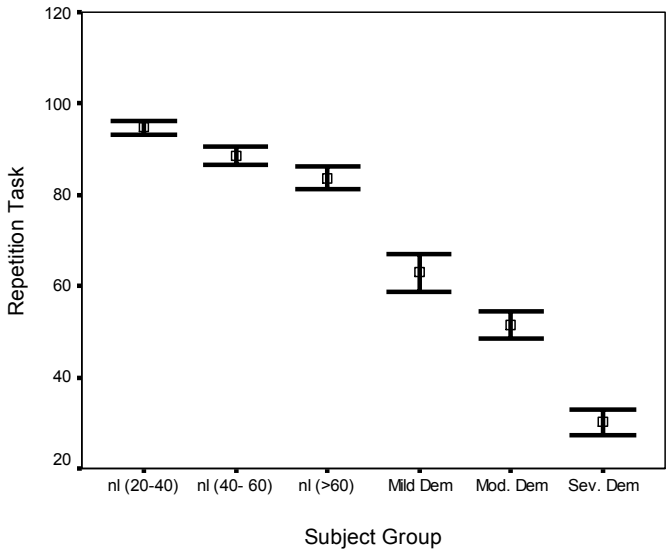

Figure 10: Error bar graph showing mean and S.D of all the groups on repetition task.

Mild dementics could repeat the sentences with six to seven words, moderate dementics could repeat only four word sentences and sever dementics could repeat only single words and two word phrases.

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.

Domain – 3: Linguistic Comprehension

The third domain of DAB is linguistic comprehension and this domain consists of four subtests within it. They are comparative questions, following commands, reading comprehension of sentences and reading commands. The maximum score of this domain is 150.

Subtest – 1: Comparative Questions

This subtest consists of 10 items which assess the individual's comprehension skills on comparative questions. The mean and standard deviation scores of each group of subjects are given in Table – 22 and graphical representation of the same is shown in Figure – 11.

Table 22: Mean and S.D of each group on comparative questions subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	20	19.9	19.2	11.8	7.6	4.0
S. D.	0.0	.36	1.33	1.47	1.26	1.63

As it can be seen from the above table the mean and S. D of young adults, adults and geriatrics are 20, 0.0; 19.9, 0.36 and 19.2, 1.33 respectively. The mean scores of normal groups ranged from 20 to 19.2. This shows that there no difference in performance across three normal groups on comparative questions task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 11.8, 1.47; 7.6, 1.26 and 4.0, 1.63 respectively. The scores of dementia population ranged from 11.8 to 4.0. This shows that there is a significant difference between normal and dementia groups and also deterioration in the mean and S.D of dementia groups.

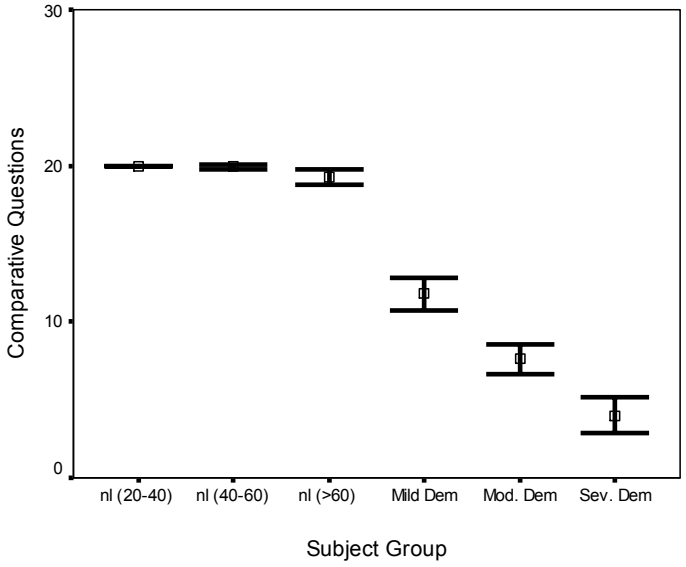

Figure 11: Error bar graph showing mean and S.D of all the groups on comparative questions task.

The present study showed significant deficits in comprehension of comparative questions in individuals with dementia of all levels of severity. However, there was no significant difference in the performance of normal groups.

Subtest – 2: Following Commands

This subtest consists of 15 items which assess the individual's comprehension skills on the subtest of following commands. The mean and standard deviation scores of each group of subjects are given in Table – 23 and graphical representation of the same is shown in Figure – 12.

Table 23: Mean and S.D of each group on following commands subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	80	79.3	76.7	48.8	28.6	21.9
S. D.	0.0	2.17	5.11	9.4	2.7	2.72

As it can be seen from the above table the mean and S. D of young adults, adults and geriatrics are 80, 0.0; 79.3, 2.17 and 76.7, 5.11 respectively. The mean scores of normal groups ranged from 80 to 76.7. This shows that there no difference in performance across three normal groups on following commands task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 48.8, 9.4; 28.6, 2.7 and 21.9, 2.72 respectively. The scores of dementia population ranged from 48.8 to 21.9.

This shows that there is a significant difference between normal and dementia groups and also deterioration in the mean and S.D of dementia groups.

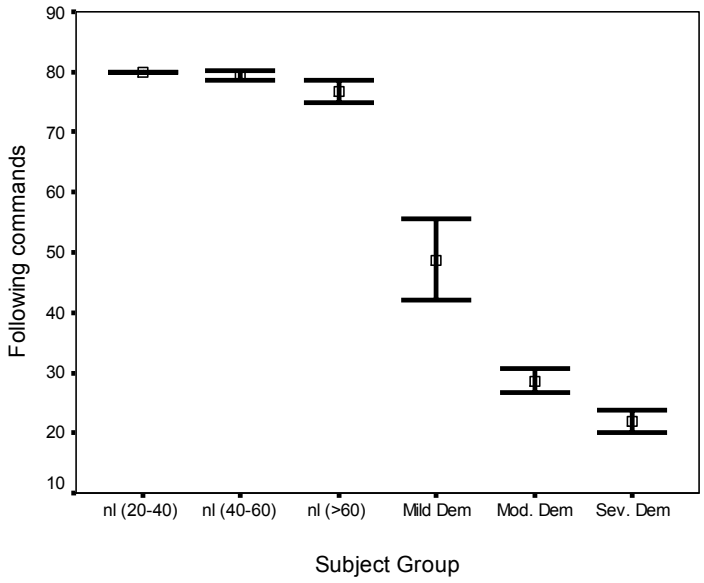

Figure 12: Error bar graph showing mean and S.D of all the groups on following commands task.

On following commands task, mild dementics could follow three step commands with relative ease, moderate dementics could follow only two step commands and severe dementics could follow some of the simple one step 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

subjects 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.

Subtest – 3: Reading Comprehension of Sentences

This subtest consists of 8 items which assess the individual's reading comprehension skills on sentences. The mean and standard deviation scores of each group of subjects are given in Table – 24 and graphical representation of the same is shown in Figure – 13.

Table 24: Mean and S.D of each group on reading comprehension of sentences subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	40	40	40	34.5	27	16
S. D.	0.0	0.0	0.0	3.68	2.58	3.94

As it can be seen from the above table the mean and S. D of young adults, adults and geriatrics are 40 and 0.0 for all the three groups. This shows that there no difference in performance across three normal groups on reading comprehension of sentences task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 34.5, 3.68; 27, 2.58 and 16, 3.94 respectively. The scores of dementia population ranged from 34.5 to 16. This shows that there is a significant difference between normal and dementia groups and also that there is deterioration in the mean and S.D of dementia groups. Individuals with mild dementia have relatively better preserved reading comprehension skills compared to other two groups.

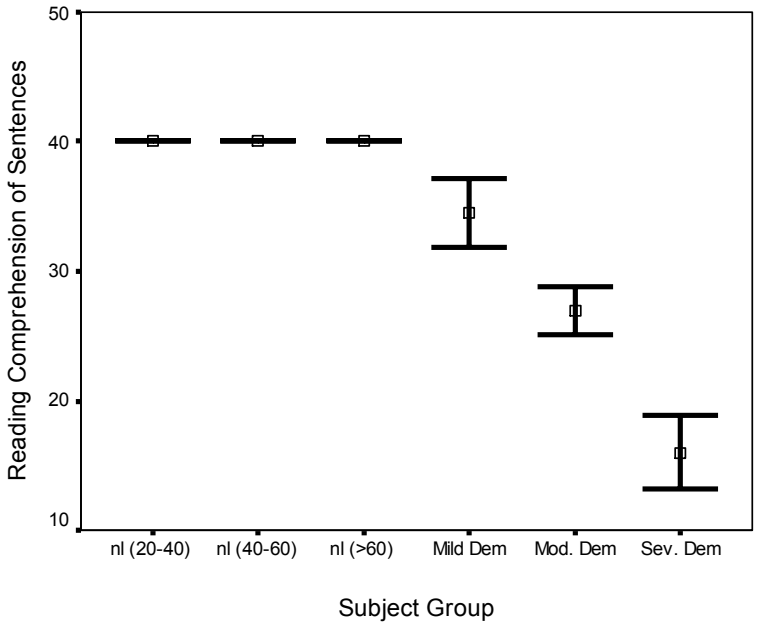

Figure 13: Error bar graph showing mean and S.D of all the groups on reading comprehension of sentences task.

Performance of all the dementia groups was better on reading comprehension than any other task. Mild and moderate dementics could perform near normally but the performance of severe dementics had difficulty in reading sentences.

Cummings, Houlihan, 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 de-developmental model of dementia. The present study also showed progressive decline in the performance of individuals with dementia with mild dementias showing better preserved abilities and severe dementia subjects showing worsened skills.

Subtest – 3: Reading Commands

This subtest consists of 5 items which assess the individual's reading comprehension skills on commands. The mean and standard deviation scores of each group of subjects are given in Table – 25 and graphical representation of the same is shown in Figure – 14.

Table 25: Mean and S.D of each group on reading commands subtest.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	10	10	9.6	6.4	4.8	2.6
S. D.	0.0	0.0	0.75	1.57	1.03	0.96

As it can be seen from the above table the mean and S.D of young adults, adults and geriatrics are 10, 0.0; 10, 0.0 and 9.6, 0.75 respectively. This shows that there no difference in performance across three normal groups on reading commands task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 6.4, 1.57; 4.8, 1.03 and 2.6, 0.96 respectively. The scores of dementia population ranged from 6.4 to 2.6. This shows that there is a significant difference between normal and dementia groups and also deterioration in the mean and S.D of dementia groups. Individuals with mild dementia have relatively better preserved reading comprehension skills compared to other two dementia groups.

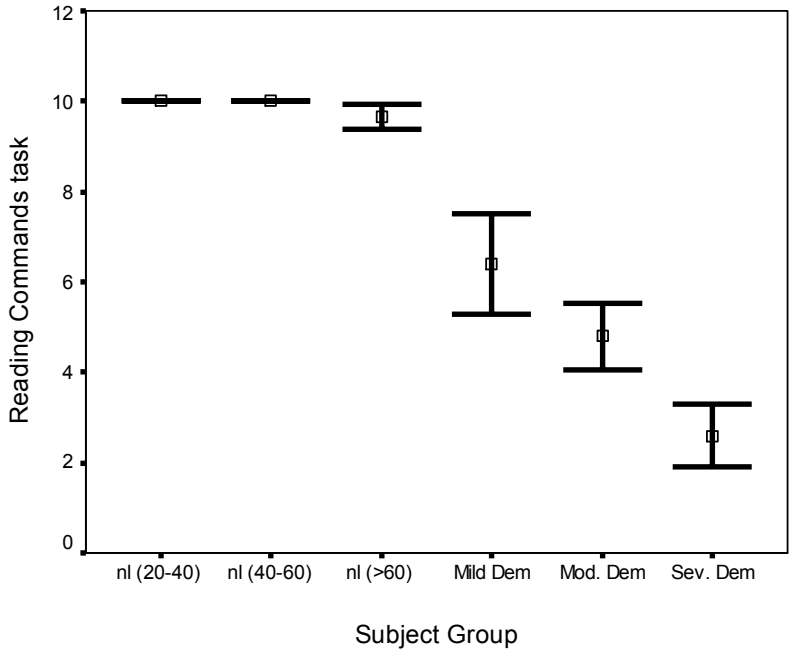

Figure 14: Error bar graph showing mean and S.D of all the groups on reading commands task.

The present study showed decline in the performance of individuals with dementia on reading commands task as the severity increased which is measured by mental state examination. These results are in accordance with the study of Cummings et al (1986) who reported progressive decline in reading comprehension deficits in individuals with dementia.

Domain – 4: Visuospatial Construction.

This domain consists of two subtests, namely, generative drawing and figure copying. The maximum possible score is 50.

Subtest – 1: Generative Drawing

This subtest consists of 8 items which assess the individual's generative drawing skills. The mean and standard deviation scores of each group of subjects are given in Table – 26 and graphical representation of the same is shown in Figure – 15.

Table 26: Mean and S.D of each group on generative drawing subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	30	29.53	28.6	16.6	12.1	7.1
S. D.	0.0	1.43	2.97	2.98	2.02	1.28

As it can be seen from the above table the mean and S.D of young adults, adults and geriatrics are 30, 0.0; 29.53, 1.43 and 28.6, 2.97 respectively. This shows that there no difference in performance across three normal groups on generative drawing task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 16.6, 2.98; 12.1, 2.02 and 7.1, 1.28 respectively. The scores of dementia population ranged from 16.6 to 7.1. This shows that there is a significant difference between normal and dementia groups and also deterioration in the mean and S.D of dementia groups.

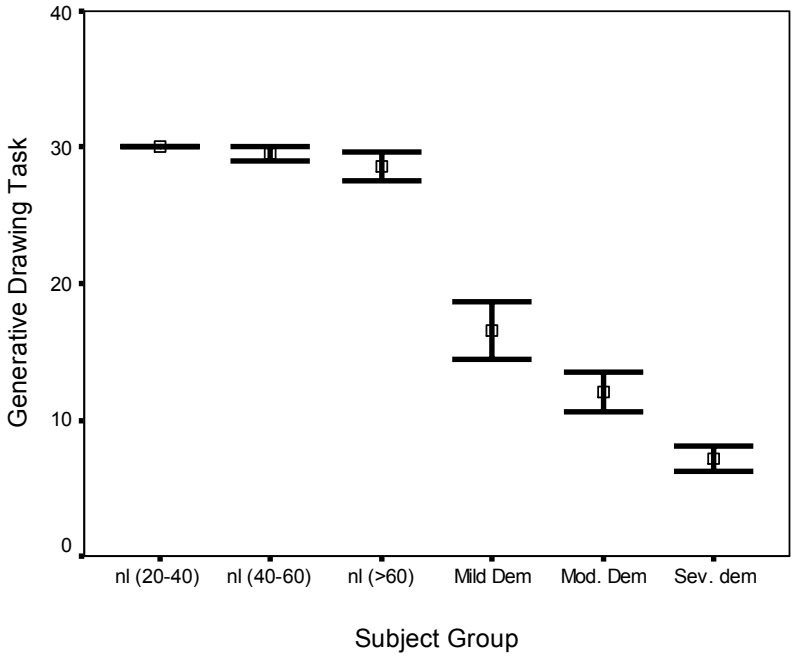

Figure 15: Error bar graph showing mean and S.D of all the groups on generative drawing task.

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 nondemented elderly, 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.

Subtest – 2: Figure Copying

This subtest consists of 5 items which assess the individual's figure copying skills. The mean and standard deviation scores of each group of subjects are given in Table – 27 and the graphical representation of the same is shown in Figure – 16.

Table 27: Mean and S.D of each group on figure copying subtest.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	19.8	19.4	18.2	13.8	7.4	4.5
S. D.	0.73	1.38	2.71	2.52	1.17	0.84

As it can be seen from the above table the mean and S.D of young adults, adults and geriatrics are 19.8, 0.73; 19.4, 1.38 and 18.2, 2.71 respectively. This shows that there is no difference in performance across three normal groups on figure copying task. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 13.8, 2.52; 7.4, 1.17 and 4.5, 0.84 respectively. The scores of dementia population ranged from 13.8 to 4.5. This shows that there is a significant difference between normal and dementia groups and also deterioration in the mean and S.D of dementia groups.

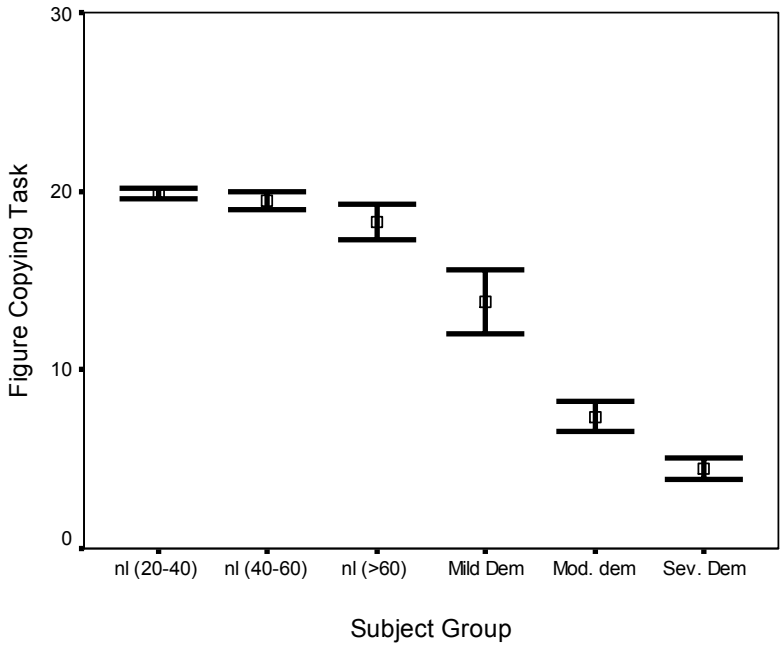

Figure 16: Error bar graph showing mean and S.D of all the groups on figure copying task.

These results are in accordance with Hodges et al (1999) and Bennett, Piguet, Grayson, Creasey, Waite, Broe and Halliday (2003) studies on deficits in visuospatial skills in individuals with dementia.

Overall Results of each domain

Memory Domain:

The first domain in DAB – K is Memory. This domain consists of four subtests namely episodic memory, working memory, semantic memory and delayed story recall subtests. The maximum total score of this domain is 100. The mean and standard deviation scores of each group of subjects are given in Table – 28 and graphical representation of the same is shown in Figure – 17.

Table 28: Mean and S.D of each group on memory domain.

Group	Young adults (20 – 40 years)	Adults (40 – 60 years)	Normal Geriatrics (above 60 years)	Mild dementia	Moderate dementia	Severe dementia
N	30	30	30	10	10	10
Mean	93.9	92	82.3	50.7	32.6	14.8
S. D.	2.49	3.04	5.13	5.83	2.98	4.02

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 93.9, 2.49; 92, 3.04 and 82.3, 5.13 respectively. The mean scores of normal groups ranged from 93.9 to 82.3. This shows that there is not much difference between the three normal groups ranging in age from 20 – 60 years on memory domain. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 50.7, 5.83; 32.6, 2.98 and 14.8, 4.02 respectively. The scores of dementia population ranged from 50.7 to 14.8. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group deteriorated as the severity increased.

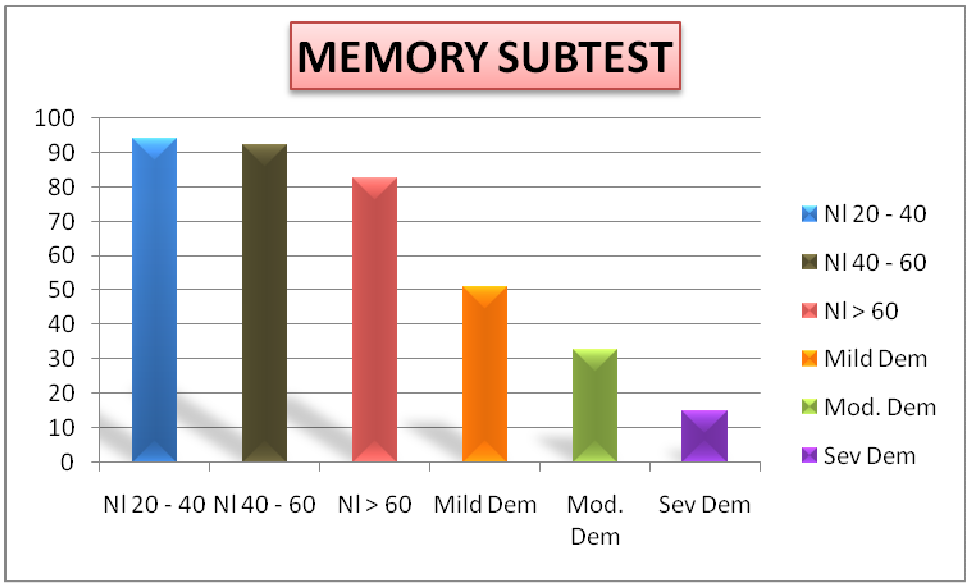

Figure 17: Bar graph showing mean of all the groups on memory domain.

All the dementia groups performed similarly on all the tasks of memory domain, i.e., on episodic, working and semantic memory tasks. As mentioned above, mild dementics performed better compared to moderate and severe dementic groups. These results are in concurrence with the results of studies by Holm et al (2005), Hodges, et al (1999), Lamar, et al (2007), Baddeley, et al (1991), LeMoal, et al (1997), Herlitz, et al (1995) which reported several memory deficits in individuals with dementia.

Linguistic Expression Domain:

The second domain in DAB – K is linguistic expression. This domain consists of six subtests namely picture naming, generative naming, Sentence completion, responsive speech, spontaneous speech and repetition subtests. The maximum total score of this

domain is 250. The mean and standard deviation scores of each group of subjects are given in Table – 29 and graphical representation of the same is shown in Figure – 18.

Table 29: Mean and S.D of each group on linguistic expression domain.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	242.26	233.1	217.6	149.3	110.4	55.8
S. D.	4.21	6.05	10.25	9.91	6.44	7.68

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 242.26, 4.21; 233.1, 6.05 and 217.6, 10.25 respectively. The mean scores of normal groups ranged from 242.26 to 217.6. This shows that there is not much difference between the three normal groups on linguistic expression domain. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 149.3, 9.91; 110.4, 6.44 and 55.8, 7.68 respectively. The scores of dementia population ranged from 149.3 to 55.8. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group was deteriorating as the severity increased.

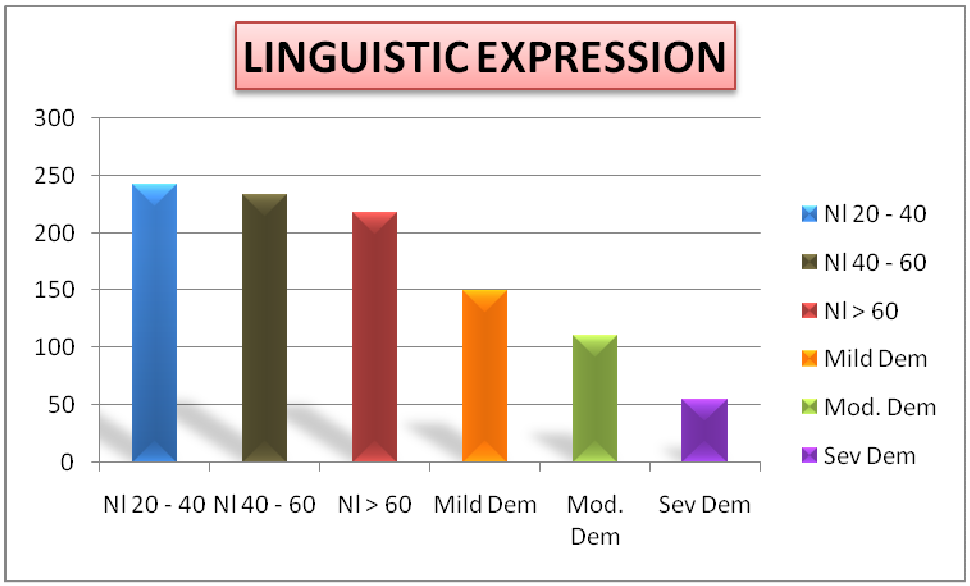

Figure 18: Bar graph showing mean of all the groups on linguistic expression domain.

All the dementia groups performed well on the tasks like spontaneous speech, repetition etc. and performed poorly on tasks like picture naming and generative naming tasks. As mentioned above, mild dementics performed well compared to moderate and severe dementic groups. These results are in correlation with the results of studies by Small et al (2008), Jacobs, et al (1995), Frank, et al (1996), Thomas, et al (2005), Heun, et al (1997), Rosselli, et al (2000) which reported linguistic expression deficits in individuals with dementia.

Linguistic Comprehension Domain:

The third domain of DAB is linguistic comprehension and this domain consists of four subtests within it. They are comparative questions, following commands, reading comprehension of sentences and reading commands. The maximum total score of this

domain is 150. The mean and standard deviation scores of each group of subjects are given in Table – 30 and graphical representation of the same is shown in Figure – 19.

Table 30: Mean and S.D of each group on linguistic comprehension domain.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**
N	30	30	30	10	10	10
Mean	150	149.6	146.43	101.5	68.0	44.5
S. D.	0	1.30	5.32	13.25	2.9	5.9

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 150, 0.0; 149.6, 1.30 and 146.43, 5.32 respectively. The mean scores of normal groups ranged from 150 to 146.43. This shows that there is not much difference between the three normal groups on linguistic comprehension domain. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 101.5, 13.25; 68.0, 2.9 and 44.5, 5.9 respectively. The scores of dementia population ranged from 101.5 to 44.5. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group deteriorated as the severity increased.

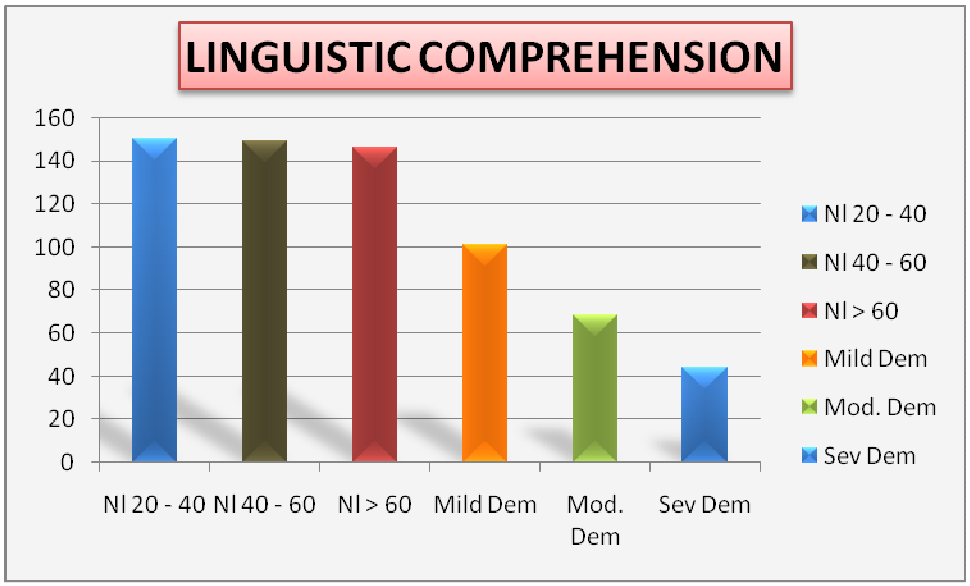

Figure 19: Bar graph showing mean of all the groups on linguistic comprehension domain.

Visuospatial Construction Domain:

This domain consists of two subtests, namely, generative drawing and figure copying. The maximum possible score is 50. The mean and standard deviation scores of each group of subjects are given in Table – 31 and graphical representation of the same is shown in Figure – 20.

Table 31: Mean and S.D of each group on visuospatial construction domain.

Group	**Young adults (20 – 40 years)**	**Adults (40 – 60 years)**	**Normal Geriatrics (above 60 years)**	**Mild dementia**	**Moderate dementia**	**Severe dementia**

N	30	30	30	10	10	10
Mean	49.86	49	47.06	30.4	19.5	11.6
S. D.	0.73	2.19	4.47	5.03	2.95	1.83

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 49.86, 0.73; 49, 2.19 and 47.06, 4.47 respectively. The mean scores of normal groups ranged from 49.86 to 47.06. This shows that there is not much difference between the three normal groups on visuospatial construction domain. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 30.4, 5.03; 19.5, 2.95 and 11.6, 1.83 respectively. The scores of dementia population ranged from 30.4 to 11.6. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group was found deteriorating as the severity increased.

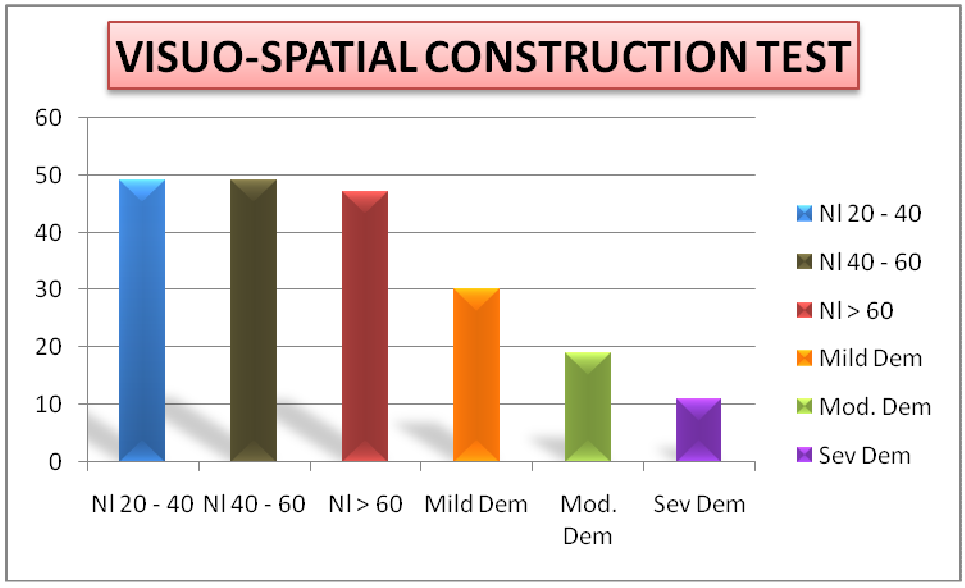

Figure 20: Bar graph showing mean of all the groups on visuospatial construction domain.

All the dementia groups performed well on the figure copying task than generative drawing task. As mentioned above, mild dementics performed well compared to moderate and severe dementic groups.

Total DAB – K Scores:

The Dementia Assessment Battery – Kannada consists of four domains, memory, linguistic expression, linguistic comprehension, and visuospatial construction with several subtests in each domain. The mean and standard deviation (S.D) of each subtest and also for each domain are calculated and they are given in Table 32 and as well as in Figure 21.

Table 32: Mean and S.D of all the tasks and domains of DAB – K.

Group	**Young adults (20 – 40 years)**		**Adults (40 – 60 years)**		**Normal Geriatrics (above 60 years)**		**Mild dementia**		**Moderate dementia**		**Severe dementia**	
Task	**M**	**S.D**	**M**	**S.D**	**M**	**S.D**	**M**	**S.D**	**M**	**S.D**	**M**	**S.D**

Episodic Memory	30	.00	29.8	.50	28.5	2.2	15.7	2.0	9.8	1.9	5	1.9
Working Memory	24.6	1.9	23.6	2.0	19.4	2.9	16.2	1.6	9.4	1.6	4.4	1.5
Semantic Memory	29.4	.89	29.0	1.4	27.2	2.5	14.0	2.8	9.4	1.5	4.8	1.8
Delayed Story Recall	9.8	.61	9.46	1.0	7.0	1.6	4.8	2.3	4.0	1.3	1.6	.96
Memory Domain	**93.9**	**2.4**	**92**	**3.0**	**82.3**	**5.1**	**50.7**	**5.8**	**32.6**	**2.9**	**14.8**	**4.0**
Picture Naming	89.8	.76	89.4	1.4	81.5	5.1	53.7	6.7	36.0	5.1	13.8	3.8
Generative naming	18.1	1.7	16.5	2.2	15.1	2.2	7.5	1.9	5.8	1.1	2.5	1.4
Sentence completion	9.7	0.5	9.0	1.3	8.4	1.7	5.3	1.0	3.9	0.7	2.3	0.6
Responsive Speech	9.8	0.5	9.7	0.6	9.4	1.0	6	0.6	3.1	1.2	2.1	0.9
Spontaneous Speech	20	0.0	19.9	.40	19.5	1.0	13.9	1.2	10.1	0.7	5.0	0.8

Repetition	94.7	4.0	88.5	5.6	83.7	6.8	62.9	5.8	51.5	4.0	30.1	3.7
Linguistic Expression Domain	**242**	**4**	**233**	**6.0**	**217**	**10.2**	**149**	**9.91**	**110**	**6.44**	**55**	**7.68**
Comaprative questions	20	0.0	19.9	.36	19.2	1.3	11.8	1.4	7.6	1.2	4.0	1.6
Following commands	80	0.0	79.3	2.1	76.7	5.1	48.8	9.4	28.6	2.7	21.9	2.72
Reading Comprehension of Sentences	40	0.0	40	0.0	40	0.0	34.5	3.7	27	2.6	16	3.94
Reading Commands	10	0.0	10	0.0	9.6	0.75	6.4	1.5	4.8	1.03	2.6	0.96
Linguistic Comprehension Domain	**150**	**0**	**149**	**1.3**	**146**	**5.32**	**101**	**13.2**	**68.0**	**2.9**	**44.5**	**5.9**
Generative Drawing	30	0.0	29.5	1.4	28.6	2.9	16.6	2.9	12.1	2.0	7.1	1.2

Figure Copying	19.8	0.7	19.4	1.3	18.2	2.7	13.8	2.5	7.4	1.1	4.5	0.8
Visuospatial construction domain	**49.8**	**0.7**	**49**	**2.1**	**47.0**	**4.4**	**30.4**	**5.0**	**19.5**	**2.9**	**11.6**	**1.8**
Total Scores of DAB –K	**536**	**5.0**	**523**	**7.3**	**493**	**15**	**328**	**54.5**	**205**	**30.7**	**122**	**19.3**

As it can be seen from the above table the mean and S. D of young adults; adults and geriatrics are 536, 5.0; 523, 7.3 and 493, 15 respectively. The mean scores of normal groups ranged from 536 to 493. This shows that there is not much difference between the three normal groups on DAB – K. The mean and S.D of mild dementia, moderate dementia and severe dementia groups are 328, 54.5; 205, 30.7 and 122, 19.3 respectively. The scores of dementia population ranged from 328 to 122. This shows that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group was inferior throughout and was found deteriorating as the severity increased.

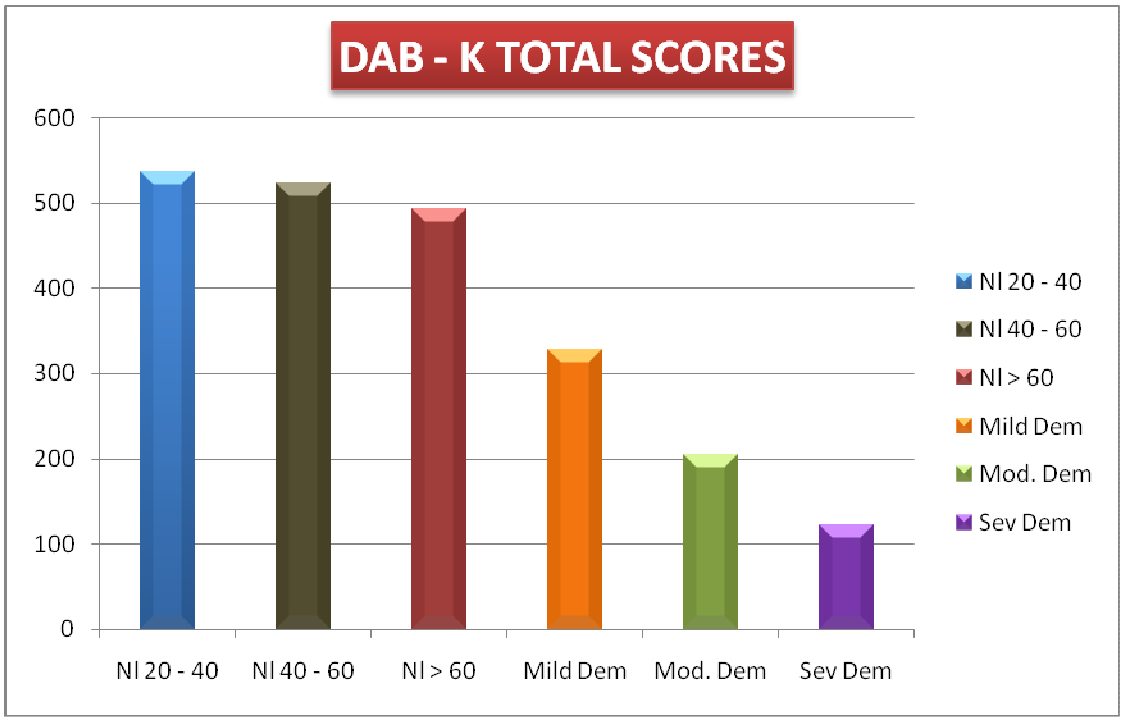

Figure 21: Bar graph showing mean of all the groups on DAB – K.

The results of this study revealed that there is a significant deterioration in the performance of dementia groups in all the tasks assessed as the severity increased. No significant difference was found between the three normal age groups on many tasks like episodic memory, semantic memory, responsive speech, and spontaneous speech, linguistic comprehension, generative drawing and figure copying parameters. Thereby, indicating that these parameters are not affected in geriatrics and are suitable to differentiate normal aging and pathological aging. Significant difference was found on tasks of picture naming, generative naming, working memory, repetition, etc. and indicating that these cannot be used to differentiate normal aging and pathological aging. Results also indicate that the test can be effectively used to differentiate between normal aging and dementics and also to assess the severity of dementia.

CHAPTER – 5

SUMMARY AND CONCLUSIONS

The present study was taken up to develop and standardize 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. The test was standardized on 90 normal individuals in three groups, young adults (20 – 40 years), adults (40 – 60 years) and geriatrics (above 60 years) and was also standardized on 30 individuals with dementia in three stages (mild, moderate and severe stages).

Results of the present study revealed significant deficits in individuals with dementia in memory, linguistic expression and linguistic comprehension. Performance of mild dementics was near normal in most of the subtests like spontaneous speech, reading comprehension, following commands, etc. Moderate dementics had more difficulty in tasks like working memory, episodic memory, picture naming, generative naming, and generative drawing, etc. Severe dementics' performance was poor in all the subtests especially due to poor spontaneous speech skills, and poor intelligibility of speech and these subjects had more difficulty in all the memory tasks and expression tasks like naming, etc. These results showed that there is a significant difference in the mean and S.D of normal groups and dementia groups and the performance of dementia group deteriorated as the severity increased.

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. No significant difference was found between the three normal age groups on many tasks like episodic memory, semantic memory, responsive speech, and spontaneous speech, linguistic comprehension, generative drawing and figure copying parameters. Thereby, indicating that these parameters are not affected in geriatrics and are suitable to differentiate normal aging and pathological aging. Significant difference was found on tasks of picture naming, generative naming, working memory, repetition, etc. and indicating that these cannot be used to differentiate normal aging and pathological aging.

Implications of the study:

- This test battery can be used by Speech language Pathologists to assess and diagnose the individuals with dementia of mild, moderate and sever stages.
- 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 language.

- Less number of subjects in dementia groups (10 in each stage) was taken in this study.
- Some variables like education, socioeconomic status were not monitored in this study.
- Individuals with dementia had different pathologies like DAT, Parkinson's, multi infarct dementia, etc. it would have been better if all the subjects had same pathology.

Future Suggestions:

- 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 education, socioeconomic status, 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 subject to answer the following questions with appropriate answers. The questions may be given orally or in writing. Accept corrections only if the subject 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 ಪಕ್ಕದಲ್ಲೆ 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 subject 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. ಪುಸ್ತಕ ಪಿಸ್ತೋಲು ಬಾವುಟ ಹೂವು	5
2	ಮಳೆಯು _____. ಹಸಿರು ಒದ್ದೆ ಬಿಸಿ ಸಮುದ್ರ	5
3	ರಾಜೇಶ್ ಅವರು ಕಾರುಗಳು ಮತ್ತು ಲಾರಿಗಳನ್ನು ರಿಪೇರಿ ಮಾಡುತ್ತಾರೆ. ಅವರು ಒಬ್ಬ _____. ದರ್ಜಿ ಯಂತ್ರ ಮೆಕಾನಿಕ್ ಚಾಲಕ	5
4	ಶಿಕ್ಷಕರು ಶಾಲೆಗೆ ಬಿಸಿಗೆಯ ನಂತರ ಹಿಂತಿರುಗುತ್ತಾರೆ. ಅವರು _____ ಗೆ ಕಲಿಸುತ್ತಾರೆ. ಎಲೆಗಳು ಮಕ್ಕಳು ವಸಂತ ಮಾಸ	5

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

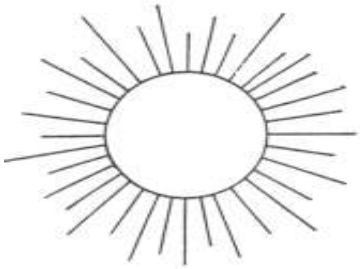
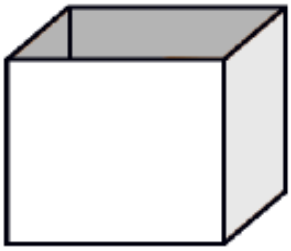
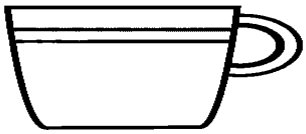
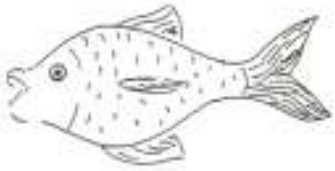
Instructions: The subject is asked to freehandedly draw the figures listed below on a separate sheet of paper. Score for each figure is given below.

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 subject 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**	

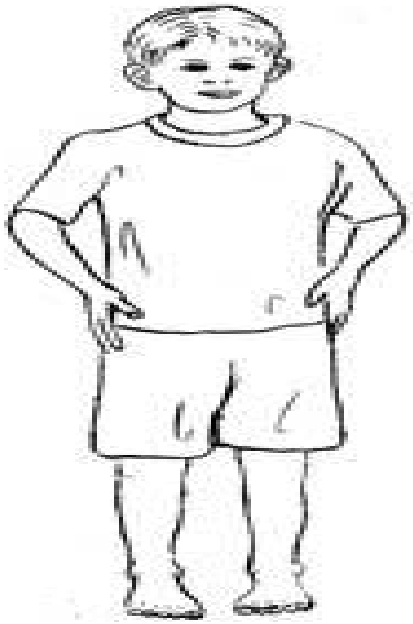
Provisional Diagnosis:

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

APPENDIX – A (1)

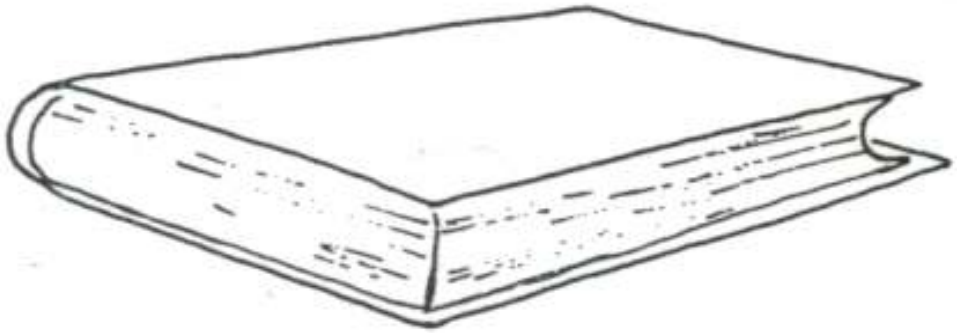
Stimulus for Picture Naming Task

PN – 1

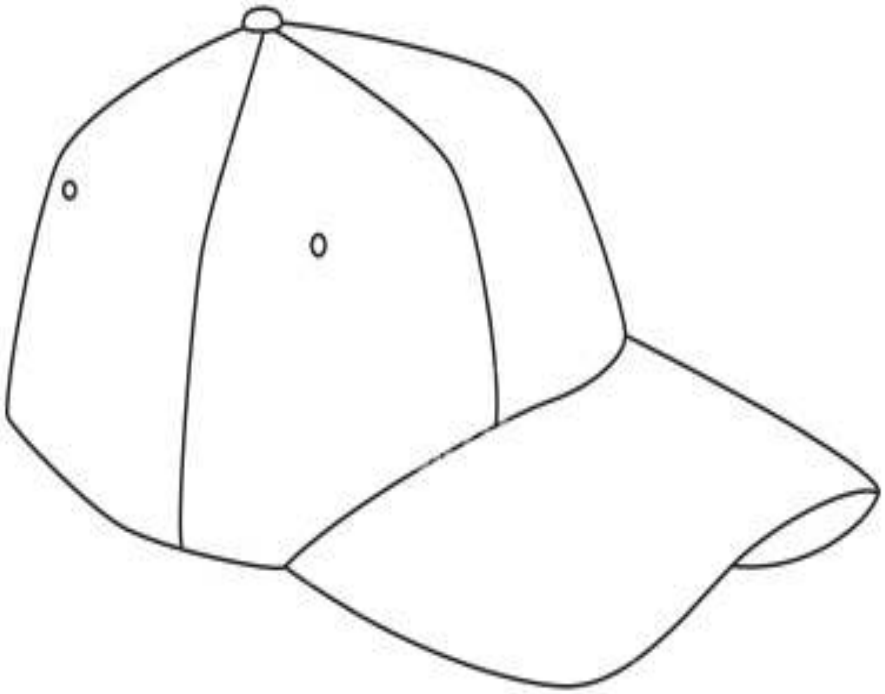


PN – 2

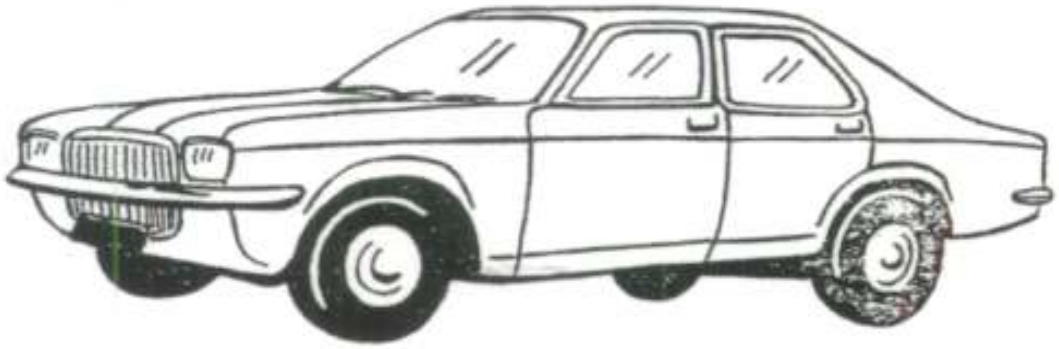
PN – 3



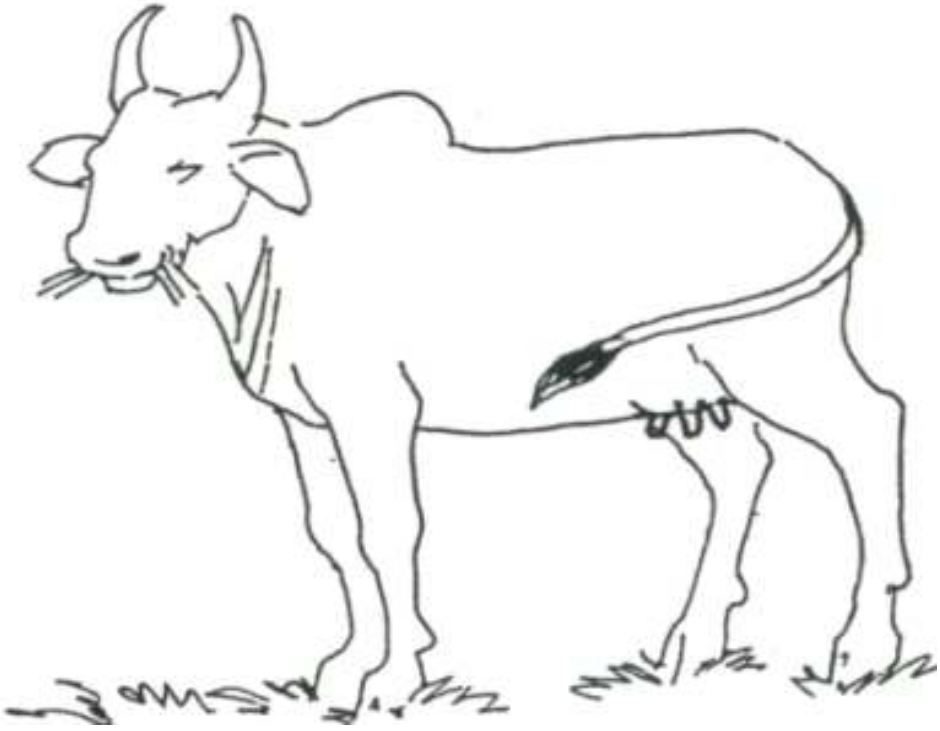
PN – 4



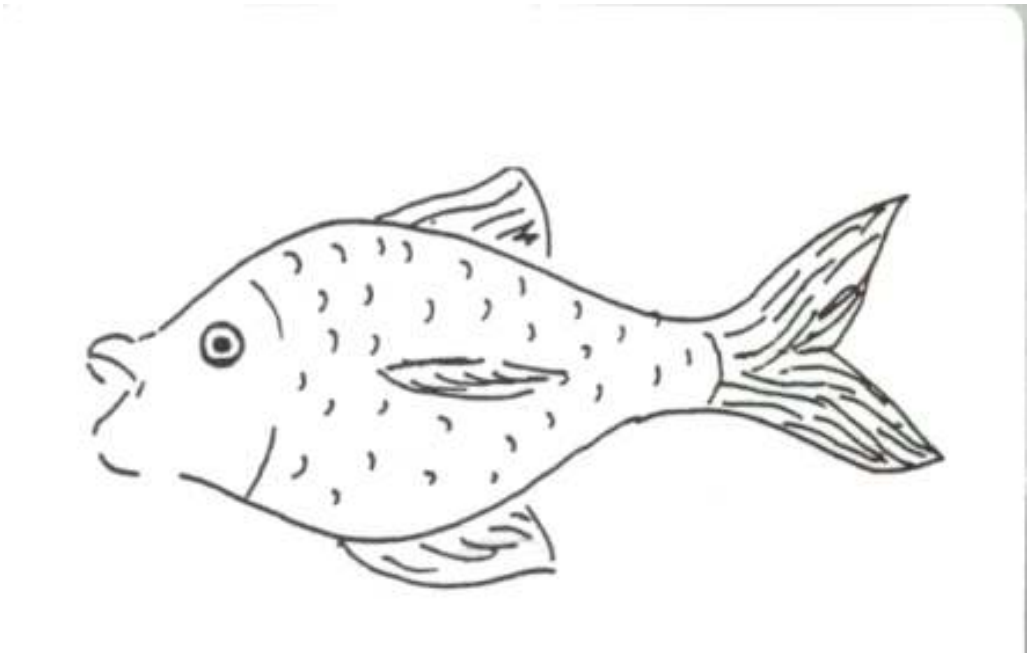
.PN – 5



PN – 6

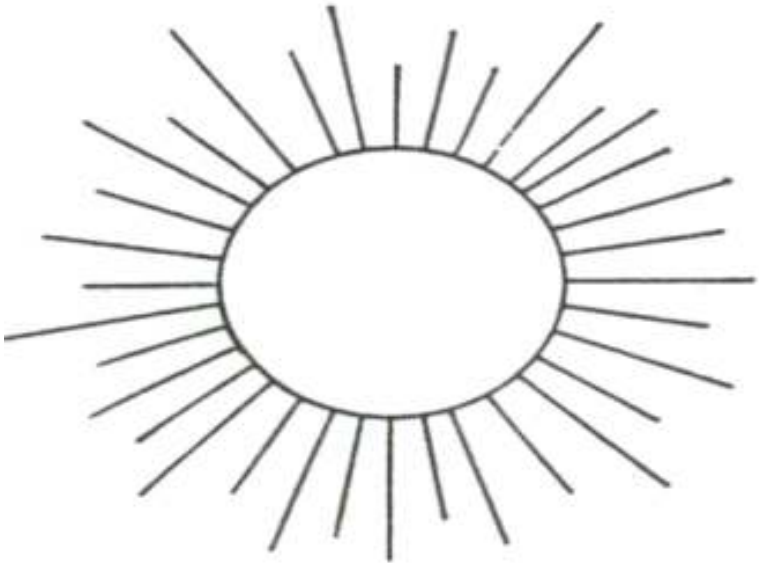


PN – 7



PN – 8

PN – 9

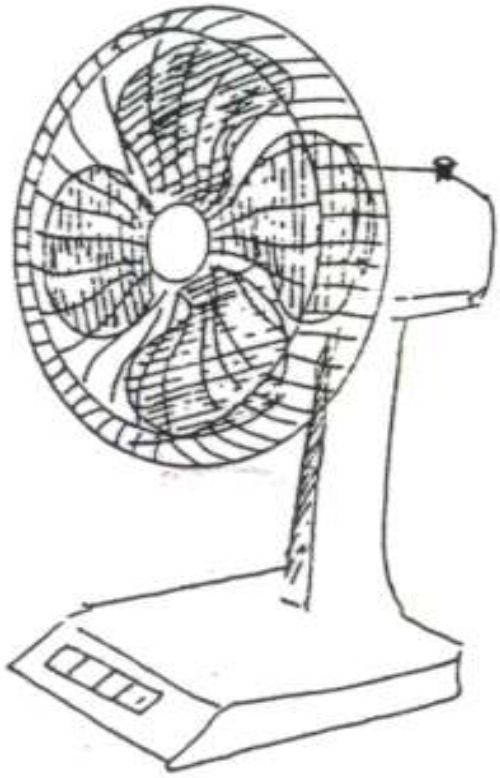


PN – 10

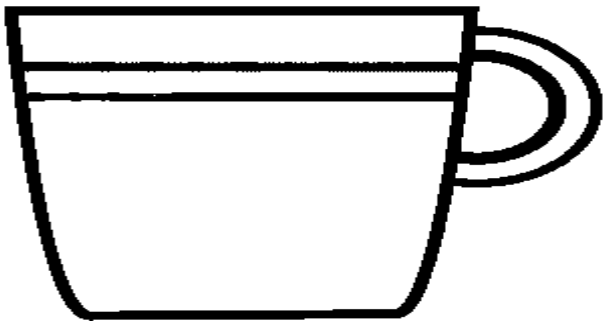
PN – 11

PN – 12

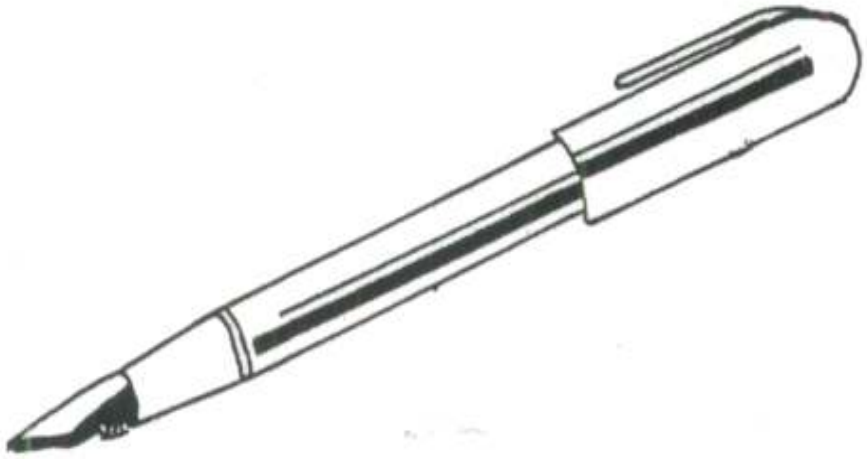
PN – 13



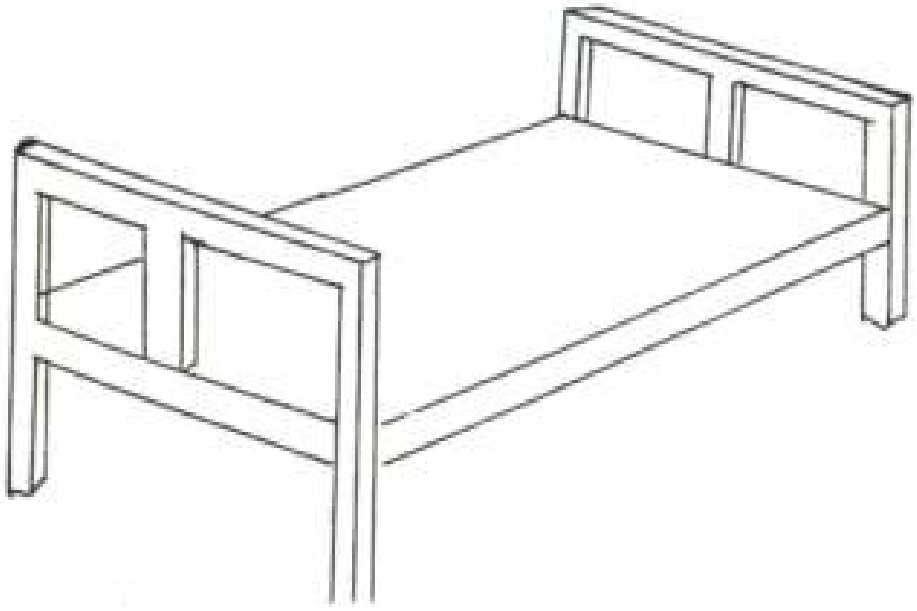
PN – 14



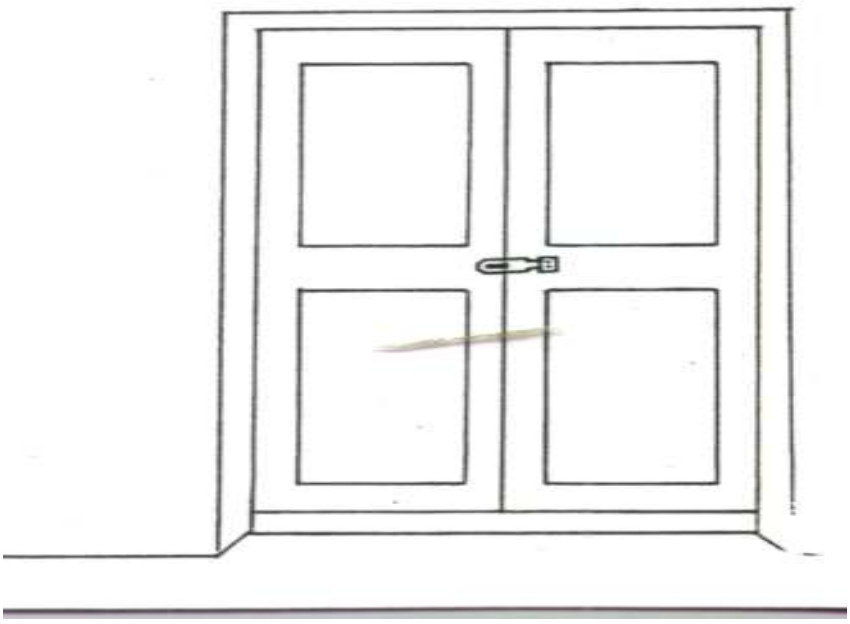
PN – 15



PN – 16

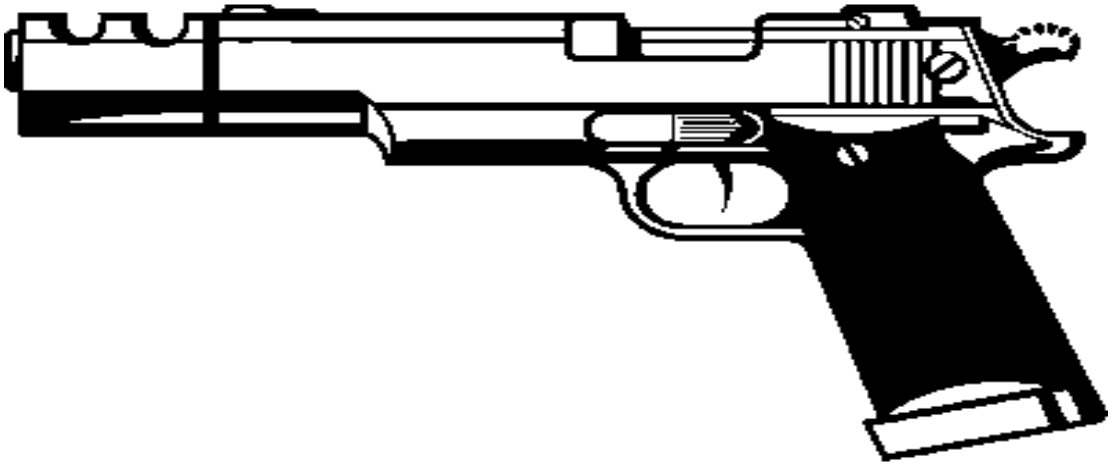


PN – 17



PN – 18

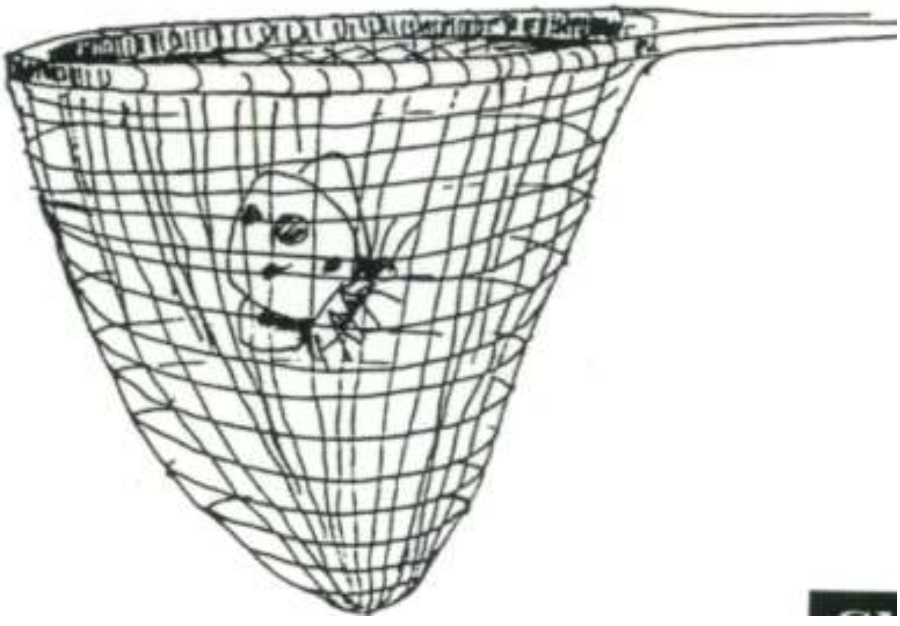
PN – 19



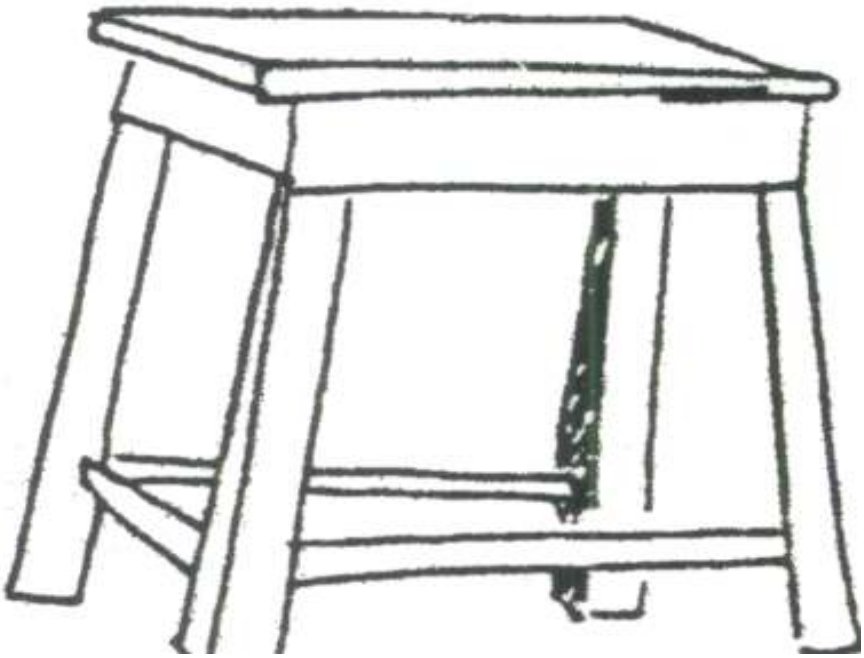
PN – 20

PN – 21

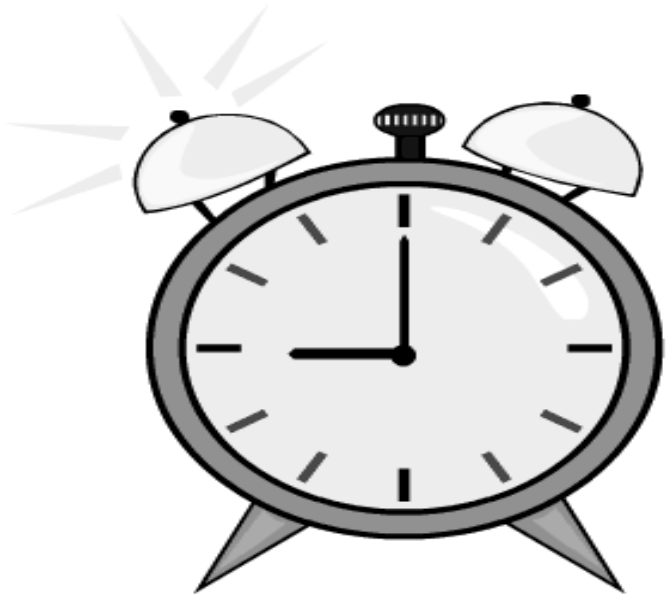
PN – 22



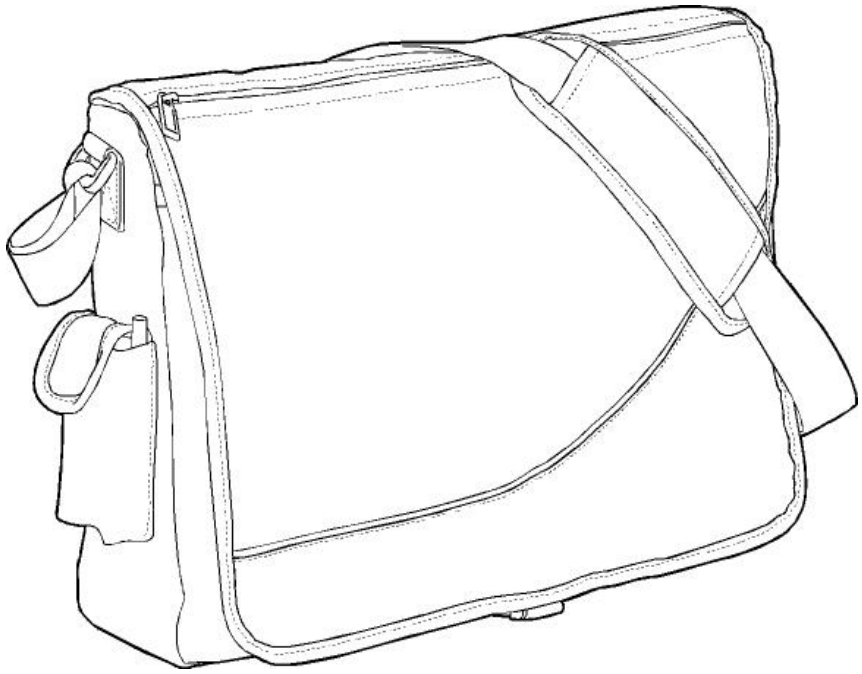
PN – 23



PN – 24



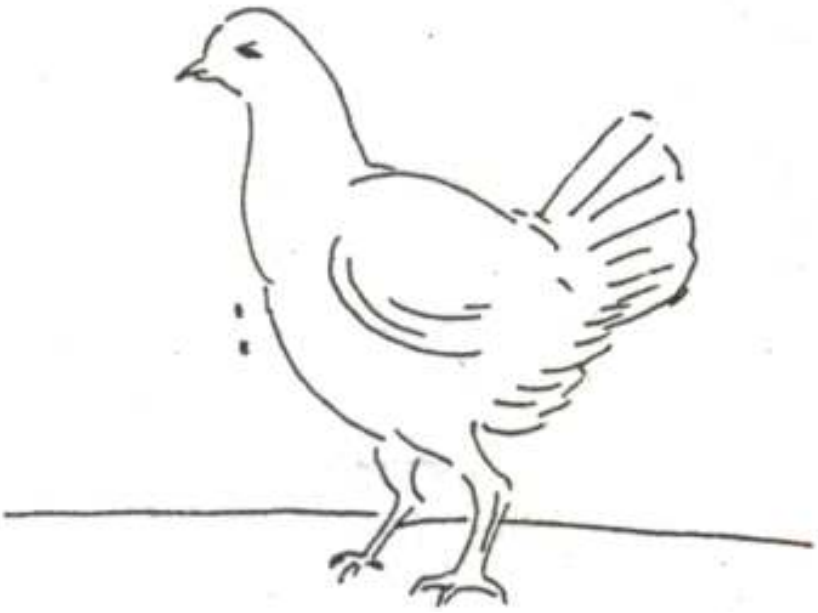
PN – 25



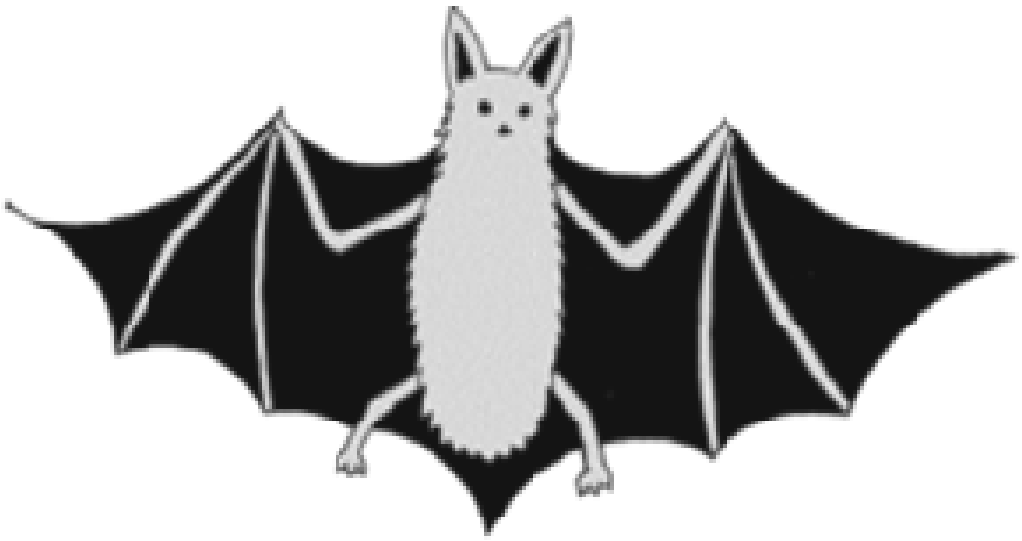
PN – 26

PN – 27

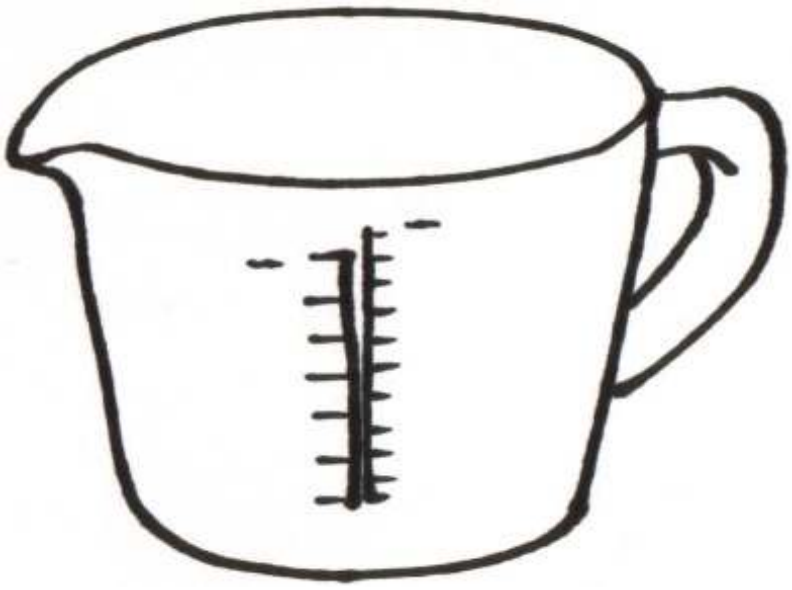
PN – 28



PN – 29



PN – 30



APPENDIX – B

MINI MENTAL STATUS EXAMINATION (MMSE) - Folstein, Folstein & McHugh, 1975

Case Name: No: Date:

Age: Gender: Examiner:

Domain	Stimulus	Max. Score	Patient Score
Orientation	What is the (year) (season) (date) (day) (month)?	5	
	Where are we (state) (country) (town) (hospital) (floor)?	5	
Registration	Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record. Trials _____	3	
Attention & Calculation	Serial 7's. 1 point for each correct answer. Stop after 5 answers. (OR) Alternatively spell "world" backward.	5	
Recall	Ask for the 3 objects repeated above. Give 1 point for each correct answer.	3	

Language	Name a pencil and watch.	2	
	Repeat the following "No ifs, ands, or buts"	1	
	Follow a 3-stage command: **"Take a paper in your hand, fold it in half, and put it on the floor."**	3	
	Read and obey the following: **CLOSE YOUR EYES**	1	
	Write a sentence.	1	
	Copy the design shown. 	1	
TOTAL SCORE		**30**	

ASSESS level of consciousness along a continuum _____ (Alert/ Drowsy/ Stupor/ Coma)

Signature of Clinician

APPENDIX – C

BRIEF COGNITIVE RATING SCALE (BCRS) - Reisberg, 1983

Case Name: No: Date:

Age: Gender: Examiner:

Domain	Rating	Item
Concentration & Calculation ability	1	No objective or subjective evidence of deficit in concentration
	2	Subject decrement on concentration ability
	3	Minor objective signs of poor concentration (ex: on subtraction of serial 7s from 100)
	4	Definite concentration deficit for persons of their background
	5	Marked concentration deficit (ex: giving months backward)
	6	Forgets the concentration task (frequently begins to count forward when asked to count backwards from 10 by 1s)
	7	Marked difficulty in counting forward to 10 by 1s.
Recent memory	1	No objective or subjective evidence of deficit in recent memory
	2	Subjective impairment only (forgetting names more often than formerly)
	3	Deficit in recall of specific events evident upon detailed questioning. No deficit in the recall of major recent events

	4	Cannot recall major events of previous weekend or week.
	5	Unsure of weather; may not know current president or current address.
	6	Occasional knowledge of some recent events. Little or no idea of current address or weather.
	7	No knowledge of any recent events.
Remote memory	1	No subjective or objective impairment in past memory
	2	Subjective impairment only. Can recall two or three primary school teachers
	3	Some gaps in past memory upon detailed questioning. Able to recall at least one childhood teacher and/or one childhood friend.
	4	Clear cut deficit. The spouse recalls more of patient's past than the patient. Cannot recall childhood friends and/ or teachers but remembers names of the schools attended
	5	Major past events sometimes not recalled (names of schools attended)
	6	Some residual memory of past (ex: may recall country of birth or former occupation)
	7	No memory of past.
Orientation	1	No deficit in memory for time, place, identity of self or others.
	2	Subjective impairment only. Knows time to nearest hour, location

	3	Any mistake in time: 2hrs; day of week; 1 day; date
	4	Mistakes in moth
	5	Unsure of month and/or year; season; locale.
	6	No idea of date. Identifies spouse but may not recall name
	7	Cannot identify spouse. May be unsure of personal identity.
Functioning & self care	1	No difficulty, either subjectively or objectively
	2	Complains of forgetting location of objects. Subjective work difficulties.
	3	Decreased job functioning evident to co – workers. Difficulty in travelling to new locations.
	4	Decreased ability to perform complex activities.
	5	Requires assistance in choosing proper clothing
	6	Requires assistance in feeding, toileting, bathing or dressing.
	7	Requires constant assistance in all activities of daily living.

Provisional Diagnosis:

Signature of Clinician

APPENDIX – D

FUNCTIONAL ASSESSMENT STAGES (FAST) - Reisberg, Ferris & Anand, 1984

Case Name: No: Date:

Age: Gender: Examiner:

GDS (Cognitive Decline)	Clinical Phase	FAST Characteristics
No	Normal	No functional decrement either subjectively or objectively manifest.
Very mild	Forgetfulness	Complaints of forgetting locations of objects; subjective work difficulties.
Mild	Early confusional	Decreased functioning in demanding employment settings evident to co –workers; difficulty in travelling to new locations
Moderate	Late confusional	Decreased ability to perform complex tasks such as planning dinner for guests, handling finances, and marketing
Moderately	Early dementia	Requires assistance in choosing proper clothing, may require coaxing to bathe properly
Severe	Middle dementia	Difficulty putting on clothing properly; requires assistance bathing, may develop fear of bathing; inability to handling mechanics of toileting; urinary incontinence, fecal incontinence

Very severe	Late dementia	Limited ability to speak; all intelligible vocabulary lost; all motoric abilities lost; stupor; comatose.

Provisional Diagnosis:

Signature of Clinician

AMERICAN SPEECH-LANGUAGE-HEARING ASSOCIATION

The Roles of Speech-Language Pathologists Working With Individuals With Dementia-Based Communication Disorders: Technical Report

Ad Hoc Committee on Dementia

Reference this material as: American Speech-Language-Hearing Association. (2005). *The Roles of Speech-Language Pathologists Working With Individuals With Dementia-Based Communication Disorders: Technical Report* [Technical Report]. Available from www.asha.org/policy.

Index terms: dementia

DOI: 10.1044/policy.TR2005-00157

About This Document

This technical report was developed by the American Speech-Language-Hearing Association (ASHA) Ad Hoc Committee on Dementia. Members of the committee included Kathryn Bayles, Michelle Bourgeois, Tammy Hopper, Danielle Ripich (chair), Susan Rowe, and Amy Hasselkus (ex officio). Celia Hooper, ASHA vice president for professional practices in speech-language pathology (2003–2005), served as monitoring vice president.

****

Introduction

The syndrome of dementia comprises multiple cognitive deficits including short- and long-term memory impairment and at least one of the following: aphasia, apraxia, agnosia, and/or impaired executive functioning (*Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition*; American Psychiatric Association, 1994). Although the intellectual profiles of individuals diagnosed with dementia vary somewhat by etiology, the degree of intellectual deterioration is sufficient to interfere with social and occupational functioning.

The most common cause of dementia is Alzheimer's disease (AD), accounting for two thirds of the cases (Katzman & Bick, 2000). Other common causes are multiple infarctions, Lewy bodies, and Parkinson's disease. Among the less common causes are Pick's disease, Creutzfeldt-Jakob disease, progressive supranuclear palsy, Huntington's disease, Wilson's disease, and kuru. Though the aforementioned diseases are irreversible, dementia can be associated with potentially reversible conditions such as infection, normal pressure hydrocephalus, thyroid disease, depression, and drug toxicity.

The syndrome of dementia is most prevalent in older adults because AD and other common causes are age-related. An estimated 4.5 million Americans suffer from AD, a number that has doubled since 1980 (Hebert, Scherr, Bienias, Bennett, & Evans, 2003). By the year 2050 the number of affected individuals will rise to between 11.3 and 16 million. Because the elderly segment of the population (65 +) will rise from its current proportion of 13% to 20% by 2030, people with dementia-associated communication problems are the profession's fastest growing clinical population (Kinsella & Phillips, 2005).

Dementia-Associated Cognitive-Communication Disorders

The declines in memory and other cognitive functions that define the dementia syndrome inexorably affect the ability to comprehend and produce linguistic information (Bayles, Tomoeda, & Trosset, 1992). Additionally, behavioral problems that develop as a result of the neuropathology can interfere with communication, among them paranoia, hallucinations, and repetitiousness.

Individuals with early-stage AD, who rapidly forget what they have recently heard, seen, or thought, have difficulty following a conversation. Often they lose the topic, miss the point, and repeat themselves. Forgetting what they intended to say results in sentence fragments (Tomoeda & Bayles, 1993). Individuals in the middle stage of the disease, who are disoriented for time and place and have severe episodic memory deficits, have difficulty remembering recent events. Their verbal output is reduced and is less substantive, and they are less efficient in expressing information (Tomoeda & Bayles, 1993). By the late stages of AD, affected individuals no longer have the intellectual capacity to care for themselves.

Perception, attention, encoding, retrieval, and executive functions are severely compromised. Semantic memory, or conceptual knowledge, is now degraded or inaccessible. The linguistic abilities of naming, describing, writing, and conversing are severely compromised (Bayles, Tomoeda, Cruz, & Mahendra, 2000). Much of the verbal output of latestage individuals appears nonsensical, and many latestage patients are unable to communicate even basic needs.

Emergence of the Role of Speech-Language Pathologists in Working With Individuals Who Have Dementia

As recently as 1975, most Americans were unaware of AD, and few speech-language pathologists (SLPs) had training about its effects on communicative function. In fact, before 1975, scant literature existed on the effects of dementia on communicative functioning. The majority of health professionals held the view that little could be done for persons with progressive dementing diseases, and rehabilitation services generally were unavailable. Tests designed to evaluate the communicative functioning of individuals with dementia had yet to be developed. As health care and social planners came to understand the social and economic implications of the burgeoning prevalence of dementia, by virtue of the "graying" of the population, resources were made available to better understand dementing diseases and how best to care for affected individuals.

Beginning in the mid-1970s, the National Institute on Aging and the National Institutes of Mental Health funded longitudinal studies of the effects of AD, Parkinson's disease, and Huntington's disease on cognition, language, and communicative functioning. Study results provided information about deficits and spared abilities throughout the course of these diseases. With greater understanding of retained abilities (see Hopper, Bayles, & Kim, 2001, for a review), clinicians and researchers saw potential for helping individuals with dementia and their caregivers.

During this same period, research in cognition expanded our understanding of human memory as comprising multiple systems that can be differentially impaired. Behavioral scientists demonstrated that individuals with AD suffered greater deficits in declarative memory systems (memory for concepts, events, and words), than procedural memory systems (a general term referring to habit memory or the ability to perform motor and cognitive procedures) (Eslinger & Damasio, 1986; Heindel, Butters, & Salmon, 1988). These findings and others like them formed the foundation for research into interventions designed to help individuals with dementia capitalize on spared cognitive systems to compensate for damaged ones.

By the late 1980s, the concern of the American public for quality long-term care for people affected with dementia led to scrutiny of nursing homes. Results of Congressional investigations resulted in the passage of the Omnibus Budget Reconciliation Act (1987), which mandated evaluation of the physical and psychological status of residents in long-term care facilities at the time of admission and periodically thereafter (quarterly or after significant changes in function). Henceforth, nursing homes, desirous of Medicare reimbursement for resident care, had to conduct comprehensive evaluations of residents and thereafter develop care plans enabling them to function at the highest possible level of independence. The required evaluation, known as the Minimum Data Set (MDS), included questions about the ability of residents to hear, comprehend, and produce language. Although the law did not require that judgments about hearing and communicative function be made by SLPs, the inclusion of questions on the MDS

about hearing, speech, and language helped establish a role for SLPs with long-term care residents, and many SLPs were employed by nursing homes. Nonetheless, SLPs have struggled to gain recognition as the professionals best qualified to evaluate communicative function. Whereas Medicare claims reviewers increasingly recognized that SLPs could appropriately treat speech and language disorders, they often failed to understand the necessity of treating the cognitive deficits that caused the communication problems of dementia.

ASHA has played a significant role in educating third-party payers, legislators, and other health professionals about the beneficial role SLPs have in the management of individuals with dementia. Starting in 1987, ASHA has published a series of documents that help explain the relation of cognition to communication and the unique qualifications of SLPs, by virtue of their training, to assess and treat cognitive-communication disorders. In a 1987 technical report published by ASHA, it was stated that "The interrelationship between cognition and language serves as the basis for effective communication. A cognitive impairment can result in a communication breakdown, requiring speech-language intervention to improve functional ability" (ASHA, 1987, p. 53). In 1991, ASHA published guidelines for SLPs serving persons with "language, socio-communicative, and/or cognitive-communicative impairments" (ASHA, 1991) in which it was stated that "language learning and use are determined by the interaction of biological, cognitive, psychosocial and environmental factors" (p. 22). The term "cognitive-communicative" disorder was used to acknowledge the inseparability of cognition and communication.

The 1987 technical report also specified that SLPs have a role in evaluation and treatment of individuals with cognitive-communication impairments. In a position statement published in 1988, more specific mention was made of the need for services to older adults with cognitive-communication problems, reflecting greater concern about the communication needs of this growing segment of the population (ASHA, 1988).

In the 1991 guidelines publication, ASHA delineated five roles that clinicians have with individuals with cognitive-communication impairments, namely identification/assessment, intervention, inter-professional collaboration, case management, and education/advocacy. Also included in this publication was a list of the competencies required to work with individuals with cognitive-communication disorders, information that was used by many training programs in developing curricula. These roles were further elaborated in a 1997 ASHA publication titled *Preferred Practice Patterns for the Profession of Speech-Language Pathology*. This document has since been updated (ASHA, 2004d). Screening was recommended for all individuals, regardless of age, who have a condition that increases their risk for cognitive-communicative problems. Assessment was described as a process in which strengths and deficits related to cognitive problems are evaluated. In addition to specifying screening and in-depth assessment as preferred practice patterns, follow-up services also were recommended to "monitor cognitive-communicative status and insure appropriate intervention and support." In 2004, ASHA published another technical report that contained the recommendations of a committee of representatives from ASHA and Division 40 (Clinical Neuropsychology) of the American Psychological Association on the responsibilities of SLPs and clinical neuropsychologists who

also assess and treat individuals with cognitive disorders (ASHA, 2004a). This document included formal recognition that both SLPs and clinical neuropsychologists have a role in assessing and treating cognition though each has a unique purpose and scope. SLPs were recognized as the only professionals who are certified and licensed to treat communication disorders associated with cognitive deficits.

More recently, in 2005, ASHA updated its statement of knowledge and skills needed by SLPs in the identification, diagnosis, and treatment of individuals with cognitive-communication disorders (ASHA, 2005b). This document specifically states that SLPs have a primary role in the screening, assessment, diagnosis, treatment, education, and counseling of adults with cognitive-communication disorders associated with dementia producing nondegenerative and degenerative neuropathologies.

Assessment Considerations

In 1980, the World Health Organization (WHO) published a framework to describe health conditions called the *International Classification of Impairment, Disability and Handicap*. In 2001, a revised model called the *International Classification of Functioning, Disability and Health* (ICF; WHO, 2001) was released. According to the WHO (2001, p. 3), the purpose of the ICF classification is "to provide a unified and standard language and framework for the description of health and health-related states." The ICF encompasses two parts, each with two components that can be expressed in positive and negative terms (WHO, 2001, p. 10):

Part I. Functioning and Disability
- Body structures and functions (positive terms) and "impairments" in these structures or functions (negative terms)
- Activity and participation levels of functioning (i.e., execution of a task and involvement in a life situation, respectively; positive terms) and "limitations and restrictions" on these (negative terms)

Part II. Contextual Factors
- Environmental factors (the physical, social, and attitudinal environment in which people live—can be facilitating or hindering)
- Personal factors (gender, age, and other variables that are not easily classified and vary by society and culture)

The ICF is a model that promotes evaluation of the interaction between a person's health condition (disease/disorder) and the environmental and personal factors (among them sensory functions) that serve as facilitators or barriers to functioning. Adherence to this model requires comprehensive evaluation of each individual's needs in relation to the health condition. When the dementia is caused by a progressive disease, periodic reevaluation and adjustment of care plans becomes essential to meet changing needs.

Screening

Screening for sensory impairment should precede screening for dementia. Hearing loss is particularly common among older adults in long-term care settings (Hull, 1995; Voeks, Gallagher, Langer, & Drinka, 1990), as is visual impairment. Ideally, referral to an audiologist or physician to check for impacted cerumen should be made prior to screening. Also, hearing aids should be inspected to ensure that they work and, if possible, a pure-tone audiometric hearing screening should be administered together with an observation of word recognition abilities. Word

recognition involves single-word repetition, making it appropriate for individuals with dementia who typically retain the ability to repeat words even in the advanced stages of cognitive decline. During screening and in all interactions, SLPs should ensure adequate lighting, as older adults generally need more illumination.

Depression is common in individuals with dementia and can adversely affect test performance, making individuals seem more cognitively impaired than is the case. In fact, the cognitive changes associated with depression so resemble the cognitive changes associated with dementia that depressive symptoms are often referred to as "pseudodementia." Thus, it is important that SLPs be knowledgeable of and sensitive to signs and symptoms of depression and make referrals to a neuropsychologist or clinical psychologist experienced with geriatric depression when those signs or symptoms are present.

Drug effects on cognitive-communicative function are also important considerations for speech-language pathologists. Polypharmacy, or the concurrent use of several medications, is common among older adults who have multiple medical conditions (Kaufman, Kelly, Rosenberg, Anderson, & Mitchell, 2002) and many medications prescribed to older adults may have side effects that include exacerbation of cognitive problems. If clinicians have questions about the effects of medication use on the cognitive-communication functioning of their clients, they should contact a pharmacist knowledgeable in geriatric pharmacy for further information.

When selecting cognitive-communication screening instruments and subsequent tests for comprehensive evaluation, clinicians must consider the cultural and linguistic background of the client. Tests that have normative samples of culturally and ethnically diverse groups should be used when available. For information on knowledge and skills required when working with culturally and linguistically diverse populations, see *Knowledge and Skills Needed by Speech-Language Pathologists and Audiologists to Provide Culturally and Linguistically Appropriate Services* (ASHA, 2004c).

Many standardized instruments with demonstrated reliability for screening for dementia are available. These instruments typically contain items that enable the clinician to identify an episodic memory problem and disorientation to time, place, and person. If screening reveals cognitive impairment, a comprehensive evaluation of communicative function should follow.

Comprehensive Evaluation

As previously mentioned, comprehensive assessment of residents of long-term care facilities is mandated by law, and the MDS is the government-prescribed assessment tool. The MDS is designed to help health care professionals identify problem areas that need more in-depth evaluation. Although SLPs typically do not conduct the MDS evaluation in long-term care facilities, they should contribute screening and assessment information to allow the MDS coordinator to accurately complete sections relevant to cognitive-communicative functioning. Because the progressive cognitive deterioration that defines the dementia syndrome inevitably affects communicative functioning, all individuals with dementia should receive a comprehensive, in-depth evaluation of cognitive-communication functioning at the time of admission to a long-term care facility and periodically thereafter as indicated. The goal of the assessment is to establish the highest level of functioning

of which the dementia patient is capable. This information is needed for formulating the required care plan because care plans must be designed with specific goals to sustain residents at the highest possible level of functioning.

In doing a comprehensive assessment, SLPs should use assessment tools that have been demonstrated to produce a valid characterization of cognitive-communication strengths and weaknesses, including language comprehension and expression and integrity of working, declarative, and nondeclarative/procedural memory systems. Additionally, clinicians should identify cultural, environmental, and linguistic barriers that impede functioning. As always, per the ASHA *Code of Ethics* (2003), SLPs who conduct assessments of individuals with or at risk for dementia should have the requisite knowledge, education, and training.

Clinicians should select a test battery for comprehensive assessment that has been standardized on individuals with dementia. The selection process should involve scrutiny of the evidence for validity and reliability of results obtained using the battery. Further, consideration should be given to the severity level of the individual being tested. Some tests are too difficult for the individual with severe dementia and do not yield useful information because the individual fails most or all of the items. Tomoeda (2001) provides a review of cognitive-communication assessments for individuals with dementia.

Comprehensive evaluation of individuals with dementia should also include observation of the individual with dementia in several communicative contexts (e.g., different settings, different partners). Interviews also should be conducted with personal and professional caregivers. Information gleaned from these methods will supplement standardized test results, aid clinicians in assessing change in functioning over time, and help in determination of appropriate treatment goals.

Determining Candidacy for Treatment

As a result of the progressive nature of most dementia-associated illnesses, clinicians are challenged to decide whether individuals with dementia have the potential to benefit from cognitive-communication interventions. Clinicians must justify to payers, families, and patients that recommended interventions are reasonable and necessary. To that end, they should identify positive prognostic factors, such as responsiveness to cues, ability to read, ability to follow simple directions and ability to converse (Bayles & Tomoeda, 1997) that demonstrate the feasibility of the proposed intervention. Some treatment programs (e.g., use of graphic and written cues in memory books, spaced-retrieval training) have short pretreatment assessment protocols that can assist clinicians in determining whether a client is a candidate for the particular treatment. In sum, assessment enables SLPs to identify residual abilities and deficits of clients, and this enables the SLPs to design appropriate care plans and to counsel professional and personal caregivers about how to best support the functioning of the patient.

Intervention Considerations

Various dementing diseases result in unique profiles of cognitive-communication impairment because of differences in the distribution of neuropathology. Therefore, an underlying principle of dementia intervention programs is to increase reliance on spared systems and decrease dependence on impaired ones (Bayles & Tomoeda, 1997). For example, in individuals with AD, nondeclarative memory

systems such as procedural memory, habit memory, capacity for conditioning, and recognition memory may be relatively preserved compared with declarative memory systems until the later stages of the disease (Eslinger & Damasio, 1986; Heindel et al., 1988). In other types of dementia, such as that associated with Parkinson's disease, nondeclarative memory systems, particularly motor skill learning, may be more prominently affected (Heindel, Salmon, Shults, Walicke, & Butters, 1989). Regardless of the etiology, less impaired aspects of cognition and communication should be used as the basis for therapy programs aimed at facilitating function. Indeed, in recent years, researchers have demonstrated that even individuals with AD dementia who have difficulty recalling episodes or events can, nonetheless, learn new information and behaviors (see, e.g., Camp, 1989; Hawley & Cherry, 2004).

A second therapeutic principle for people with dementia is the strengthening of knowledge and processes that have the potential to improve. Repeated exposure to a stimulus-response pairing may result in the association being strengthened even though the individual lacks the ability to recall the learning situation. Importantly, techniques that limit a client's opportunity to make mistakes during learning create stronger engrams for the desired response. This approach is known as “errorless learning,” and researchers are increasingly demonstrating that minimizing errors during learning trials is an integral component of therapy programs for individuals with dementia (see, e.g., Clare et al., 2000).

Finally, clinicians should design interventions that will evoke a positive emotion in the client. Elicitation of positive responses during therapy tasks increases the likelihood of engagement and learning. When stimuli and techniques are used that evoke negative emotion (including repeatedly correcting a person with dementia who incorrectly recalls information), the person may be distressed long after they have forgotten the stimuli.

Direct and Indirect Interventions

To ensure relevance and appropriateness of treatment programs, decisions about goals, techniques, and stimuli must be made in collaboration with clients, their caregivers, and other health care professionals. Clinicians must consider the cultural background of their clients when designing treatment programs and adapt specific activities to their interests. Clinicians should refer to *Cultural Competence* (ASHA, 2005a) for further information on the ethical considerations of working with individuals with dementia who have culturally and linguistically diverse backgrounds.

Clinicians can work directly with individuals who have dementia to facilitate cognitive-communicative function (“direct” interventions; Clark, 1995) or indirectly through environmental modifications, development of therapeutic routines and activities, and caregiver training (Clark, 1995; Hopper, 2001). Some examples of direct interventions with research evidence to support their use are spaced-retrieval training (Bourgeois et al., 2003; Camp, 1989), reminiscence, the Breakfast Club (Santo Pietro & Boczko, 1998), Montessori-based activities (Orsulic-Jeras, Judge, & Camp, 2000; Orsulic-Jeras, Schneider, & Camp, 2000), and the use of graphic and written cues in memory wallets and books (Bourgeois, 1990, 1992, 1993). These direct interventions are designed and implemented by

SLPs; however, all direct interventions should be taught to caregivers for use after individuals with dementia have been discharged from skilled SLP treatment programs.

Caregiver training is essential to facilitating optimal outcomes for individuals with dementia. Most caregivers lack understanding of how communicative functioning will be affected in the different stages of dementia, and will profit from periodic counseling as the dementing disease progresses. For this reason, and the fact that caregivers have continual (often daily) interactions with people with dementia, SLPs should consider caregiver training in any dementia management program. Caregiver communication training programs have been developed by some researchers (Clark & Witte, 1989 [as cited in Clark, 1995]; Ripich, 1994; Santo Pietro & Ostuni, 2003) and positive outcomes reported (Ripich, 1994; Ripich, Wykle, & Niles, 1995; Ripich & Ziol, 1999). Whereas direct interventions may not be appropriate for all individuals with dementia, indirect interventions, particularly caregiver training in communication strategies, are appropriate for individuals in all stages of dementia severity.

Both the environment and everyday routines are appropriate targets for management to improve functional communication abilities of individuals with dementia. In fact, SLPs and other clinicians have used linguistic stimuli, such as large-print signs, to indicate locations of importance, such as restrooms, bedrooms, and dining rooms. The techniques of using tangible stimuli and single-word cues are both consistent with the principle of capitalizing on cognitive-linguistic strengths in managing individuals with dementia. Increasing lighting; decreasing ambient noise; creating a home-like, culturally appropriate environment; and developing familiar routines are all among the recommended strategies for improving cognitive-communication skills and other functional abilities in dementia (Lubinski, 1991). Although anecdotal evidence is abundant in support of the benefit of these strategies on communicative functioning of individuals with dementia, research is needed to demonstrate their efficacy and effectiveness.

In summary, SLPs have a therapeutic role with both patients and their caregivers through direct and indirect interventions. When a clinician is involved from early in dementia until the terminal stage, both types of intervention are likely to be used.

Evidence-Based Practice Considerations

The term "evidence-based practice" (EBP) is defined by Sackett, Rosenberg, Gray, Haynes, and Richardson (1996, p. 71) as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients… [by] integrating individual clinical expertise with the best available external clinical evidence from systematic research." Patient values and preferences should be considered in framing care programs. In 2004, ASHA published a technical report, *Evidence-Based Practice in Communication Disorders: An Introduction*, which includes a short introduction on the underlying tenets of EBP (ASHA, 2004b).

In 2001, the Academy of Neurologic Communication Disorders and Sciences (ANCDS), together with ASHA support, committed to developing EBP guidelines for dementia-based communication disorders. A committee of researchers and clinicians was formed to review and evaluate published research. Whereas in 1975 little research was available about the communication disorders associated with

the dementias, today there is extensive literature. Tests have been developed for identifying the cognitive-communicative impairments of individuals with dementia, and many interventions have been reported to produce positive effects on the functioning of these patients. The results of the work of the Committee to Develop Evidence-Based Practice Guidelines for Dementia Based Communication Disorders is being published in a series of articles (see Hopper et al., in press; Mahendra et al., in press-*a*, in press-*b*). Bayles and colleagues (in press) provide a description of the criteria used by committee members for evaluating the validity and reliability of the results of intervention studies.

Future Research Needs

Treatment efficacy and effectiveness studies related to indirect and direct therapy approaches for dementia are top research priorities for the profession. Questions related to intervention—what techniques are effective, with whom, for how long, and in what context—remain largely unanswered. The list that follows is a sample of topics important for future research and comes from the previously mentioned ANCDS technical report:

- Documentation of cognitive-communication profiles of individuals with different types of dementia and the response of these individuals to direct and indirect interventions
- Effects of environmental manipulations (e.g., routines and activities) on cognitive-communication abilities
- Influence of cultural and linguistic diversity on response to interventions (e.g., environment, accent of caregivers and persons with dementia and their communication interactions, presence and type of bilingualism)
- Use of technology in treatment for individuals with dementia (e.g., computer programs)
- Effects of modification of language on the comprehension and behavior of the person with dementia (e.g., simplifying syntax, modifying rate of speech, use of different question types)

As medical and pharmaceutical treatments for AD and other dementias continue to improve, individuals with dementia will be identified earlier and live longer. Already efforts are under way to test behavioral interventions that might be paired with pharmacological therapy to maximize cognitive-communication abilities (see, e.g., Chapman, Weiner, Rackley, Hynan, & Zientz, 2004). Indeed, there is reason to believe that cognitive-communication stimulation will be essential to gaining full benefit from drug treatment.

Conclusions

With the growth of the older adult population and the increased incidence and prevalence of dementia, SLPs will increasingly be serving individuals with dementia. Because research related to managing individuals with dementia is burgeoning and evidence is growing about the value of intervention, clinicians are encouraged to keep abreast of developments and use an EBP approach to assessment and treatment. In summary, SLPs have a primary role in the screening, assessment, and treatment of dementia-associated cognitive-communication disorders, including caregiver training and counseling. Other roles include collaboration with team members, case management, education, advocacy, and research.

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