COGNITIVE - LINGUISTIC ASSESSMENT PROTOCOL FOR ADULTS

Register No. M9903

A Dissertation submitted in part fulfillment for the
Second year M.Sc. (Speech and Hearing),
University of Mysore, Mysore

All India Institute of Speech and Hearing,
Manasagangothri, Mysore-570 006

May 2001

Dedicated to

my

Amma & Anna

CERTIFICATE

This is to certify that the dissertation entitled "COGNITIVE - LINGUISTIC ASSESSMENT PROTOCOL FOR ADULTS" is the bonafide work in part fulfillment for the degree of Master of Science (Speech and Hearing) of the student with register number M9903.

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CERTIFICATE

This is to certify that the dissertation entitled **"COGNITIVE - LINGUISTIC ASSESSMENT PROTOCOL FOR ADULTS"** has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier in any other University for the award of any Diploma or Degree.

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DECLARATION

This dissertation entitled **"COGNITIVE - LINGUISTIC ASSESSMENT PROTOCOL FOR ADULTS"** is the result of my own study under the guidance of Dr. K.S. Prema, Lecturer, Department of Speectb-Language Pathology, AIISH, Mysore and has not been submitted at any other university for the award of any Diploma or Degree.

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CONTENTS

INTRODUCTION

"I *have decided not to grow old but these temple bells*. . . . . ."

This haiku poem written by a Japanese monk 300 years ago expresses poignantly the fact that old age is inevitable and is the normal course of every living creature. It is an integral part of life, and that is why it must be regarded as the manifestation of growth and development rather than a mere decline. Humans are different from animals in that they know, see and sense that they are getting old and that, to a considerable extent; old age can be changed depending on how they will perceive it, how they will accept it, and how they will prepare for it.

- **Ulatowska (1985)**

Aging is associated with special physical, emotional and social burdens imposed by mental decay in later life, and a general wear and tear at anatomical and functional levels. 'Normal aging' often refers to the most common or usually encountered functional state of the nervous system in a population of older individuals (Civil and Whitehouse, 1991). A distinction has been attempted, by researchers, between normal or 'senescent' changes and abnormal or 'senile' changes. But, our understanding of what constitutes 'normal' aging processes has been restricted by confusions in terminological and research methodological issues. As speech - language pathologists, we would be interested in studying the changes in language and communication concomitant to biological aging processes. In addition,

language of the elderly is intrinsically worthy of study because it provides us with documentation of life span characterization of normal language.

Normal aging is accompanied by changes in the ability to process, understand and use language. There is no global decline in linguistic functions. In fact, certain abilities like vocabulary development, and discourse abilities continue to improve into late adulthood. However, decline in certain cognitive functions like attention, memory, recall etc., have been reported. A general decline in reaction times have also been documented. These cognitive changes impinge on linguistic abilities leading to such problems as:

- Difficulty in word retrieval processes, (Kemper ; 1992, Maxim ; 1999).
- Decline in complex discourse processes, (Ulatowska et al., 1985).
- Slight diminution in language performance in terms of use of semantic information, structures, errors of reference, intact phonological and grammatical systems within the clause; but reduction in types of clause structure and verb phrases used. (Brownwell and Joanette, 1993).
- Difficulties in high level comprehension tasks as drawing inferences, recalling story gist, and detecting verbal anomalies, (Cohen ; 1979, Cohen and Faulkner; 1981).

With increasing interest in topics of gerontological concern in the 1970s, it was realized that practically nothing is known about language functioning in the later years of life. (Ulatowska et al., 1985). References to language changes in the elderly

ranged from precipitous decline to complete preservation of linguistic function with advancing age. Research issues in gerontological studies have been plagued by methodological difficulties like definition of 'elderly', separating cognitive functions from purely linguistic factors in language functioning, clearcut delineation of senile and senescent population, etc. Despite these difficulties, a growing body of research does point to deterioration of complex linguistic processing abilities in the elderly. But, inspite of this slight decline in language performance, the elderly are still able to communicate adequately (Kemper, 1992).

Research into language changes in the elderly should be of relevance to the crucial, but as yet unresolved, issue of the relationship between language and cognition. Reports of cognitive deterioration, memory deterioration and slower information processing as observed on performance IQ tests disclose a significant age-related decrement (Albert and Heaton, 1988). On the other hand, verbal IQ performance tests show more equivocal results pertaining to decline in linguistic function. Most studies report of a verbal IQ preservation, where vocabulary, information stores and comprehension may be relatively insensitive to age related changes at least until age of 75 to 85 years. (Granick, 1971). But higher level linguistic processes are known to be affected in the elderly, as evident in more recent research (Ulatowska et al., 1985). Thus, a fundamental question that must be decided concerns how these cognitive disabilities are reflected in the verbal behaviour of normal elderly persons, as well as aphasic and demented patients. If there exists differing degrees and kinds of deterioration in these abilities, will this throw light on

differential effects of various cognitive process on language performance and communicative success? How will this information help us in scrutinizing language disorders in aphasics, and in differentiating dementic from normal elderly?

Another relevance for the study of language in normal elderly people is its immediate relevance to the clinical study of pathological language. Aging is the single greatest risk factor in stroke (Jarvik, 1975). Thus, it is extremely important to know which language changes are attributable to aging and which to stroke related pathological changes. A few researchers have given evidence of different patterns of aphasic disruption as a function of age (Kertesz and Sheppard; 1981, Obler et al., 1978) i.e. Wernicke's and global aphasia occur more predominantly in older patients. Also, some types of errors commonly attributed to aphasic language are also representative of language of normal elderly (North et al., ...). Aging is the most common factor associated with language changes in the early stages of the dementias. Often, in the early stages of dementia, there is a delicate boundary between what may be attributed to normal aging versus what may be attributed to the disease process itself. The lack of adequate normative data in this area represents a notable lacuna in the clinical assessment of communication disorders.

Ethnocultural differences also exist in older adults within the framework of aging and neurogenic language disorders (Payne, 1997). In the Indian context, very few studies have been done to explore the language abilities in the elderly (Nidhi; 1996, Raksha; 1996, Nidhi and Raksha; 1994, Raksha and Nidhi ; 1994). Thus, there

is need for more detailed information on language performance in the elderly and ethnocultural differences in the Indian subcontinent (mainly with relation to crosslinguistic data). Besides establishing normative data on cross-linguistic population, there is immense need for standardized test material for evaluation of cognitive - linguistic function in the elderly. Cognitive - communicative tests are available for assessment of patients with traumatic brain injury, eg. Measures of Cognitive - Linguistic Abilities (MCLA) (Ellmo et al., 1995), Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) (Adamovich and Henderson, 1992), Boston Naming Test (Goodglass and Kaplan, 1983), Ross Test of Higher Cognitive Processes (Ross and Ross, 1979) and Ross Information Processing Assessment (RIPA-2) (Ross-Swain 1996), among others. But these tests are standardized for use specific to the cognitive-communication problems in the patient with traumatic head injury. Also, most of these tests concentrate on one or few cognitive-linguistic domains, or test the global linguistic domain. Norms for these are restricted to the western population.

Considering the above notes, the present study was carried out with the objectives of:

- Developing a protocol for assessment of cognitive - linguistic abilities in native Kannada speaking, normal, young-elderly subjects.
- Assessment of cognitive - linguistic abilities in normal adults from 40 years of age to 70 years of age, to look out for following information :

- Age related changes, if any, in performances on various cognitive -linguistic skills under study.
- Gender contingent variations, if any, in performance on the different cognitive-linguistic skills considered.
- Potential parameters that would differentiate senescent vs senile age-related changes.

The study would have implications for clinical as well as research purposes.

REVIEW OF LITERATURE

Man is gifted with a few special skills such as thinking, reasoning, judgement, memory, speech, language, communication, reading, writing etc. These faculties are unique to human beings and clearly distinguishes them from other lower animal species, including the primates, our nearest ancestors on the taxonomic charts. Scientist from various disciplines such a psychology, speech-language pathology, cybernetics, genetics, neurolinguistics etc. are involved in investigating these special faculties and the possible inter-relationships that exist among them. More recently, with increasing focus on communication in human society, research is geared towards the relationship that exists between communication and the other human faculties collectively known as 'cognitive skills'.

Cognition involves a wide range of mental processes such as attention, pattern recognition, memory, organisation of knowledge, language, reasoning, problem solving, classification, concepts and categorization (Best, 1999). These cognitive processes are all inter-related with one another rather than existing in isolation. Study of cognitive processes helps us to learn how we acquire, store, retrieve and use knowledge (Matlin, 1983).

Communication is mainly an active and intentional two ways process of exchange of messages between speaker and listener. *Language* forms an important mode of communication, and involves use of an arbitrary set of symbols (code)

arranged in a prescribed manner to convey meaning. To produce, speech, the language phenomenon involves using a code, retrieval of linguistic units, organizing and further processing most of which involve cognitive processing, viz., using a set code requires memory, organizing involves abstract reasoning, attention, orientation etc. though studies have suggested the inter-relations among cognitive processes, the exact relationship of language with other cognitive processes have been minimally explored.

Psycholinguists and behaviorists maintain that language is the very basis of thought (Watson; 1924, Matlin; 1983). Also, language users must constantly remember, solve problems and reason, and hence language is not an isolated system; it depends heavily on other cognitive processes. However, many other researchers maintain that language function is modular (Blank et al; 1979, Yamada; 1983, and others) i.e., it can function independently of other cognitive structures. Thus, the exact nature of this relation is not clear, and has been a debatable topic since interest in this line of thought has been kindled only in the late 1980's (Prigatano; 1984, Lesser; 1987, Davis; 1989), particularly amongst groups of speech language pathologists, cognitive psychologists, neurolinguists and psycholinguists. They have attempted to study the intricate relationships between language functions and cognitive processes by carrying out investigations on normal geriatric population and/or on clinical populations with known cognitive or language deviancies.

Evidence from cognitive-communicative abilities in the aged:

'Normal aging' often refers to the most common or usually encountered functional state of the nervous system and other anatomical substrates in the population of older individuals. (Civil and Whitehouse, 1991).But the correct definition of the geriatric/ older individuals / elderly has been an issue of major debate. Recognizing the heterogeneity of the population, Ulatowska, Cannito, Hayashi & Fleming (1984) recommend further sub grouping of elderly into young-elderly (65-85 Years) and old-elderly (85+years). Nuegarten (1974) also suggested a similar sub-categorization, but considered age groups 60-75 years as the young-old and 75+ years as the old-old group.

Our understanding of the normal aging process in the nervous system is limited, and has often been associated with general wear and tear; and degenerative processes. However, all the functional correlates, of the anatomical wear and tear **do** not deteriorate to equal extents. In fact, Roth and colleagues (1967) suggest that "a certain level of cerebral damage has to be reached before the progressive intellectual and personality deterioration (as associated with dementia) becomes manifest". **Roth** (1972) uses this 'threshold effect' to explain the rapid step-like deterioration often observed in elderly persons after years of little more than a mild, slowly progressive, or stationary defect of memory for recent events, together with some accentuation of life-long personality features.

The threshold model is an attractive one because it offers hope of successful intervention and prevention. According to the threshold model, morphological changes occur slowly, so that there is adequate time to detect their behavioral consequences before a critical level or 'threshold' is reached and to intervene therapeutically early enough to prevent clinically irreversible damage (Jarvik, 1975)

Research in the 1950s on the intelligence quotient (IQ) of cross sections of the populations suggested that verbal IQ changed very little with increasing age until a person reached their seventies, when there was some decline on complex tasks. Performance on vocabulary abilities showed hardly any changes. One aspect of language which did show a *study* decline with age was psychomotor speed i.e. the ability to co-ordinate mental and physical action.

Perceptual and time constrained motor abilities, reaction times etc. show greater deterioration with aging in the geriatric population. Cognitive abilities such as memory, problem solving and general intelligence too show a decline. Cognitive decline can be one of the earliest indicators of morbidity and mortality (Jarvik et al., 1973). Since the most common causes of death in the age group above 60years are arteriosclertoic, cardiovascular or cerebrovascular disease, one may be led to infer that the lowered cognitive performances reflect subclinical cerebral changes (Jarvik, 1975).

On the other hand, it is generally held that language functions are the least likely of the neurobehavioral functions to deteriorate with aging (Obler and Albert, 1981). Certain language abilities may develop throughout the lifespan e.g. improvement in narrative skills, or style, ability to encode thought into language, to communicate effectively and to understand what others intend, may show an improvement. Early research has shown that language based intelligence tests may not show much decline with increasing age (i.e. verbal IQ shows very little change), but later research suggests that language comprehension and spoken language has produced more equivocal results (Maxim, 1999). While language itself may not show much decline with aging, aspects of cognition such as memory, attention, and problem solving do so and will impinge on the older person's ability to process language. (Brownwell and Joanette, 1993). Thus, while language systems itself works more slowly, in older people, other cognitive parameters of language also show small changes which add to the language processing load (Maxim, 1999).

It is not easy to differentiate between language change during normal aging (senescent change) and those language changes due to age-related diseases (senile changes),In this view, a detailed look at cognitive communicative capacities may help to provide a clearer picture. The ability to process and use language for communication involves both language and cognition, and hence it is essential to disentangle the strands of these mental processes in order to establish why language may change with increasing age (Maxim, 1999).

Any complete discussion of speech, language, and hearing impairments characteristic of aged individuals must be considered within the general framework of the aging process itself. The impact of communicative impairments is more easily appreciated when viewed within the context of biologic, psychoemotional and sociologic alterations which typify the aged person. It is safe to state that nearly all people, as they grow old, experience physical, psychological and interpersonal difficulty of one sort or another. Sometimes communicative handicaps cause such problems and sometimes they are the results of these impairments.

1) Because of anatomic changes in the sensory system, the central nervous system (CNS) receives less information upon which processing decisions may be made.
2) Threshold responses to tasks such as tachistoscopic recognition may be elevated in part because of caution in responding.
3) As a result of CNS alterations during aging, the ability to integrate information from several senses or within one sense may deteriorate.
4) For the same reason, the elderly may display a rigidity in responding and a reduced ability to alter original percepts e.g. in an ambiguous-picture perception experiment, younger subjects were much better able to reorganize an original precept and see the alternate figure.

(Schow, Christensen, Hutchinson and Nenbonne, 1978)

Several theories have been put forth to explain the aging processes. Given below is a flow diagram of the conceptual schemes depicting inter-relationships

between genetic and environmental influences on brain function, behavior and aging.

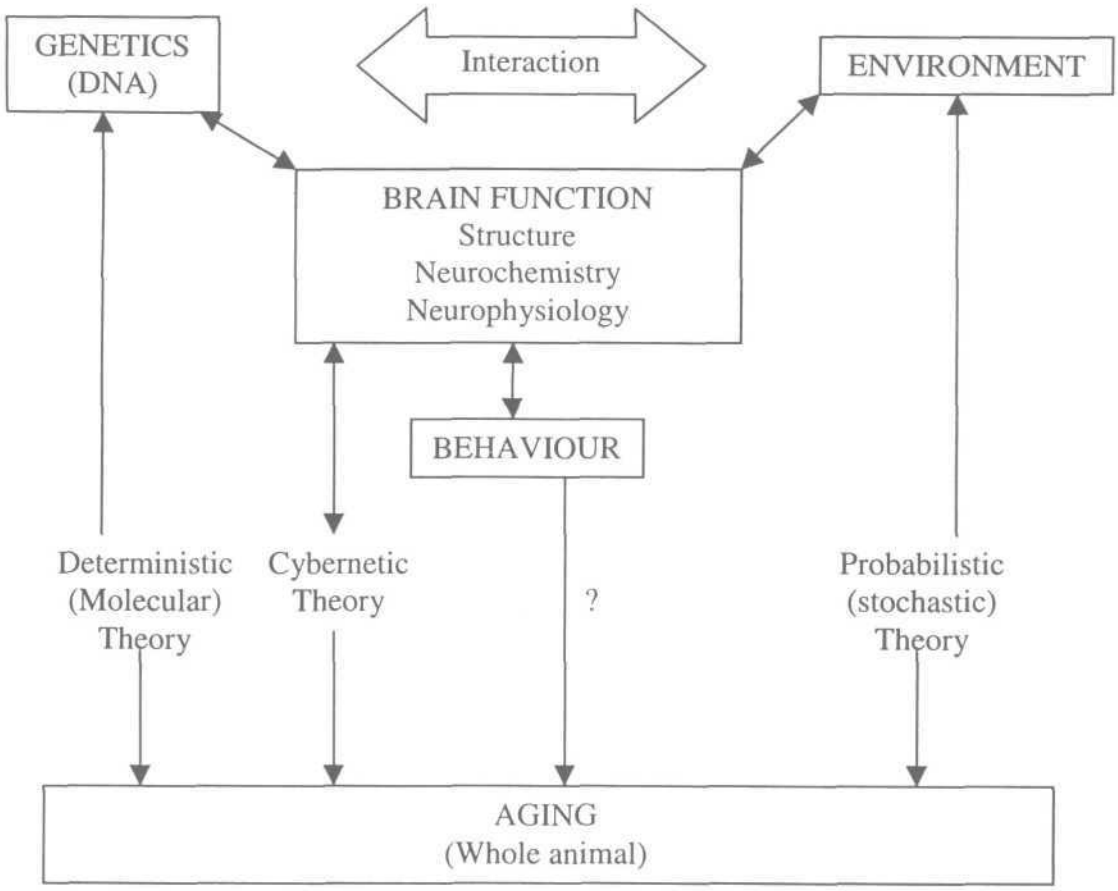


Fig.l Genetic and environmental influences on brain function, behaviour and aging

Samorajski (1975). [From Brody; H., Harman; D., Ordy; J.M., (1975), Aging, Vol.1, Clinical, morphologic and neurochemical aspects in the aging CNS]

As is thus, evident form the flow diagram, a lot of factors affect the performance abilities of the geriatric person.

Aging and Language processing:

Elderly people may continue to expand their vocabulary store as long as they remain healthy and active. Their ability to recognize words as part of their vocabulary as well as to recognize the meaning of these words does not change with age, but they may find difficulty in actively retrieving a particular word when they need it. Generative naming tasks show an age deficit although the elderly can achieve better scores if the time element is waived. The storage facilities remain, but retrieval is less efficient and thus has often been termed as 'benign senescent forgetfulness'.

For single-word processing tasks, the normal healthy elderly person has retained memory stores for vocabulary and the semantic associations between words. But word retrieval is slower and more difficult for single words. Hence, the elderly benefit more when asked to retrieve single words for a particular context. Far less is known about the ability to process sentences, and larger units of text, but in sentence repetition and correction tasks, the elderly perform less well on lengthy and complex sentences.

Research thus reveals an intact language competence and minimally impaired language performance, both in understanding and language production (Maxim, 1999).

Aging and Understanding Language:

Elderly people have greater difficulty understanding sentences that are complex either in grammatical form or in terms of the semantic structure, or in both (Davis and Ball 1989) Sentence length does not appear to be an important factor in the ability of the elderly to understand language, but both increased sentence complexity and speed of delivery have been shown to impair the ability of older people to under stand (Jaccoby and Hay, 1998)

The sentence types which cause particular difficulty in understanding for the elderly, are also sentences on which younger people do not perform at ceiling level, eg. sentences that a parsing mechanism cannot complete at a first attempt and requires a second pass before the process is complete.

There is also evidence that, when listening to a passage, the elderly do not pick up the same information as efficiently as the younger people. Both older, and younger people seem able to make similar use of context to aid their processing of a passage, but if there is intervening information or if inferences to be understood,older people perform less well than younger people. Also older people have greater difficulty in processing grammatically encoded information about relationships between events (Kemper, 1992, Hamm and Hasher; 1992)

It must also be pointed out that deterioration in learning is common in old age, and this factor also affects the individuals everyday ability to understand.

Aging and spoken language:

The production of fine rapid movements of the lips and tongue slows down with age. However this does not affect the ability of the person to produce intelligible speech, unless dentition is compromised. Changes in vocal quality occur in terms of stability and pitch. The fundamental frequency of male voices decreases over adult life until about 60 years of age, when it begins to rise again. In adult females, fundamental frequency remains stable until early old age, when it decreases.

Phonological and grammatical systems within the clause appear to be almost impervious to aging and even dementia. Healthy elderly make more errors in grammatical form than younger people. They have greater difficulty in monitoring their own output, in making language repairs when necessary and in producing left-branching grammatical structures (sentence initial subordinate clauses).

Studies of connected discourse produced by elderly people suggest that there may be errors of reference and fewer propositions than in the language of younger people. There may be a reduction in types of clause structure and verb phrases, but little change in sentence-length. Obler and Albert (1981) report that discourse may become more elaborate syntactically, yet less fluent in its utterance and active use of lexicon may falter although passive use is preserved.

Thus, most studies suggest diminution of language performance, but adequate communication.

Aging and attention:

Attention is central to the linguistic or cognitive processing. The ability to process language may therefore be limited by the attentional capacity available to the individual (Maxim, 1999) Attention can be of two types, viz., selective attention and sustained attention. Sustained attention refers to concentration of a particular stimuli without getting distracted, whereas selective attention refers to leaving out irrelevant stimuli. Impaired attention may lead to subject's missing out on information in spoken discourse or in written material, which may have an impact on their responses and cause communication break down (Boyle and Strikowsky-Harvey, 1999)

Sustained attention does not change with age, but selective attention does (Maxim, 1999). Research has consistently shown that elderly have more difficulty than younger people in allocating attention to the target task. This is true for both, the auditory and the visual modality (Harley, 1992). ***Immediate and sustained auditory attention*** also affects oral word association tasks (Ruff et al., 1997)

A simple letter cancellation task, in which a specified letter of the alphabet appeared repeatedly within a random letter matrix, requires sustained attention in scanning the page and marking each instance of the letter (as in subsets of WISCAVAIS). Response to commands and matching task have also been employed for assessing attention (Vitaliano et al, 1984: the clinical utility of Dementia Rating Scale for assessing Alzheimer's patients).

Discrimination and perception deals with the ability to differentiate between stimuli. Attention plays an important role in discrimination and perception abilities. Hence tasks involving discrimination and perception are often employed in testing attentional skills e.g. letter cancellation, same /different identification etc. (Carter et al., 1980).

Aging, memory and language:

Memory is needed for encoding into memory stores, for retaining language in short or long term stores and for retrieving from the stores. The several types of memory show differential change in normal aging, but almost all aspects of memory are important for language in some way.

Episodic memory shows an age related decrement. Episodic memory encompasses representations of events that have been experienced by an individual and are tagged with respect to time and place of occurrance. Age differences have been demonstrated to be minimal in tests of immediate recall (primary memory) (Craik, 1977).

Episodic memory, which mainly concerns with time-related or autobiographical events, is tested using autobiographical or orientation questions like "Is your name-?", "Is today Monday?" etc. These tasks have been employed in Scales of Cognitive Ability for Traumatic Brain Injury (SCATBI) (Adamovich and Henderson; 1992). Western Aphasia Battery (Kertesz and Poole, 1983), Ross

Information Processing Assessment (RIPA) (Ross-Swain, 1996) and other tests for Alzheimers Disease and Parkinson's disease.

An age related deficit is typically observed in working memory tasks that require any manipulation of information that is temporarily stored or any additional processing while information is held in memory tasks that require any manipulation of information that is temporarily stored or any additional processing while information is held in memory. Elderly subjects do worse than young adult subjects in working memory tasks (Craik and Rabinowitz, 1984). Even in long term memory recall, young adults recall more items than older adults (Hultsch and Dixon, 1984). Cues help to reduce this disparity in performance (Lawrence; 1967, Bowles and Poon; 1982)

Working memory, is a much researched aspect, especially in recent studies concerning Parkinson's disease, Dementia Alzheimers' Type etc,(Waters and Caplan, 1998). Working memory capacity is related to the ability to use the meaning of a sentence to accomplish a task. This may be tested using tasks like digit repetition (forward and backward,) used in Weschler's Adult Intelligence Scale, and Weschlers Memory Scale, sentence to picture matching etc. In digit span tests it has been suggested by Carter et al., (1980) that upto 7 digits is usually sufficient to judge competence for daily living activities.

Semantic memory is more resistant to aging. The semantic memory store is well preserved in relation to what is contained in the memory and healthy elderly people continue to take in new words to the store, although semantic processing becomes more variable with age. Retrieval becomes more difficult, but the ability to recognize words in the memory and to use networks of associations between the words is well-maintained (Bowles, Williams, and Poon, 1983). Thus, although older adults are slower than young adults in making lexical decisions, as they are in virtually all tasks, there is typically no age difference in the ability to identify words and non-words (Bowles and Poon; 1982, 1988, Howard; 1983; Howard; Me Andrews and Lasaga; 1981). Confrontation naming shows an age related decline, with older subjects being abler to name fewer objects and action words than younger adults. (Borod; Goodglass, and Kaplan; 1980, Nicholas; Obler; Albert and Goodglass; 1985, Bowles and Poon; 1985). Brooks, Gardiner, Kaminska and Beavis (2001) reported that younger adults in explicit memory tasks but not in implicit memory task but not in implicit memory tasks.

Semantic memory is concerned with language and knowledge. It deals with such Organisation of information in memory stores that enables co-ordinate naming, Superordinate naming, generative naming and word fluency. These tasks have been extensively used by Bayles, Tomoeda, and others, 1992 in testing patients with Alzheimers disease. Word fluency tests are a good task to gain insight into such abilities as auditory attention, word knowledge, and long term memory, especially in case of diffuse multifocal or non-frontal lobe factors (Ruff, Parker and Levin, 1997)

The impact of these memory deficits on language will be that knowledge of language will not decline with age, but memory/retrieval for time related or autobiographical events do show an age related decline. These changes usually do not affect normal communication, although the elderly frequently complain of difficulty in retrieving items from semantic memory. Comprehension and discourse tasks, used to evaluate language competence, make demands on working memory. Therefore, some of the age differences observed in language performance can be attributed to changes in working memory processes rather than to changes in language competence (Kynette and Kemper; 1986, Obler; 1980) In addition to its involvement with working memory, discourse requires the retrieval of words form semantic memory. Age differences in discourse, such as elaboration; empty speech and settling for more common; less precise words, may results form the inability to retrieve the best word, reflecting a memory rather than a linguistic source. (Obler; 1980, Sandson; 1987).

It may not be possible to separate age related changes in memory processes from age-related changes in linguistic processes. However, it is important to be aware that measures of language performance are influenced by memory demands of the task.

Aging, problem solving and classification skills:

Problem solving is a metalinguistic / metacognitive task that enables a person to identify and change aspects of their behaviour that are causing communication breakdowns. This ability is employed in explaining problems in order to seek assistance or to communicate potential solutions. Problem solving abilities include such skills as reasoning sequencing, comparing and predicting.

Tests for problem solving abilities have included the following tasks:

Sentence disambiguation: The purpose of this task is to evaluate linguistic reasoning abilities (Bayles et al., 1989) The disambiguation of different types of linguistically ambiguous sentences requires different cognitive processes (Bayles and Kaszniak; 1987, Caffrey and Bayles; 1987 and others). Whereas lexical ambiguity requires lexical analysis, structural ambiguity requires evaluation of the grammar and logical ambiguity requires evaluation of the relations between subject, verb and object.

Sentence formulation: This task involves unscrambling of words, arranging them in the correct order to make a sentence. Bayles et al., (1992) used a similar task for staging Alzheimers patients, under additional language and cognitive measures'. Their task, however was to ask the patient to generate a sentence containing that word. Points were given to each grammatically correct sentences produced that included the stimulus word.

Predicting outcome: Predicting outcome of a specified situations has been considered a task involving problem solving and abstract reasoning skills (Ross-Swain, 1996), as also compare and contrast tasks. Predicting the cause of a specified situation and also

answering 'why' questions involve problem solving and reasoning (Ross-Swain, 1996) and have been used in the Ross Information Processing Assessment (RIPA). Sequential task analysis is also a measure of problem solving ability, which involves reasoning, temporal organization abilities and has been included by Ross-Swain in her test, viz., RIPA, under the head 'Problem solving and abstract reasoning'.

Another metacognitive ability that is very important for coherent communication is organisation. This involves the process of organization of information in memory stores as well as the input from sensory organs. It helps in comprehension of linguistic relationships such as categorial relationships, analogous relationships, improved verbal organization to enable, concise and cohesive expression of thoughts. Organisation also promotes processing and comprehension of complex information for the purpose of analysis, synthesis, and drawing logical conclusions and solve problems with accuracy (Boyle and Strikowsky-Harvey, 1999).

Organizing given information into categories, working with analogies and sequencing events will thus form the tasks to test this ability. Category identification tasks have been used in RIPA-2 (1992), SCATBI (1994) and neuropsychological examinations. Analogies have been employed in SCATBI under reasoning ability, as also in the SONR (Snijders, et al., 1989) sequencing event as a measure of organizational abilities has been used by Carter et al., (1980).

One common image of aging is that of increased rigidity or difficulty in changing set cross sectional studies on age-related differences in problem solving ability have often used tasks that require language mediation. These studies have often confirmed that in novel situations, elderly people find it difficult to generate the concepts necessary to solve a problem. In comprehending ambiguous sentences, elderly are less likely than younger people to interpret both meanings. They also find it difficult to find strategies or to change to new strategies (Maxim, 1999).

A significant contribution towards the cognition - communication relationship has also come from studies and reports on language abilities in subjects with neurological disorder. Linguists aphasiologists, and neurolinguists have given major contribution in this regard.

Evidence from neurogenic language disorders

Lesser (1987) considered the cognitive system as outside of but contributing to language processing (specifically the processes for reading aloud). Language sets the tone for the cognitive activities the left hemisphere appears to perform - the logical sequential apexes of mental operations (Swindell et al., 1998). Au et al., (1988) using definitions of aphasia as a linguistic disorder in the relative absence of other cognitive dysfunctions put forth her view that language could not be isolated from general cognitive influences. Yet, she reported , other cognitive function could be identified that are separate from language.

On the other hand, language comprehension is frequently necessary for such cognitive skills as the acquisition of new knowledge, as when a person attends a lecture, reads a manual, or listens to a boss's instruction (Boyle and Strikowsky - Harvey, 1999). Higher level cognitive processes like reasoning and metacognitive thinking are largely mediated by language (ASHA, 1987).

Based on his study of data on aphasics and dementics, Davis (1989) put forth his view that language is a cognitive process in its own right and forms a sub system of cognition. In other words, cognition is a superordinate in concept to the language subsystem. This view has been supported by McNeil and Kimelman (1986) and Marshall (1989). Davis further specified that language use may involve processes of a particular kind. There may be language specific cognitive processes (e.g. syntactic parsing) distinguishable from general cognitive process (eg attention) distinguishable form general cognitive process (e.g. attention). The language specific factors would be particular kinds to knowledge, representation, and process. He argued that language disorders should be diagnosed with respect to the underlying cognitive subsystem(s) impaired.

Considering the above arguments, it may be observed that there is considerable overlap in the cognitive and language domains. Language disorder or decline and severe, persistent cognitive impairments may coexist. Both these functions are highly interrelated and interdependent. Noting the relation between language and cognition, the American Speech -Language Hearing Association

(ASHA) has stated that certified speech language pathologists are qualified to diagnose and treat individuals with cognitive-communicative impairments (ASHA, 1988)

ASHA defines cognitive communicative impairments as communicative disorders that results from deficits in linguistic and non-linguistic cognitive processess (ASHA, 1987). The intrinsic relationship between cognition and language, especially the importance of such cognitive processes as attention and organisation for comprehending and producing language is the basis for ASHA'S position (Boyle and Strikowsky-Harvey, 1999). The ASHA (1987) cognitive and language sub committee identifies several aspects of cognition that may effect language:

1) Impaired attention, perception or memory
2) Inflexibility, impulsivity or disorganized thinking or acting.
3) Inefficient processing of information (rate, amount .complexity)
4) Difficulty processing abstract information
5) Difficulty learning new information, rules and procedures.
6) Inefficient retrieval of old and stored information
7) Ineffective problem solving and judgement.
8) Inappropriate or unconventional social behavior
9) Impaired executive functions, self-awareness of strengths and weaknesses, goal setting, planning, self-initiating, self-inhibiting, self-monitoring and self-evaluation.

Cognitive communicative abilities have been proked into great detail in case of certain neurogenic language disorders such as traumatic brain injury (TBI), closed head injury (CHI) dementia and also to a certain extent in right hemisphere disorders, (RHD). In these disorders, language deficit is often not the glaring sign/ symptom. Rather it is the more prominent cognitive deficits that catch the attention of the attending physician. In case of slowly developing disorders like Parkinsons Disease, Dementia, Alzheimer's Disease etc, cognitive symptoms are the first to catch the attention of the caregivers. In early stages of dementia disorders and mild cases of TBI, the subtle language disorders often go unnoticed. However, in the past few decades, research in speech language pathology has tried to document the speech and language problems of this population, and have come up with significant inferences on early identification and differential diagnosis of dementia; and better profiling of subjects with TBI, CHI and RHD.

Cognitive -communicate Disorders of right cerebrovascular accident patients.

RHD often results in a loss of orientation and in thought disorders. These disturbances are evident in tasks of conversation (Myers, 1986). The communication impairments associated with right hemisphere damage are described as disorders of expression and reception of complex contextually based communicative events resulting from disturbance of the attentional; and perceptual, mechanisms underlying non symbolic, experiential processing (Myers 1986) However, RHD patients do not exhibit the auditory comprehension problems that are found in dementia patients (Bayles and Kaszniak, 1987)

RHD often results in an impairment in the cognitive domains of orientation, scanning, visual neglect, attention, memory integration, planning and reasoning / problem solving (Boyle and Strikowsky-Harvey,1999), which are characterized by intuitive cognitive processes (Swindell et al., 1998). These have been widely researched but their impact on speech and language abilities are being recognized only since the past twenty odd years. This may be because the role-played by the right hemisphere in language and communication acts in the normal right handed individual is being unraveled only recently. These studies too are racked by methodological issues leaving to doubt as to the reliability and validity of these studies. However, the subtle language disorders in the RHD are being recognized by SLPs and the cognitive-communicative rehabilitation packages are gaining favor.

Cognitive communicative disorders inpatients with dementia.

Dementia refers to a acquired intellectual deterioration in an adult.(Bennett, 1999) Dementia is often equated with compromised cognitive skills. Cognitive communicative abilities and its disruption have been documented in dementia of various types . Although declines in phonology, syntax and semantics have been studied (Bayles; 1982, Bayles and Kaszniak; 1987, Bayles et at; 1989,Bennet; 1999), the degree of decline in communication abilities seems to exceed the decline in these specific language areas. (Ripich and Terrell, 1988) Therefore a complete description of communication competence rather than linguistic knowledge in necessary for assessment in dementia. This broadened perspective requires analysis of communication units beyond the sentence level.

Dementia Alzheimer's type (D.A.T): The patient with mild DAT is forgetful and memory deficit is apparent only with in depth interviewing. The patient performs normally on tasks of oral reading, Superordinate identification, auditory comprehension and writing to dictation, but is clearly impaired on tasks such as object description, picture description , and super ordinate naming. But as D.A.T progress, performance on linguistically oriented cognitive tasks steadily deteriorates and by the last stage (late dementia) Patients have very severe cognitive impairment accompanied by loss of all verbal abilities. Language task performance deteriorates from 60%-90% in the early stage to 1% or less of normal mean for the later stages (Bayles, Tomoeda and Trosset, 1992). Bayles, Boone; et al, (1989) posit that it is possible to differentiate D.A.T. form normal elderly subjects and aphasia on the basis of cognitive-communicative measures alone. They report that measures of verbal memory, mental status, ability to pantomime and receptive vocabulary are the best for differential diagnosis of mild D.A.T. form normal elderly subjects , significant differences are found between aphasics and mild D.A.T. patients, primarily on memory tasks.

Parkinsons Disease: From a cognitive communicative point of view, parkisosnism is marked by emotional or personality changes, memory disorder, defective ability to manipulate acquired knowledge and striking slowness in the rate of information. Processing vocabulary and general facility with languages (comprehension) are thought to be preserved.

Cognitive communicative problems in-patients with aphaisa.

[1] Aphasia has been traditionally defined as an isolated disorder of language comprehension or production due to a developmental or acquired cause. The cognitive school emerged when clinicians began to show aphasic patients do have intellectual problems. (Trousseau; 1801-1867, Jackson; 1835-1911; Pierre-Marie; 1853-1940, Brown; 1977,Chapey; 1981, Martin; 1981, Davis.1993). Cognitive views of aphasia include impairment in long - and short-term memory for words, phrases and sentences, and impairments in general and specific strategies of processing linguistic information. '

Martin (1981) defines aphasia as 'the reduction because of brain damage, of the efficiency of the action or the interaction, of the cognitive processes that support language. It is characterized by a reduction in and dysfunction of language content or meaning, language form or structure and language use or function and the cognitive processes which underline language, such as memory and thinking. (Chapey, 1981). This position is similar to those who espouse that aphasia results form impaired cognitive processing and its description must include some reference to the cognitive must include some, reference to the cognitive processes assumed to 'underlie' or support language.

Language out comes following traumatic brain injury, (T.B.I.) and subsequent difference edema seldom conform to classic aphasia syndromes and are relatively rare in all degrees of severity. (Heilman, Saffran and Geschwind, 1971) generalized and

persistent expressive and receptive language impairment and global cognitive deficits are more than norm in cases with TBI. (Levin, Grossman, Sarwar and Meyers, 1981) Anomia is often reported to be the primary aphasic symptom in the absence of general cognitive disruption after T.B.I. (Levin et al; 1981, Sarno; 1980). Halpern, Darely and Brown (1973) used the phrase- 'language of confusion' to describe the verbal consequences of general cognitive disruption characteristic of the severe T.B.I. Thus the language problem following TBI are more effectively termed as 'cognitive-communicative disorders' rather than 'aphasia'.

The language problems following of cerebrovascular accident or a stroke are more accurately labelled as "aphasia[1]. Stroke tends to have one sided focal effects, through there is an enormous range of differences between stroke patients with respect to the depth, extent and site of damaged tissue. In all these patients, language impairment with relatively intact functions of the brain is the major sign. Various classification system have been put forth to differentiate among the symptom complexes of an aphasic patient (Kertesz and Poole; 1983. Chapey; 1981, Schuell; 1972, and others). However, time and again; the inability of these classification systems to account for all patients of with aphaisa and the inability of an aphasic patient to conform to all the signs and symptoms of a particular aphasia type, has been pointed out. With the realization of the insufficiency of these classification systems, arguments regarding the definition and existing classification systems came up.

, Limitations of one or more aspects of cognitive functions along with motor impairment are probably the most common consequences of stroke. A mild degree of cognitive impairment at least, occurs in the majority of patients who have suffered a stroke (Robinson, 1998) The frequent occurrence of lasting alterations of functions in area of brain quite distant from the lesion have been suggested by electrophysiological studies (Gummow et al., 1984), and by many patients who experience sensorimotor symptoms in their limbs on the supposedly unaffected side (von Ravensburg et al., 1984) During acute stages of the disorder, secondary diffuse effects typically add symptoms of widespread brain pathology as edema and other physiological reactions take place .Swelling and other secondary effects of stroke can cause more serious bilateral or diffuse damage than the stroke itself. Thus stroke patients frequently display signs of bilateral or diffuse damage during the early stages of their illness. At one month post stroke, most patients with hemiplegia (lateralized paralysis) have perceptual deficits as well, regardless of the side of lesion (Edmans and Lincoln,. 1989). Attention disorder have been reported by Coslett et al., 1993) in case of left hemisphere stroke patients Martin (1990) reports of a reduced memory span. Turtaglione et al. (1991) report of an impaired decision making process as expressed by accuracy of response in left hemisphere damage. ;

Given the nature of these evidences, one of the arguments that was put forth by the increasing interest in aphasia by neuropsychologists was the question of why aphasia is not considered as a cognitive disorder of communication. It may be postulated that Davis[1] view of language specific cognitive abilities is true and these

cognitive -linguistic abilities will show changes with age. That aphasia type change with age, even within the over 50 population, is confirmed by a study by Obler et al., (1978), where they showed a 11 year difference between patients with Broca's aphasia (mean = 52 years) and those with Wernicke's aphasia (mean = 63 years). Thus it would appear that the clinical observation of increasing fluency of aphasia from childhood to a adulthood is substantially confirmed even within the older age groups. These results may also be interpreted as proof of changing localization of language and language-related cognition areas, even through adulthood to old age, that is, there appears to be a continuous reshuffling of functions of various areas in the brain.

In any event, memory, attention, perseveration, disinhibition, and perception of the real world do interact in language performance in ways that the dementias are only beginning to tell us (Segalowitz., 1983). A number of behaviors of dementia such as paragrammatism and verbal paraphasias, also obtain in the aphasias, in ways that have been less obviously attributable to deficits of underlying 'psychological mechanisms'. The debate here, is whether these evidences can help us conclude that there is cognitive decline in the aphasias. Certainly, if there is necessary intellectual decline in the aphasias, it is minimal compared to the decline of the dementias. Must we then presume that similar language behavior results form different lesions-from language area lesions in the aphasias, but from other lesions in the dementias? Although theoretically possible, that it probably not the case, if only because the diffuse lesions of the cortical dementia do touch the language areas, particularly the

superior temporal gyrus (Brody,1976). In sum, in order to work out the roles that inattention, memory loss, perseveration, and deficits of semantic cognition and disinhibition play in the language disturbances of the dementias, (and probably aphasias), we must look for relations and correlations between the development of each of these deficits and the appropriate language behaviors

\ Boyle and Strikowsky -Harvey (1999) have described in detail the impact of cognitive impairments on language or other aspects of communication:

Table 1 : Potential impact of cognitive disorders on language / communication

Cognitive Impairment	Potential impact on language or other aspects of communication.
1) Orientation:	Patients who are confused about time and place may provide inaccurate information in their discourse that can seriously impair conversational exchanges.
2) Scanning:	Reading comprehension may be impaired, patient may be unable to check so self correct writing.
3) Visual neglect:	May impair reading and writing. May impair pragmatic aspects of discourse, such as making eye contact with partners who are in the affected hemispace.

4. Attention:	Patients may miss information in spoken discourse or in written material, which may have an impact on their responses and cause communication breakdowns.
5. Memory:	Patient may not retain and/ or recall information that is conveyed in spoken or written form. This may impair their responses and cause communication breakdowns.
6. Integration:	Difficulty in appreciating the relationship of discrete elements to an overall structure may impair pragmatics and discourse comprehension / production. It can also impair the patient's ability to interpret and respond appropriately to humor, sarcasm, or indirect request, thus impairing conversational interactions.
7. Planning:	Poor planning can affect the organization and coherence of discourse.
3. Reasoning/ Problem solving:	Patients may be unable to identify and change aspects of their behavior that are causing communication breakdowns, they may be unable to explain problems in order to seek, assistance or to communicate potential solutions.

The following salient points seem to emerge from the brief review of literature:

- Language abilities, by and in itself, may or may not be modular. But the use of language for communication involves use of various cognitive processes as scaffolding on the basis of which linguistic exchange occurs.
- Changes in cognitive abilities and processes as a result of degeneration related to normal aging or senility or neurogenic disorders affect the linguistic and/ or communicative abilities also.
- Language functions form an important vehicle for communication. Cognitive processes would shape the use of language skills for communicative functions. Thus cognitive-linguistic function would form a sub process of cognitive - communicative processes.

Considering these points, the present study is undertaken to observe the cognitive -linguistic abilities of Kannada-speaking subjects across ages from 40 years to 70 years. The following hypotheses were postulated:

- There are no changes in cognitive -communicative abilities across age in normal Kannada speaking 'young -old' geriatrics as compared to middle age adults
- There are no differences in performance across various cognitive - linguistic domains.
- There is no relation between performance on cognitive-linguistic tasks and gender.

The primary objective of the present study was to develop a protocol for measurement of cognitive -linguistic abilities in Kannada-speaking subjects. Secondarily, other objectives of the study included assessment of the cognitive-linguistic abilities normal adults from 40 years of age to 70 years of age to look out for the following information:

- differences in performances in test protocol, across age.
- gender contingent variations in performance on the test protocol.
- potential tasks for tapping senile vs. senescent age-related changes.

METHODOLOGY

The aim of the study is to evaluate changes, if any, in the performance on cognitive-linguistic tasks in old age (upto 70yrs of age), on the Cognitive - Linguistic Assessment Protocol.

Subjects:

Normal adults in the age group 40-75 years, were taken up for the study. The subjects from 40-60 years of age were labeled as 'normal middle- age' adults. The subjects from 60-70years were considered the 'young-old' adults (as per the classification given by Nuegarten, 1974; persons from 60-75years were the 'young-old' adults). The 'old-old' adults of age 70 years and above were not taken up for the study. Equal number of male and female subjects were considered for the study.

The subjects were sub-grouped as given in Table 2

Table.2: Demographic data of subjects sampled.

SI.	Age	Number of Males	Number of Females
1	40-44.11 yrs.	3	3
2	45-49.11 yrs.	3	3
3	50-54.11 yrs.	3	3
"4	55-59.11 yrs.	3	3
5	60-64.11 yrs.	3	3
6	65-69.11 yrs.	3	3

Criteria for selection of subjects.:

The following criteria were considered for selection of subjects:-

1) The subject should not have any history of neurological and\or psychological disorder as reported.
2) The subject should be able to speak, read and write in Kannada. He\She should have a minimum of primary school education.
3) The subject should not have any significant deficit in hearing sensitivity for speech; and should have normal \ suitably corrected vision.
4) The subject should not have a history of drug \ alcohol abuse, as reported.
5) The subject should not have any gross deficits in communication.
6) The subject should be physically fit during the testing period.

Screening procedure:

(1) *Mini Mental State Examination,* (MMSE) (Folstein, Folstein and Mc Hugh, 1975). All the subjects scoring greater than or equal to 25 points on the MMSE (as followed by Flannagan and Jackson, 1997), were considered for the study.

(2) *Speech discrimination task:* The speech discrimination task consisted of repeating five spondee words. The objective was to assess speech discrimination ability in the same environment in which the battery of tasks would be administered. The spondees chosen were such that they contained both low- and high-frequency sounds. To participate in the study, the subject had to discriminate all five spondees correctly.

Cognitive - Linguistic Assessment Protocol [C.L.A.P.]

Cognition has been used as the cover term for the core processes involved in acquiring, storing, retrieving, and using world knowledge. Considering the exhaustive list of cognitive processes provided by Best (1999) and Matlin (1983), -those cognitive processes most often employed in linguistic communicative tasks were delineated. This was done, based on the nature of the cognitive -communicative tasks used by various authors in studying the population with disorders (Peter and Eastwood; 1983, Levine and Zallen; 1984, Vitaliano et a1; 1984, ASHA; 1989, Bayles; Tomoeda, Boone and Slauson; 1989, Adamovich and Henderson, 1992, Bayles, Tomoeda, and Trosset, 1992, Gallagher; 1994, Payne; 1997, Boyle and Strikovsky - Harvey; 1999). Thus, from Best's (1999) original list consisting of memory, organization of knowledge, language, reasoning, problem solving, classification, concepts and categorization, the following were taken up as the core cognitive abilities that support language.

(1) Attention

(2) Perception

(3) Discrimination

(4) Memory

(5) Reasoning

(6) Problem solving

(7) Organization

On the basis of a presumed similarity in strategies employed in the harnessing of cognitive processes for language functioning, the above parameters were grouped into four main domains:

(1) Attention, perception and discrimination

(2) Memory

(3) Reasoning and problem solving

(4) Organization

Table 3: Cognitive-linguistic measures used in the protocol

DOMAIN		**TEST ITEM**	MAXIMUM SCORE
I: Attention, Discrimination and Perception			
Visual	a	Letter cancellation	10*
	b	Contingent letter cancellation	10*
	c	Word cancellation	10*
Auditory	a	Sound count.	10
	b	Letter- pair discrimination	5
	c	Word - pair discrimination	5
	d	Months - backward naming	10*
II: Memory			
Episodic memory	a	Orientation and recent memory questions	10
Working memory	a	Digit forward	5
	b	Digit backward	5
Semantic memory	a	Coordinate naming	5
	b	Superordinate naming	5
	c	Word - naming fluency	5*
	d	Generative naming	5
	e	Sentence repetition	10
	f	Carry out commands	10

Ill: Problem Solving		
a	Sentence disambiguation	10
b	Sentence formulation	5
c	Predicting outcome	10
d	Compare and contrast	10
e	Predicting cause	**10**
f	Why questions	**10**
g	Sequential analysis	**5**
		10
IV: Organisation:		
a	Categorization	10
b	Analogies	10
c	Sequencing events	40*

* Items are timed tasks

Domain I: Attention, Perception and Discrimination

Two main modes were considered for this domain.

(1) Visual and

(2) Auditory

Two types of attention processes were evaluated, viz., selective attention and sustained attention. The cognitive processes of perception and discrimination were contingent on attention and the three are parallel processes.

Visual Category:

(a) *The cancellation at a letter level:* The cancellation of all of the stipulated letter was considered a task requiring sustained attention.

(b) *The cancellation at the word level:* Similar to the above test, this is a sustained attention task.

(c) *Contingent cancellation:* This task requires fulfillment of a pre-requisite contingency before cancellation of the letter. This task was used to evaluate selective attention.

Scoring: Performance on each subtest was scored based on accuracy of responses. (i.e., x/10). The time taken to complete each task was also noted.

Auditory *category:*

(a) *Sustained auditory attention* was evaluated using a task where the subject was required to count mentally how many times a particular letter was read out in a list,

(b), (c) The second subtest involved the subject's ability to *discriminate amongst a pair of letters \ words* read out by the tester (same \ different task). This is predominantly a discrimination task.

(d) The last subtest required the subject to recite the *names of the months in the backward direction* (i.e., December to January). This task requires attention and involves recall process too.

Scoring: Performance on each task was scored for number of correct answers. Subtest (a) was given one point for every correct count. One point was deducted for every count above the correct number of total occurrence of stipulated letter.

Domain II: Memory

Three main types of memory processes were tested:

1) Episodic memory
2) Working memory and
3) Semantic memory

Episodic Memory : was tested by asking questions that tested orientation of self with respect to place, self and time and also a few questions of general knowledge.

Scoring: A score of one was given for each correctly answered question.

Working Memory : was evaluated using digit forward and digit backward repetition tasks. A maximum of seven digits were included in the list (as suggested by Carter et al., 1980)

Scoring: A score of one was given if all the digits in the list were repeated in the correct expected order.

Semantic Memory : Tasks included items to test for language-knowledge such as:

a. *Coordinate naming:* The subject was given a noun - class and asked to name at least five objects which may be included within that class.
b. *Superordinate Naming:* is a task complementary to coordinate naming. A list of items belonging to a particular class was given to the subject to identify the class to which the given items may be classified.
c. *Word Naming Fluency:* is a task to evaluate recall, and involved the subject's naming five words that begin with the specified letter. This was a timed task. Time taken for each trial was noted for scoring.
d. *Generative Naming:* The subject was asked to name the target word, the description of which (in terms of use) was given.
e. *Sentence repetition tasks:* A phrase/sentence was read out to the subject and an immediate repetition was expected. The target utterances were not very long,

keeping in mind that very long and multiple transformation utterances were not used often in everyday verbal language use.

f. *Carrying out commands:* Two objects; a pen and a book were placed in front of the subject. Commands of various levels of complexity, which required manipulation of these objects, were given. This task was adapted from Western Aphasia Battery (Kertesz and Poole; 1983).

Scoring: All items were alloted a score of one for each correctly answered question. Except for word naming fluency, none of the tasks were timed.

Domain III: **Problem Solving**

This domain included various tests that assess reasoning abilities to aid in problem solving. The following tasks were considered.

(a) Sentence disambiguation: Ambiguous sentences were given to the subject, and was instructed to explain the two interpretations that could be made from the sentence.

Scoring: One point was scored for each correct explanation of the meaning of the sentence. Two points were scored only if both the meaning interpretations were clearly stated.

(b) Sentence formulation: This was a word order unscrambling task to form a grammatically correct sentence.

(c) Predicting the outcome of a described situation.

(d) ***Comparing and*** *contrasting two objects:* Here, the subject was required to give one similarity and one difference between a pair of objects named.

(e) ***Predicting*** *cause* ***of a described situation***

(f) Answering why questions

(g) Sequential task analysis: The steps involved in carrying out a named task was required to be listed by the subject. The subject was required to analyse the task into alteast four steps for a full score to be given.

Scoring: Each of the above tasks were given a score of one for a correct answer. They were untimed tasks.

Domain IV : Organization

Organization of available information to result in coherent communication is an important metalinguistic and metacognitive task.

(a) ***Categorization abilities*** were tested as a measure of word-class organization abilities.

(b) ***Analogies:*** This task consisted of items to test ability to reorganize word concept to meet task demands. This task also involves logical reasoning processes.

(c) Sequencing of events in a temporal order to form a coherent story was also taken up as a task of organizational skills.

Scoring: A score was given for each correct answer. The tasks were not timed.

All the items within a subtest were placed in an order of increasing complexity. All tasks were given only one trial each. The individual test items in the assessment protocol are appended in Appendix .

Procedure:

Subjects were selected from the residential areas and old-age homes in the city of Mysore (Karnataka state). The screening tests; viz.., Mini Mental State Examination and the speech discrimination screening test was carried out to confirm candidacy for the present study. Subjects scoring greater than or equal to 25 points on the Mini Mental State Examination (as per Flanagan and Jackson, 1997), and full scores on the speech discrimination screening tasks were considered for the study.

The cognitive-linguistic assessment protocol was administered on only those subjects who passed the screening tests. Instructions specific to the task were given in Kannada. The scoring was carried out simultaneously for each task as per the scoring procedure scheduled for each item.

The data obtained was subjected to appropriate statistical analysis. In addition, general trends in the responses of the subjects, and specific responses, i.e., accuracy, timing, and quantitative and qualitative performance was noted down, for a detailed descriptive analysis of cognitive-linguistic performance of 'young-old' geriatrics.

RESULTS AND DISCUSSION

The primary objective of the study was to develop a protocol for assessment of cognitive-linguistic abilities in Kannada speaking, normal healthy adults. The protocol so constructed includes four domains, viz.,

I Attention, perception and discrimination

II Memory

III Problem solving

IV Organization

After reviewing literature on the processes involved in each cognitive domain, it was further subdivided. Based on guidelines provided by the observations of researchers like Boyle and Strikowsky - Harvey (1999), and ASHA (1987) among others, only those processes which were judged important for linguistic functions were included in the assessment protocol.

Tasks for assessing each of these sub-tests thus delineated, were adapted / selected from available tests and remediation programs for cognitive - communicative abilities in patients with traumatic brain injury (eg. SCATBI, CLIP, neuropychological test batteries, etc.,), tests for aphasia (eg. WAB), and also cognitive - linguistic tasks considered in various studies on language abilities in the dementias.

The adaptation of these tasks for the Kannada speaking subjects was undertaken with the help of native Kannada speakers with graduation level education and good knowledge about the syntactic and semantic structural aspects of the language. This was in an attempt to make the assessment protocol a culture fair tool for the Kannada - speaking population. The tasks selected met the requisite for the respective cognitive-linguistic process under scrutiny.

Details of items under each domain in the protocol and correlations among the items have been discussed later in this chapter.

The secondary objectives of the study included administration of the protocol developed on normal healthy, Kannada - speaking adult males and females in the age range of 40 years to 70 years. Thirty six subjects, (18 males and 18 females) were considered under 6 age groups with equal numbers of male and female subjects in each age group. Some variables like native Kannada background, sensory deficits (hearing and vision), neurological/psychological/physical fitness were controlled, but certain confounding variables did exist. The subgradations of educational levels, socioeconomic levels etc., were not considered. The significant inter subject variations within each age group could be partially a result of these confounding variables. The differences in performance on the test protocol are discussed below.

Performance on the cognitive - linguistic domains across age groups.

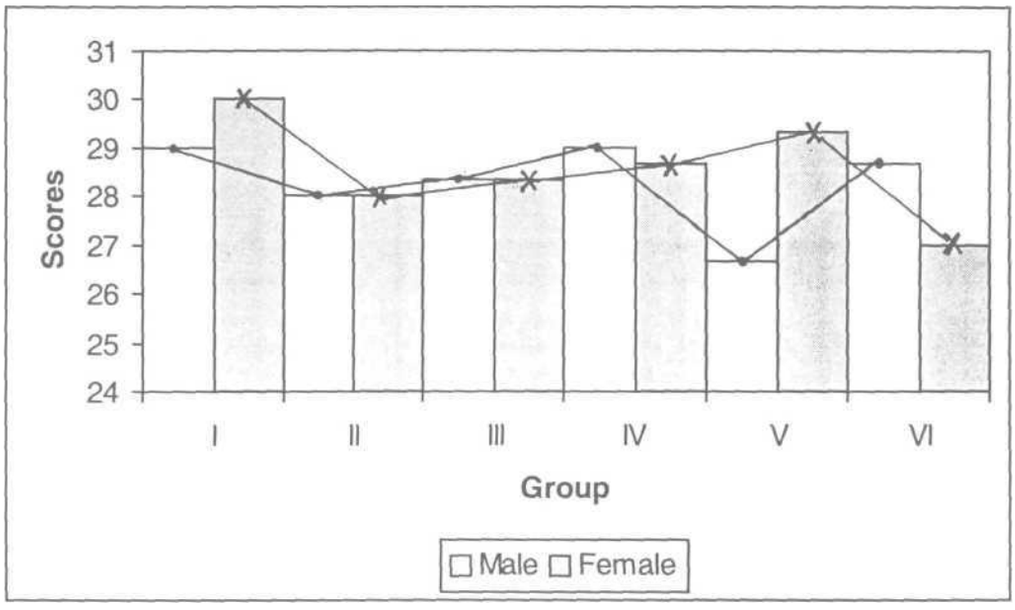
The mean scores obtained by subjects on each domain across age groups is tabulated in Table 4.

Table 4 : Mean scores of subjects on cognitive linguistic domains across age - groups.

			II		III		IV		V		VI	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
VIS (i/30)	29	30	28	28	28.33	28.33	29	28.66	26.66	29.33	28.66	27.00
	29.5		28		28.33		28.83		27.66		27.83	
AUD (y/30)	27.33	29.66	29	27,66	28	28	26.33	21	27.66	28.33	29.33	29
	28.50		28.33		28		27.67		27.99		29.165	
TOTAL Aim.. (x+y/60)	56.33	59.66	57	55.66	56.33	56.33	55.33	57.66	54.32	57.66	57.99	56
	57.995		56.33		56.33		56.95		55.99		57.00	
EMO (a/10)	10	9	10	9	9	9.33	9.33	8.33	10	7.66	10	9.33
	95		95		9.165		8.83		8.83		9.67	
WM (b/10)	6.66	4.66	7	6.33	5	4.66	6	6.66	5.33	5	5.33	5.33
	5.66		6.67		4.83		6.33		5.17		5.33	
SM(c/40)	38.66	38.66	38.33	39	38	36.66	39	37.66	37.33	39.66	37.66	37
	38.66		38.67		37.33		38.33		37.50		37.33	
TOTMEM **(a+b+d/60)**	55.32	52.32	55.33	54.33	52	50.65	54.33	52.65	52.66	52.32	52.99	51.66
	53.82		54.83		51.325		53.49		52.49		52.33	
TOTPD (p/60)	55	46.33	52	49.66	52.33	48	54.33	53.33	50.33	56	54.3	47.66
	50.67		50.83		50.165		53.83		53.17		51	
TOTOC (q/60)	32.66	48	42.33	41	31.66	41.33	31.66	38.66	32	39.66	27.66	48
	40.33		41.67		36.50		35.16		35.83		37.83	

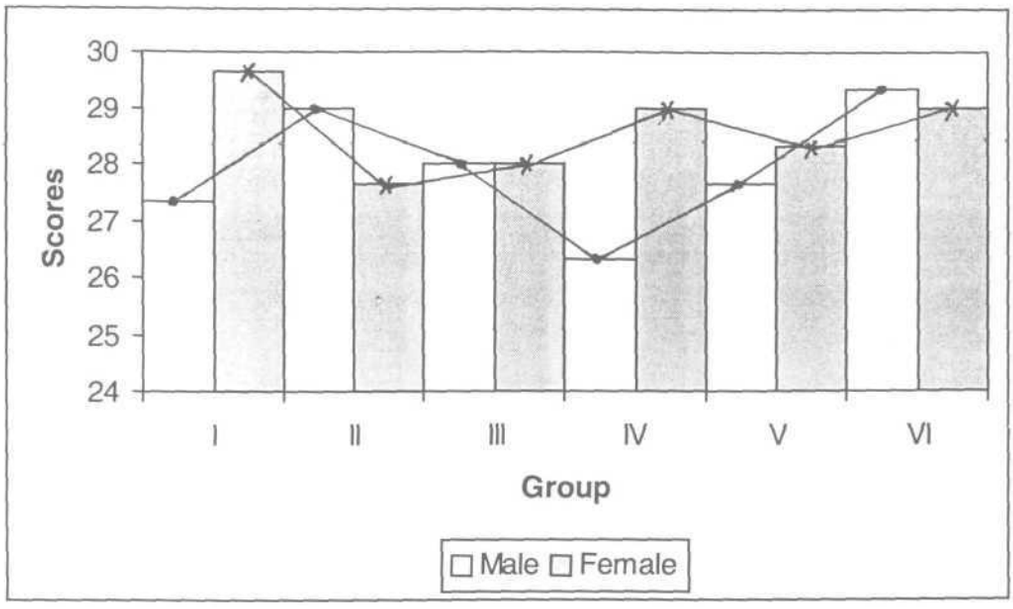
Attention perception and discrimination

This domain was subdivided into two main subtests, visual and auditory tasks. The visual subtest consisted of 3 subsections, assessing letter cancellation, contingent letter cancellation and word cancellation tasks. The auditory subtest consisted of 4 sections, assessing ability to count occurrence of sound (auditory counterpart of visual letter cancellation task), letter-pair discrimination, and word pair discrimination, and finally, month backward naming.



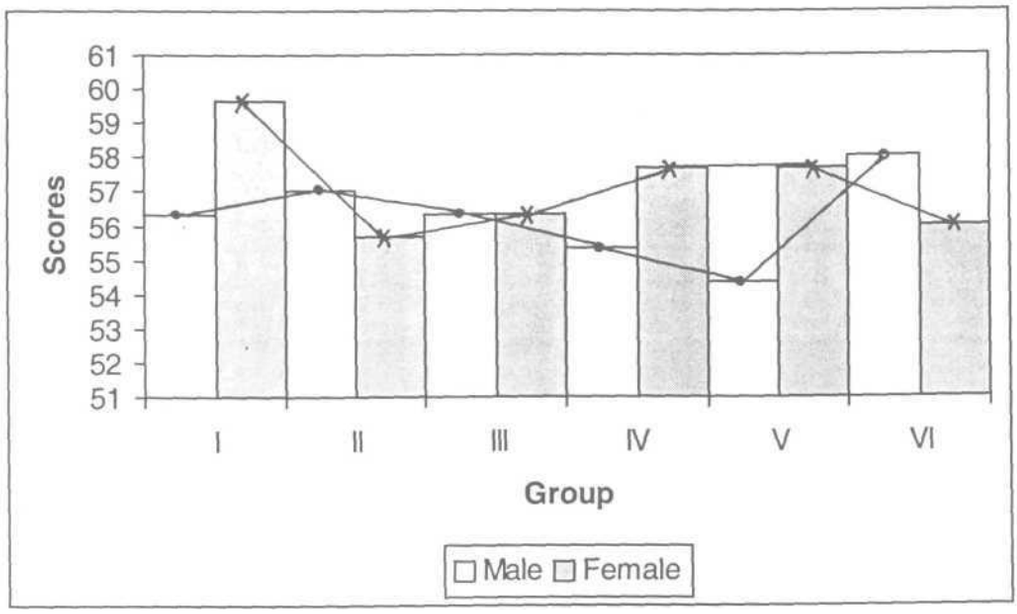
Graph 1 : **Mean** scores **on visual attention subtest**

Graph 1 shows the variations in performance on visual attention subtest. There is a slight decrease in mean score from group I which consists of subjects with age 40 to 44.11 years to the group VI of subjects with age 65-69.11 years. There is no steady decline as there was variability in intergroup performance. The decline is more prominent in females than in males. This decline is not of statistical significance as determined by the t-test.



Graph 2 : Mean scores on auditory attention subtest

Graph 2 shows the variations in performance on auditory attention subtests of domain I. As is seen in the graph, there are a lot of inter-group variations in performance on these subtests. The variation does not show any specific pattern across age group. A t-test confirmed no significant variation.



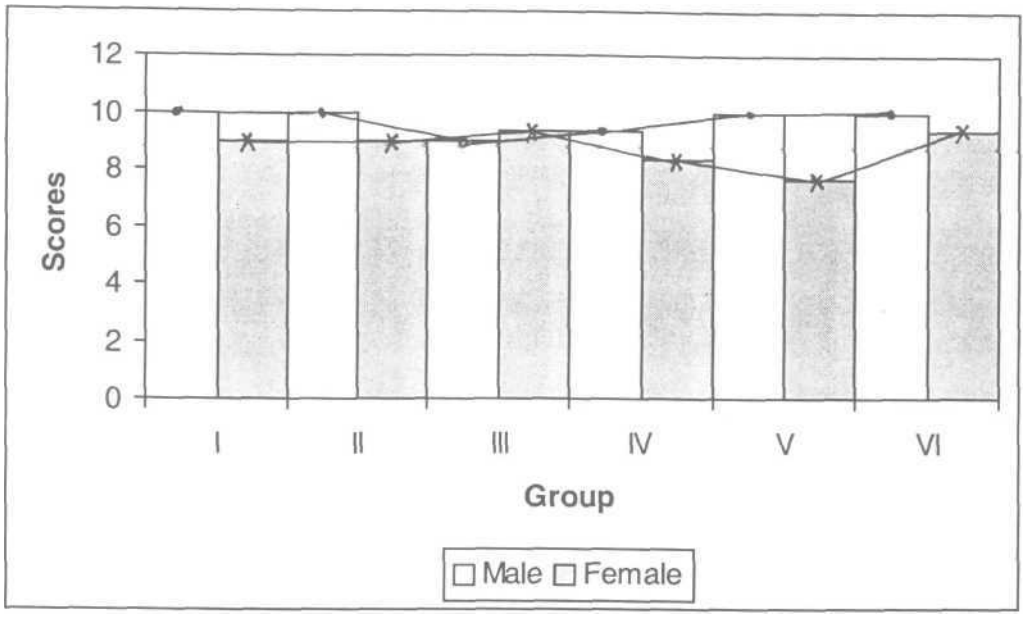
Graph 3 : **Mean** scores **for Attention, Perception and Discrimination**

The graph 3 shows the overall variations in performance on the tasks in domain I (Attention, perception, and discrimination) across age groups. This too, reflects the same observations evident in graphs 1 and 2. The slight decline in performance on attention tasks is more evident in females than in males, but this is not of statistical significance as determined by the t-test.

Early research had reported of modality differences in attention, with the elderly having greater difficulty in visual modality (Maxim, 1999). The older age group may be penalized on visual tasks by visual perceptual problems not found in the younger groups. Hartley (1992) reported that when age - related hearing problems were accounted for, the elderly can perform well on sustained attention tasks but show decrements on some selective attention tasks which require more effortful processing or speed of response. The results obtained in this study corroborate the earlier research findings. The gender differences observed in this study have not been reported earlier in literature. This observation may be incidental and could be a result of the small subject group. A larger group needs to be considered to study the gender contingent variations in attentional and perceptual skills across age groups.

Memory :

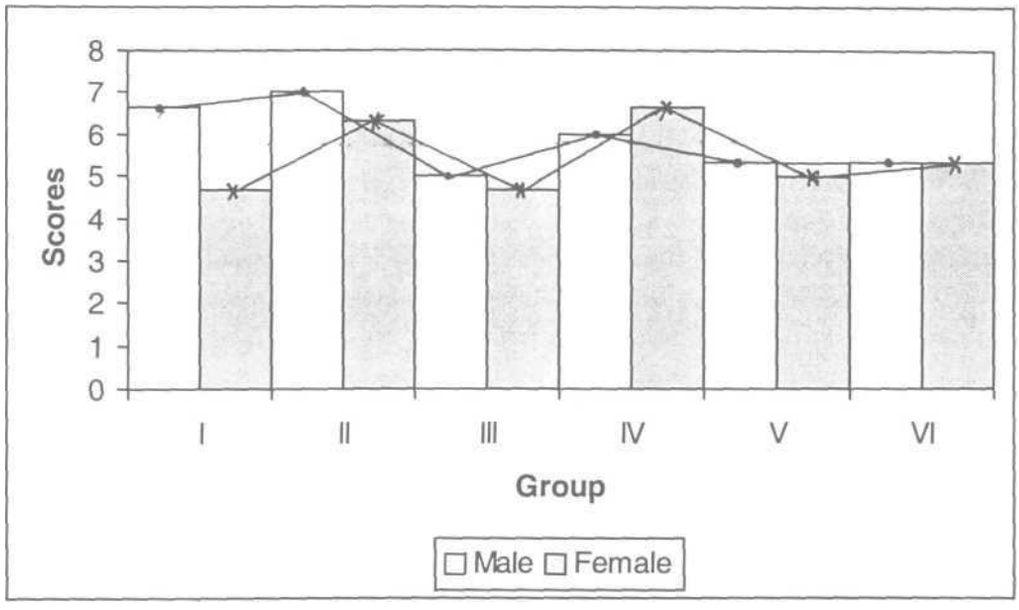
The memory domain was assessed under 3 main heads, episodic memory, working memory and semantic memory.



Graph 4 : Mean scores on episodic memory subtest

The intergroup variations in performance on episodic memory subtest is shown in graph 4. A small decline in performance is seen in females, but is more variable in males. Even in the female subgroup, group VI does not conform to the trend. The decline is not of statistical significance on the t-test.

A decline in episodic memory skills with aging has been reported in literature (Craik; 1977, Maxim; 1999). The decline in episodic memory could be related to the difficulties in retrieval of information available in long term memory store, rather than a decay of this information.



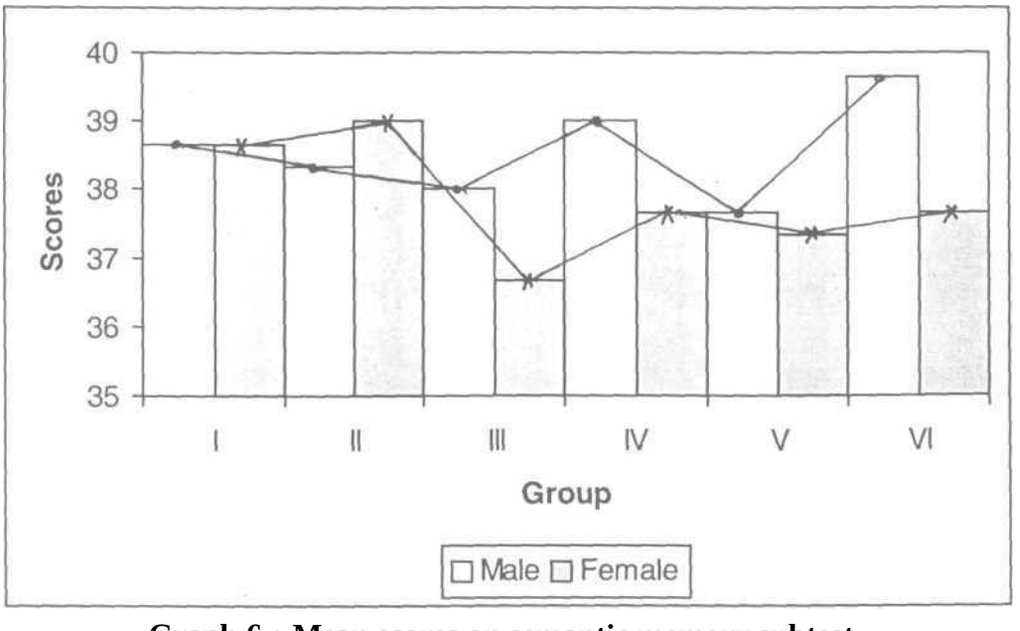
Graph 5 : Mean scores on working memory subtest

Cross group variations in performance on working memory tasks are shown in graph 5. Here, the small decline in scores is seen in males, but this is of not enough magnitude to be of statistical significance, as was demonstrated by the t-test.

Literature reports of age-related changes in working memory are highly variable. Craik (1977) reported of minimal age differences in tests of short-term primary memory, but typical age related decline in working memory was observed by Craik and Rabinowitz (1984). More recently, Brooks et al., (2001) report that younger adults do not perform significantly better than older adults in working memory tasks. In the present study also, performance on working memory does not show any significant declining trend across age. Considering the working memory model provided by Baddeley, (1986), there may be various subsystems in the working memory process such as central executive system, phonological STM and the semantic and syntactic STM that play differential roles in language processing, and

affect different language processes to various extents. The variations in observations on working memory deficits in the elderly could be a result of the differences in the tasks chosen to assess the same. These tasks may be tapping different aspects / subsystems of working memory thus accounting for incongruencies in inferences on working memory abilities in the elderly.

The tasks in the present study, viz., digit forward and digit backward repetition mainly tap the phonological loop system, and show no trend in variations across age. Males did show a small, decline in scores across age, but this was not of statistical significance.



Graph 6 : Mean scores on semantic memory subtest

Performance on semantic memory tasks are shown in graph 6. There is not much variation in performance across subgroups. Especially in males, the performance appears to be more or less steady across age, except in the older age

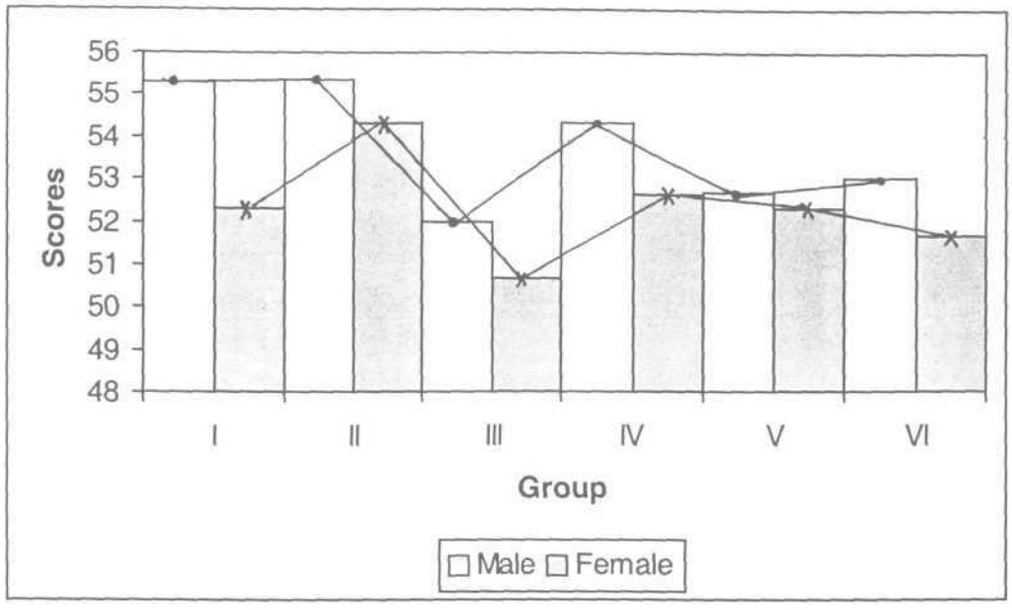
groups where slight variability sets in. These variations, too, are not of statistical significance on the t-test.

As per literature, semantic memory is more resistant to aging as compared to other memory processes, though processing times may be longer, and more variable with age (Maxim; 1999, Raksha and Nidhi ; 1994, and Au and Bowles ; 1991). These deficits in semantic memory processes are more a result of retrieval deficits than a lexical access problem. Organization within the semantic network does not change with increasing age, as seen on association tests. (Bowles, Williams, and Poon, 1983).

However, certain authors like Barresi et al., (1986) attribute various naming failures in the elderly to a significant erosion of semantic memory rather than solely an effect of impaired access to phonological information. They refer to these decline as 'semantic degradation'.

The results of the present study agree with literature in that no significant variation in this task was obtained across age groups. The slight decreasing tendency may be because of multiple cognitive process influences (eg working memory) on semantic memory tasks included in the protocol.

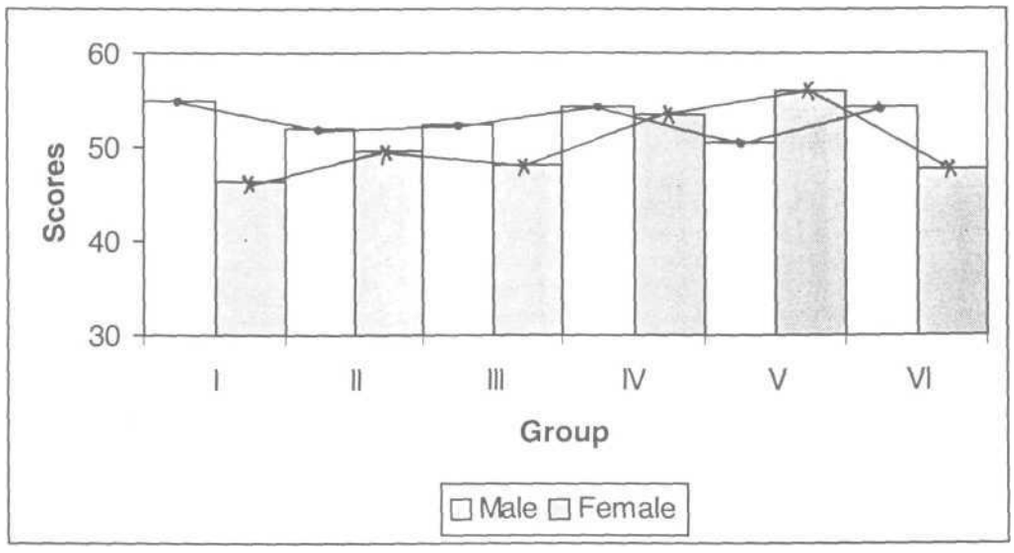
Graph 7 depicts the overall averaged scores for memory tasks across age groups. The small declines in performance from age group I to group VI is more evident in this graph of combined memory scores, than in the individual memory



Graph 7 : Mean scores for memory domain

tasks. Also, the greater prominence of decline in memory functions in males rather than in females is more evident in this combined memory score. Females show greater variations in performance across age groups. This decline is not reflected in the t-test, which does not establish a statistically significant relation.

Problem solving



Graph 8 : Mean scores **on Problem Solving domain**

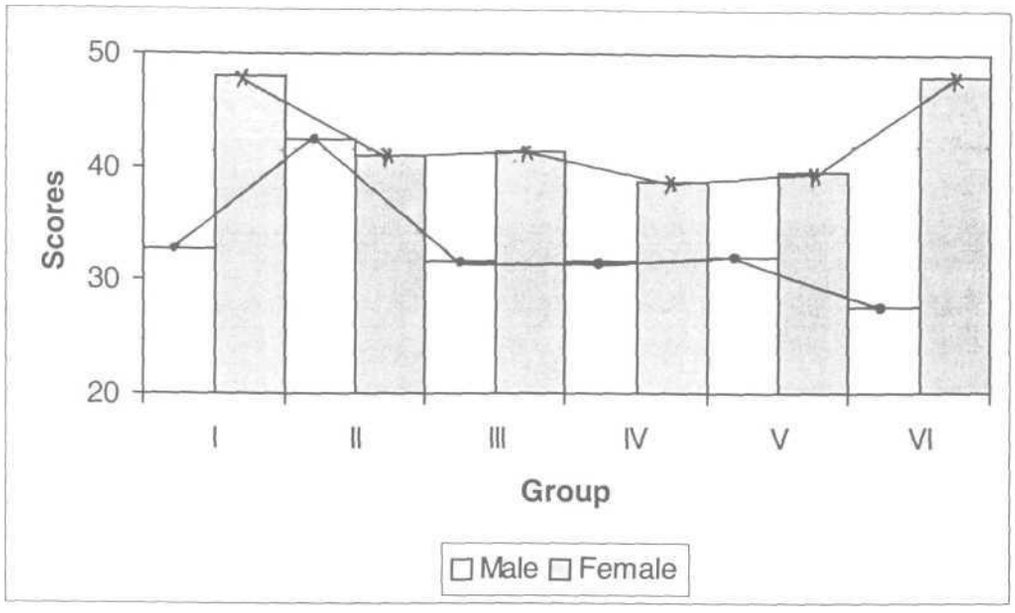
Graph 8 illustrates the variations in performance on tasks of problem solving. As is evident in the graph, the males show a more-or-less steady though statistically not significant, decline in performance on problem solving tasks with increasing age. Females, on the other hand show more idiosyncratic variations and are consistently poorer on this task than males. It may also be noted that there is a wider gap in performance on problem solving tasks among gender in the younger age group, which is narrowed in the older age group. This could be because of more decline in these processes in males than in females, who are poorer on problem solving tasks right from group I.

Literature reports of difficulty in comprehension of ambiguous sentences in the elderly. These deficits are related to difficulties in finding strategies or changing to new strategies (Maxim 1999). This increased rigidity or difficulty in changing set leads to deviances in ability to generate concepts necessary to solve a problem.

The results of the present study do also show a decline, as expected from literature but is not of a statistically significant extent.

Organization

The age related changes in organizational skills are represented in graph 9. There appears to be a steady decline in organizational skill in females, but group VI does not conform to this trend. Males do not show any specific trend in performance, and perform poorer than females on these tasks across all age groups.



Graph 9: Mean scores on Organization domain

Unlike in problem solving tasks, however, the gap in performance on organization between males and females is not bridged with increasing age. t-test demonstrates statistically insignificant changes.

Elderly subjects have greater difficulty in processing grammatically encoded information about relationships between events (Kemper; 1992, Hamm and Hasher ; 1992). Healthy elderly make more errors in grammatical form than younger people. They have greater difficulty in monitoring their own output and in making language repairs when necessary. Obler and Albert (1981) observed an improvement in understanding what others intend. However, none of these observations were made in the present study. This could be because, two of the tasks included in the study did not test metacognitive/metalinguistic skills, but only a lower level, lexical level organisation skills. The third task involved sequencing events, which involved interpretation of the temporal relationships between events. But considering the small

population taken up for the study and the large inter subject and inter group variations, these tasks did not show any trends of declining abilities.

Analysis of variance

Considering the above results, and discussion, it is seen that though small changes in cognitive -linguistic processes across age-groups are evident, these changes are not statistically significant to warrant a conclusion of declining trends with increasing age. Hence, the results were further subjected to univariate analysis to study the variations among the mean scores on various domains. Considering scores on each of the cognitive-linguistic parameters, and also the timed items separately, anova was carried out for studying variations across group, gender and both group vs gender.

Analysis of results employing univariate ANOVA revealed few significant relations among the groups and between gender. The details are given in Table-5 below

Table - 5 : Univatiate ANOVA

Dependent variable	Source	F	Sig.
Time (Auditory attention month backward naming)	Group Vs Gender	3.84.7	O.Dl
Time (semantic memory : word naming fluency)	Group Vs Gender	3.685	0.013
Episodic memory	Between gender	4.250	0.050
Total (organization)	Between Gender	6.136	0.021

From the table above the following observations could be made:

A significant difference for group Vs sex, at 0.01 level was seen for :

a. Time taken for auditory attention task, viz. Month-backward naming.

b. Time taken for word naming fluency (semantic memory task).

Significant gender variations, at 0.05 level of significance, was seen for

a. Episodic memory tasks.

b. Total scores on organization domain.

Thus it is seen that timed tasks demonstrate a very significant (0.01 level of significance) variation across group Vs. gender performances. From this, it may be inferred that timed tasks which tap reaction times and processing time play a major role in demonstrating variations in cognitive-linguistic skills across groups in gerontological studies (Kemper; 1992, Ulatowska et al., 1985, Obler and Albert; 1981, Howard etal., 1981).

Correlation statistics

A review of available literature states that all cognitive process are interrelated with one another rather than existing in isolation. But, the exact nature of correlation between language and other domains of cognitive functions are not clearly delineated. Correlation statistics on the data obtained using the cognitive linguistic assessment protocol may be used to discuss the influence exerted by abilities on one domain on the performance on other domains. The results on this would be used to corroborate the primary objective of this study.

The correlation matrix, which displays the Carl Pearson's product-moment correlation values between subgroups and between domains is given in Table-6 below.

Table 6 : Correlation matrix

		TOTVIS	TOTTIVIS	TOTAUD	TIMEAMBM	TOTWM	TISMWNF	TOTSMCOC	TOTMEM	TOTPS	TOTOC	TIMESE	EMO
TOTVIS	Pearson Correlation	1.000											
	Sig. (2-tailed)												
	N	36											
TOTTIVIS	Pearson Correlation	,319	1.000										
	Sig. (2-tailed)	.058											
	N	36	36										
TOTAUD	Pearson Correlation	.205	,161	1.000									
	Sig. (2-tailed)	.230	.348										
	N	36	36	36									
TIMEAMBM	Pearson Correlation	-.256	.653**	-.224	1.000								
	Sig. (2-tailed)	.131	.000	.189									
	N	36	36	36	36								
TOTWM	Pearson Correlation	.185	,639**	.148	-.367*	1.000							
	Sig. (2-tailed)	.279	.000	.390	.028								
	N	36	36	36	36	36							
TISMWNF	Pearson Correlation	-.262	.646**	,226	.696'*	•460**	1.000						
	Sig. (2-tailed)	.123	.000	.186	.000	,005							
	N	36	36	36	36	36	36						
TOTSMCOC	Pearson Correlation	.176	,120	.100	,120	.396*	-.165	1.000					
	Sig. (2-tailed)	.306	.486	.564	.485	.017	.336						
	N	36	36	36	36	36	36	36					
TOTMEM	Pearson Correlation	.183	-.186	.097	-.156	.506**	-.191	.989*	1.000				
	Sig. (2-tailed)	.287	.277	.573	.364	.002	.265	.000					
	N	36	36	36	36	36	36	36	36				
TOTPS	Pearson Correlation	.272	,390*	.215	-.475**	.307	-.297	.041	.099	1.000			
	Sig. (2-tailed)	.108	.019	.207	.003	.068	.078	.812	.564				
	N	36	36	36	36	36	36	36	36	36			
TOTOC	Pearson Correlation	.299	,198	.293	,140	.358*	-.086	.154	.189	.068	1.000		
	Sig. (2-tailed)	.077	.248	.083	.417	.032	.616	.371	.270	,692			
	N	36	36	36	36	36	36	36	36	36	36		
TIMESE	Pearson Correlation	,226	.557**	-.290	.441**	-.359*	.517*	.143	0.82	-.467*	,014	1,000	
	Sig. (2-tailed)	.185	.000	.086	.007	.031	.001	.405	.633	.004	.938		
	N	36	36	36	36	36	36	36	36	36	36	36	
EMO	Pearson Correlation	-.079	,010	,103	,004	.120	.170	-.404*	,294	.317	.027	-.283	1.000
	Sig. (2-tailed)	.648	.953	.549	.980	.487	.321	.014	.082	.059	.875	.094	
	N	36	36	36	36	36	36	36	36	36	36	36	36

** Correlation is significant at the O.O1 level (2-tailed).

Correlation is significant **the 0.05 level** (2-tailed).

I. Attention, Perception and Discrimination :

(i). From the correlation matrix given above, it can be seen that, the total timed-visual tasks has a very significant, postive correlation (0.01 level) with the timed auditory tasks in the same domain. Thus, we may infer that both these timed tasks assess the same cognitive -linguistic process, viz., attention, perception and discrimination. The visual and the auditory attention are parallel and the auditory attention are parallel processes. Visual attention is required mainly for written language tasks, whereas auditory attention plays an important role in spoken language comprehension,

(ii). The timed visual tasks also share a good correlation with some other tasks from other domains. The total time for visual tasks has a significant (at 0.01 level), but negative correlation, with total working memory score. This way be interpreted as time taken for visual attention items increases as working memory capacities reduce. Thus, working memory plays a role in attention tasks, especially visual attention processes.

(iii). The total time taken for auditory task also has a significant negative correlation (at 0.05 level) with total working memory. Thus, similar to visual attention, auditory attention tasks also take longer processing time with decrease in working memory capacity. Thus, working memory plays an important role for auditory attention tasks also.

In attention, perception and discrimination domain, there is a good positive correlation between both the sub tests. Also, both these sub tests share negative correlation with working memory capacity. Hence both these tasks may tap the same

strategies required by the two modalities for attentional processes with working memory being at the core of all attentional tasks. Thus working memory seems to play a significant role, irrespective of modality being tested. Both these tasks should be retained in the protocol, as they tap two different modalities of the attentional processes, both of which are important for communication.

II. Memory

The working memory tasks have a significant correlation with many other sub tests. The implications of this correlation are discussed along with the discussion for those individual sub tests.

(i). Time taken for word naming fluency tasks (semantic memory) has a highly significant, positive correlation (at 0.01 level) with time taken for visual attention tasks as well as auditory attention tasks. This high positive correlation may be a pointer to the lexical recall processes, which may involve visual coding, and auditory coding also. Thus the results lead us to speculate whether during word naming tasks where the subject has to recall words that start with the specified sound, he/she not only retrieves the auditory image of the word from the lexion, for comparison with specified sound, but also retrieves the visual concomitants of the word. Further, it also suggests that the use of visual cues for retrieval may help in multiple modality processing and thus speed up the retrieval process.

Strengthening the above discussion is the negative correlation, (highly significant at 0.01 level) between time taken for word naming fluency task and the total working memory. Retrieval of auditory and visual images and their comparison with the target sound requires intact working memory abilities. A decrease in working memory capacity would thus result in increased time for word naming fluency tasks, as is evident in the negative correlation between the two tasks. On the whole, if verbal attention,word knowledge, and/or verbal long-term memory are deficient, then word fluency can be affected as a secondary consequence (Ruff et al., 1997).

(ii). Considering the total scores on semantic memory and total scores on working memory, there is a significant positive correlation (at 0.05 level) between the two. If we consider some of the tasks that were included under semantic memory subtests. eg: coordinate naming, superordinate naming, word naming fluency and sentence repetition), it is seen that these tasks involve active recall and manipulation of lexical items from the semantic memory. This manipulation and processing of retrieved material requires working memory. Thus, working memory abilities impinge on tasks of semantic memory processing, leading to a positive correlation between these two subtests. It may be difficult to isolate these two processes and hence working memory acts as a confounding variable in assessments of semantic memory processes for linguistic tasks. This must receive its due consideration while interpreting performance on semantic memory sub tests.

(iii). The total scores on episodic memory and semantic memory tasks have a very significant correlation (at 0.01 level). This correlation may have implications on the long term memory stores of the word and knowledge bank required for episodic and semantic processes. Considering the high positive correlation, probably, the episodic and semantic information is stored in a common memory store.

(iv). The total working memory score has a highly significant positive correlation (at 0.01 level) with the total memory score. This high correlation is despite the fact that working memory subtest had only two items and hence had a low score weightage in comparison to the semantic memory subtest. This correlation again, supports the implication that working memory has a role to play in the processing of the other two memory subtypes, especially semantic memory and to a lesser extent, with episodic memory (with which there was no significant correlation evident on statistical treatment).

(v). Total scores on semantic memory tasks also correlate well with the total memory scores, with a 0.01 level of significance of correlation coefficient. Since total semantic memory scores also correlate well with working memory and both share a significant correlation with total memory scores one may infer that the total memory scores are majorly affected by the scores on working memory and semantic memory.

In language processes, using the set arbitrary code involves memory abilities. Semantic memory, which is concerned with language and knowledge is affected by

working memory as also by attentional, perceptual and discriminatory processes. Working memory capacities and computational speed influence performance on semantic memory tasks directly, as well as indirectly through its way over attentional processes.

III. Problem solving

Problem solving involves reasoning, comparing, sequencing and predicting. In the correlation matrix, we obtain a significant negative correlation between problem solving and time for visual (at 0.05 level) as well as auditory attention tasks (at 0.01 level). From this, one may infer that both the attention tasks were negatively correlated with problem solving abilities, i.e., reduced efficiency in problem solving would lead to greater time required for the attention tasks. The greater value of significance with auditory attention tasks may be because most of the tasks chosen to tap problem - solving abilities were auditory and only one task (sentence formulation) involved use of visual modality.

Conversely, from the nature of correlation between the two tasks, it may also be inferred that reduced attentional processing abilities will have a negative influence on problem solving, leading to an increased inefficiency in strategies employed for tackling the problem.

IV. **Organisation**

(i). There is a significant positive correlation (at 0.05 level) between total scores on organizational tasks and total scores on working memory. Thus, working memory,

again, has a role to play in organizational skills. Organization involves such abilities as shifting set, analysis and interpretation of external and internal sensory signals and adoption of appropriate strategies for successful communication. This manipulation and processing of information requires the help of working memory processes.

(ii). This inference is again strengthened by the negative correlation (at 0.05 level) between total score on working memory and time taken for sequencing events (an organization task). Reduction in efficiency in working memory affects the time taken for sequencing events i.e. the subjects take longer time to sequence events when they realize that they may be going wrong (metacognitive skills intact as evident from lack of correlation between total score on sequencing events task and working memory), but reduced working memory capacity slows down self-correlation process. These results agree with Waters et al., (1995) and Waters and Caplan's (1997) inferences that relate working memory capacity to the ability to use the meaning of a sentence to accomplish a task.

(iii). The high positive correlation (at 0.01 level) between timed attention tasks (auditory and visual) and time taken for sequencing events subtest of organization domain suggests that attention is an important consideration in timed organization tasks. High time requirements on attention tasks correlates with higher time required for completing organizational tasks like sequencing events and vice versa. Thus, speed of information processing for organizational tasks depends on the attentional capacities of the subjects, in addition to other requisite abilities.

(iv). Time taken for sequencing events subtest has a high significant positive correlation with time taken for word naming fluency. Word naming fluency involves recall of lexical items from the semantic store. This process may also be utilized in sequencing events, where the stimulus items may be stored in short term working memory and subjected to reorganization. Before the reorganization, the previously stored stimulus items are recalled. Thus, there may be a common recall process involved in both word naming fluency and sequencing events, thereby leading to a correlation between time scores for both.

(v). Time taken for sequencing events also has a significant positive correlation (at 0.01 level) with total scores on problem solving.

Thus, sequencing events, which is an organizational task is a multiple modality task involving attention, perception and discrimination, working memory and problem solving capacities.

Thus, from the results of correlation statistics, we see that there is indeed a lot of interaction among cognitive domains and these interactions will effect the language processing efficiency. These relationships between language and cognition are more evident in time-constrained tasks, as we see that more significant correlations were obtained for timed tasks.

From the results and discussion presented above, we may thus make the following conclusions, w.r.t. the objectives of the study :

- A protocol for assessment of cognitive - linguistic abilities has been developed / constructed. Though an attempt was made to make the protocol culture fair for the Kannada speaking adult population, it was observed that certain tasks, viz. The sentence disambiguation subtest of the problem solving domain was consistently difficult for all the subjects. Many of the subjects had difficulty in understanding the nature of responses expected of them in reply to the task set for them. Therefore, the nature of cultural biases reflecting on test items in this subtest need to be probed.
- The Cognitive-Linguistic Assessment Protocol was used in the assessment of cognitive linguistic abilities in normal Kannada speaking adults from 40 years of age to 70 years of age. Though a small decline was seen in visual attention tasks, total attention, perception and discrimination scores, episodic memory, working memory, total memory scores, problem solving and organization, these are not of statistical significance. These results agree with literature which reports of little decline in the 'young-old' adults, but more significant decline only in the 'old-old' adults above 75 years of age. (Roth, 1972, Jarvik, 1975, Obler and Albert, 1981, Ulatowska et al., 1985, Barresi et al., 1986, Kemper; 1992, and Ellis and Hodgson, 1988). This observation can be used in differentiating senescence from senility in the young-old geriatrics, in that any decline in any of the cognitive-linguistic functions included in the protocol may be interpreted as a senile change. Further detailed testing may be carried out to discover the cause of the senility (i.e. diagnosis of dementias, primary progressive aphasia, etc.).

SUMMARY AND CONCLUSIONS

Aging is an inevitable process of life. Humans are different from animals in that they can anticipate aging and prepare themselves for it. Normal aging is that commonly encountered functional state of the nervous system in a population of older individuals. Normal aging is accompanied by changes in the ability to process, understand and use language. There is no global decline in linguistic functions, though some minimal changes in language abilities from a global communication point of view have been reported in literature. Cognitive changes in terms of decline in performance tasks in measurements of IQ have been documented. The effect of these cognitive declines on language performance has been only minimally probed. Only in the 1970s, with increasing interest in geriatric communication problems, and realization that cognitive processes impinge on communication abilities, was the term cognitive - communicative processes introduced. AS HA (1987) taking cognisance of the intricate relations between cognitive disorders and concomitant language and communication problems, delineated / defined the role of speech-language pathologists in the realm of cognitive-communicative disorders. Consequently assessment procedures for cognitive -communicative problems have been developed, but these concentrate on cognitive-communicative disorders of patients with traumatic brain injury. Recently, more cognitive-communicative assessment procedures have been developed for the dementias in general and Dementia Alzheimer's Type in particular.

- A protocol for assessment of cognitive - linguistic abilities has been developed / constructed. Though an attempt was made to make the protocol culture fair for the Kannada speaking adult population, it was observed that certain tasks, viz. The sentence disambiguation subtest of the problem solving domain was consistently difficult for all the subjects. Many of the subjects had difficulty in understanding the nature of responses expected of them in reply to the task set for them. Therefore, the nature of cultural biases reflecting on test items in this subtest need to be probed.
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- Small gender contingent differences in performance on the different cognitive-linguistics domains were observed, but these differences were not of statistical significance.

From correlation analysis, it was inferred that attention, perception and discrimination are influenced by working memory capacity. Working memory also has effect on semantic memory processes, directly, as well as indirectly through its influence on attention. Problem solving and organization are also correlated with attention and working memory. Working memory capacity correlates with time taken for performance on attention tasks, word naming fluency, and sequencing events. Timed tasks generally showed good correlation across domains, probably because of common underlying processes like working memory. Subtests within a domain also correlated well with each other and with total scores for the domain, thereby increasing construct validity of test items.

The results of the present study reveal that CLAP would serve as a sensitive tool to screen the cognitive linguistic abilities of the young old. In the absence of such tools, to date, in Indian languages, the mean scores across age-groups would serve as a norm-reference for clinical screening purposes.

CLAP has enriched the existing theoretical literature on the relations between cognition and language. Future research on cross - linguistic / ethonocultural differences in cognitive - linguistic abilities in Indian context could benefit from this study on Kannada, a South Indian language.

SUMMARY AND CONCLUSIONS

Aging is an inevitable process of life. Humans are different from animals in that they can anticipate aging and prepare themselves for it. Normal aging is that commonly encountered functional state of the nervous system in a population of older individuals. Normal aging is accompanied by changes in the ability to process, understand and use language. There is no global decline in linguistic functions, though some minimal changes in language abilities from a global communication point of view have been reported in literature. Cognitive changes in terms of decline in performance tasks in measurements of IQ have been documented. The effect of these cognitive declines on language performance has been only minimally probed. Only in the 1970s, with increasing interest in geriatric communication problems, and realization that cognitive processes impinge on communication abilities, was the term cognitive - communicative processes introduced. ASHA (1987) taking cognisance of the intricate relations between cognitive disorders and concomitant language and communication problems, delineated / defined the role of speech-language pathologists in the realm of cognitive-communicative disorders. Consequently assessment procedures for cognitive -communicative problems have been developed, but these concentrate on cognitive-communicative disorders of patients with traumatic brain injury. Recently, more cognitive-communicative assessment procedures have been developed for the dementias in general and Dementia Alzheimer's Type in particular.

Considering the ethnocultural differences in cognitive-communicative abilities with aging, and a lack of standardized procedures for Kannada speaking adults, the present study was undertaken to construct a protocol for assessment of cognitive-linguistic abilities in the Kannada speaking population.

The primary objective was to develop the protocol and administer it on normal Kannada speaking adult and young-old subjects. The secondary objective included observing age-related changes if any, on performance across domains; gender contingent variations, if any, on performance on the test and to comment on potential cognitive linguistic parameters that would differentiate senescent vs. senile age related changes.

The Cognitive-Linguistic Assessment Protocol was developed. Initially, a list of cognitive process that would be central to language functions were segregated from Best's (1999) exhaustive list of cognitive process. These were, then further subgrouped into four main domains, viz., attention; perception and discrimination, memory, reasoning and problem solving, and organization. These four domains were then categorized into subtests, again considering those processes within a domain that would be most salient for language processes. Items under each subtest was constructed after considering the methods used by various clinicians and researchers as quoted in literature. Transliteration of these test items was carried out with the help of native Kannada speakers with knowledge of the syntactic, semantic and pragmatic constructs of the language to ensure a culture-fair test.

The test protocol thus developed was administered on 36 normal adults from 40 to 70 years of age, divided into 6 subgroups. Equal number of males and females were included in each group. The subjects met the selected inclusion criteria like native Kannada speaker criteria like native Kannada speaker - reader, with no present or past history of neurological, or psychological illness, nor any drug or alcohol abuse, and no gross sensory or communicative deficits. All the subjects passed the two screening assessments, viz., Mini Mental State Examination and speech discrimination screening test, to be considered as subjects for the study. However, certain confounding variables like level of education and socioeconomic status were not controlled and this may have had influenced the results. The test protocol was administered in the same environment where the screening tests for candidacy were carried out, and scoring was done simultaneously as scheduled for each test. The data thus obtained was subjected to statistical scrutiny.

The results revealed that though small differences in performance on each subtest were present across age groups and with respect to gender, these differences were not of statistical significance on the T-test. This agrees with literature (Roth; 1972, Jarvik; 1975, Bowles et al., 1983, Ulatowska et al., 1985, among others), which states that decline in cognitive and language processes occur after 75 years of age. In fact, Roth (1972), reports of a rapid, step-like deterioration observed in elderly persons after years of little more than a mild, slowly progressive or stationary defect of memory for recent events, together with some accentuation of life-long personality features.

Univariate analysis of variance revealed a very significant difference in variation for timed tasks on auditory and semantic memory subtests for group vs gender comparision. Thus, timed tasks which tap reaction times and processing time play a major role in demonstrating variations in cognitive linguistic skills across age group in gerontological studies. Hence, the scoring system of the present protocol may be further modified to include timing aspects, to help document senescent changes and differentiate senile changes.

Correlation statistics provided some more insight into the interactions among the various cognitive linguistic processes, thereby helping to strengthen the premises of the test protocol.

A significantly high positive correlation was present for both the attention subtests. Also, both the subtests shared a negative correlation with working memory. Hence, both the tasks tap the similarities in the attentional processes involved. Working memory seems to be at the core to attention tasks and has a significant role to play irrespective of modality being tested.

Semantic memory, which is concerned with language and knowledge is affected by working memory, as also by attentional, perceptual and discriminatory processes. Working memory capacities and computational speed influences performance on semantic memory tasks directly, as well as indirectly through its sway over attentional processes.

Problem solving and organization are cognitive-Iingusitic processes involving multiple determinants like attention; perception and discrimination process, working memory and reasoning capacities.

Thus, there is indeed a lot of interaction among cognitive domains and these interactions affect language processing efficiency. Again, these relationships among language and cognition are more evident in time-constrained tasks, as more significant correlations were obtained for timed tasks.

Implications :

(i). The results of the present study reveal that CLAP would serve as a sensitive tool to screen the cognitive - linguistic abilities of the young-old. In the absence of such tools to date, the mean scores across age-groups would serve as a norm reference for clinical screening.

(ii). Clinically, this test protocol would be in helpful to differentiate senile versus senescent changes. Since no significant decline was noted in the performance on cognitive linguistic tasks across age groups from 40 to 70 years of age, any decrease in these capacities may be interpreted as a senile degenerative function. This will help in early identification of geriatric communication problems like dementias, primary progressive aphasia, CVA aphasic problems in the elderly population etc.

(iii). CLAP has enriched the existing theoretical literature on the relations between cognition and language. Future research on cross-linguistic / ethnocultural differences

in cognitive-linguistic abilities in the Indian context could benefit from this study on Kannada, a South Indian language.

Limitations:

(i). The research design did not include the 'old-old' geriatric population. Inclusion of this group may have provided more information on the changing scenario, if any, on cognitive - linguistic abilities in the aged.

(ii). Only a few test items were timed. Most of the statistical probes revealed time - related significant variations / correlations. Hence timed tasks may have been more appropriate for the study of cognitive - linguistic abilities in this population.

(iii). Educational level and socioeconomic status was not controlled. This may have affected the results.

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APPENDIX

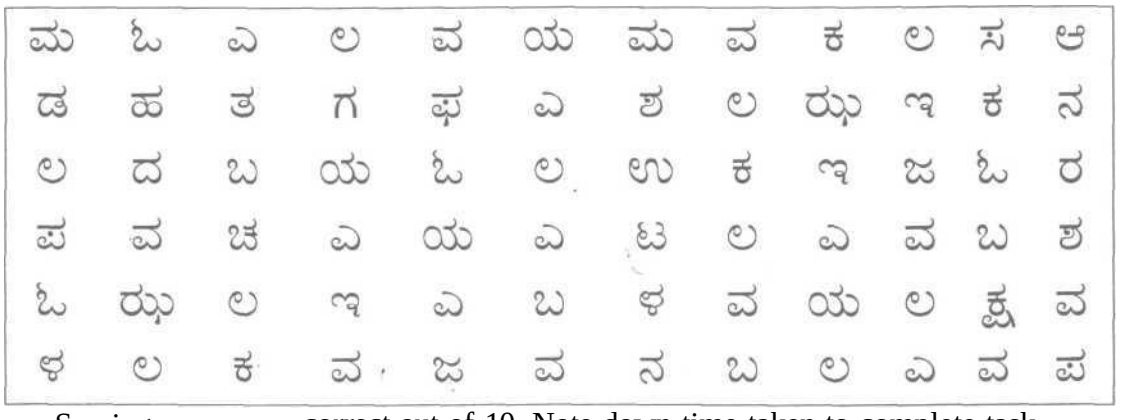
Cognitive -Linguistic Assessment Protocol

Domain I: Attention. Discrimination and Perception.

Visual subtest:

a. Letter cancellation

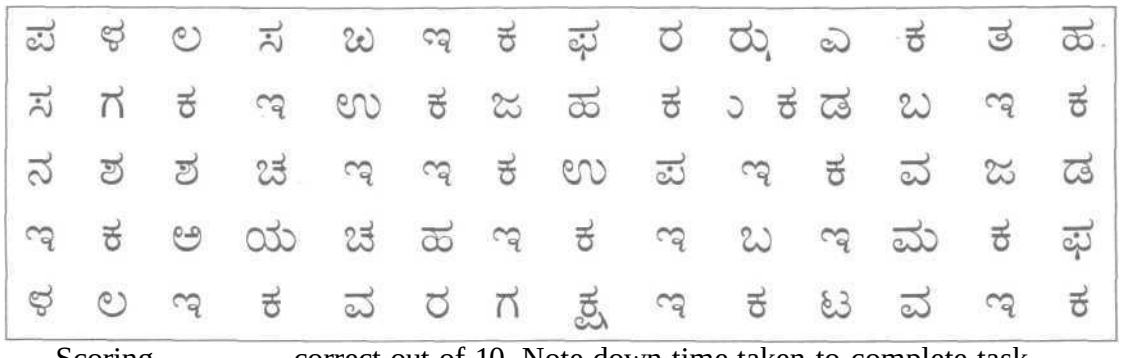
"ideralli iruva pratyek T akSarannu aDigere yeLedu gurutisi".



Scoring : correct out of 10. Note down time taken to complete task

b. Contingent letter cancellation

"i" akSara pakka iruva pratyek 'k' akSarannu aDigere yeLedu gurtisi".



Scoring correct out of 10. Note down time taken to complete task

c. Word cancellation

"idralli iruva pratyek 'kittLe' Sabdannu aDigere yeLedu gurtisi".

ಚೆರ್ರಿ	ಸೇಬು	ಸೀಬೆ	ಕಿತ್ತಳೆ	ಪೀಚ್	ಹಸಿರು	ಹಳದಿ	ಬಾಳೆಹಣ್ಣು
ಕಿತ್ತಳೆ	ನೇರಳೆ	ಸಪೋಟ	ದ್ರಾಕ್ಷಿ	ನಿಂಬೆ	ನಿಂಬೆಹಣ್ಣು	ನೀಲಿ	ಪರಂಗಿ
ಕಿತ್ತಳೆ	ಹಲಸು	ಕಿತ್ತಳೆ	ನಿಂಬೆ	ನಿಂಬೆ	ಕಿತ್ತಳೆ	ಮೊಸಂಬಿ	ಕಿತ್ತಳೆ
ದ್ರಾಕ್ಷಿ	ಕಿತ್ತಳೆ	ನೀಲಿ	ಸಪೋಟ	ಸೀಬೆ	ಸೇಬು	ನೇರಳೆ	ನೀಲಿ
ನಿಂಬೆ	ಸೇಬು	ಕಲ್ಲ	ಕಿತ್ತಳೆ	ಸೇಬು	ಬಾಳೆ	ಕೆಂಪು	ಹಸಿರು
ಹಳದಿ	ಬಿಳಿ	ಂಗ್ರಿ	ಸೇಬು	ಸೀಬೆ	ಕಿತ್ತಳೆ	ಕೆಂಪು	ಬಿಳಿ
ನೀಲಿ	ಕಿತ್ತಳೆ	ಹಳದಿ	ನೇರಳೆ	ಕಂದು	ಬೂದು	ಚೆರ್ರಿ	

Scoring :————correct out of 10. Note down time taken to complete task.

Auditory Subtest:

a. sound count

"naanu iiga kelavu akSaragaLu oduteni. YeSTu sari 'b' Sabdha bantu anta keLikonDu heLi'T

m b t j b p S v g t b

1 b S k r b p f b L c

b j L b b h t s d d 1

scoring :————correct out of 10.

-1 for each extra count beyond 10.

b. Letter pair discrimination.

"naanu iiga 2-2 akSaragaLu heLutteni, aa aksaragaLu ondeena, bere bere na anta heLi".

b	P
t	t
1	1
c	j
d	k

Scoring :————correct out of 5

c. Word pair discrimination

"naanu iiga 2-2 padagaLu heLutteni. aa akSaragaLu ondeena, bere bera na anta heLi".

kuri	kuuri
baLe	maLe
niinu	naanu
hoovu	hoovu
cappali	cakkali

Scoring :————correct out of 5.

d. Month background naming

"tingaLa hesaru ulTa kramadalli heLi"

Scoring : 1 point for every month named. Eg. "Dec, Nov, Aug, July, June, May, April, March, February, January" = 8 marks

December and November are not scored, as they are used to help the subject begin. Months named in wrong order are not scored.

Eg : Dec, Nov, Oct, Sept, Aug, June, July, May, March, April, February, Jan. = 6 marks.

Note down time taken to complete task.

Total———*Correct* out of 10.

Domain II: Memory

Episodic memory

a. Orientation and recent memory questions.

1. nimma hesaru eenu?

   (What is your name)

2. nimma taaiia hesaru eenu?

   (What is your mother's name)

3. niivu uTa yavaga maDuttira? BeLage/ maDhyana/ sanje/ratri.

   (When do you eat food, morning/afternoon/evening/night).

4. idu yavu uuru?

   (What place is this ?)

5. bharatada iigina pradhaanamantri yaru?

   (Who is the present prime minister of India).

6. suuryannu puurvadalli huTuttano pascimadallo?

   (Does the sun rise in the east or in the west)

7. tandeya tandege yenu andu hesaru ? (ajja)

   (A father's father is a - grandfather).

8. Banknalli iTTiruva haNakke prati tingaLu baruva sampadaneege - endu hesaru. (baddii)

   (Monthly earnings ins a bank account is called —) (interest).

9. ondu padada arthavannu niivu yelli huDukalu? (nighanTu)

   (What do you use to look up the meaning of a word ?) (dictionary)

10. march tingLu, June tingLina munce baratta?

    (Does the month of March come before July ?)

    Scoring : 1 Mark for every question answered correctly.

    Total———Correct out of 10.

Working memory

a. digit forward

"naanu iiga kelavu ankagaLu heLutene. adanna keLiskondu, niivu ade kramadalli punha heL beku".

8 9 6

5 8 1 2

1 4 6 2 7

1 5 9 3 4 7

2 5 8 7 1 7 9

Scoring : 1 point for every correctly repeated sequence. No points if all members repeated but in wrong order. Total 5 points

Total———correct out of 5.

b. digit backward.

"naanu iiga kelavu ankagaLu heLutene. adanna keLiskonDu, niivu ulTa kramadalli heLi".

2 5 7

9 7 1 8

5 4 6 1 9

8 4 3 9 7 6

7 4 2 9 6 3

Scoring: 1 point for every correctly repeated sequence. No points if all numbers repeated but in wrong order.

Total———correct out of 5.

Semantic memory

a. coordinate naming.

"baravaNigeyalli upayogisuva aidu vastugaLannu hesarisi".

Scoring : 1 point for each item named max. 5 points.

no point given for items like 'rubber', 'duster' etc.

Total ———out of 5.

b. Superordinate naming

"keLage koTTiruva padagaLu yavu gumpige servuttave aagumpada hesaru heLi".

ಬೆಕ್ಕು, ಮಂಗ, ಹುಲಿ, ನಾಯಿ, ಆನೆ,
ಶೂಗಳು, ಬೂಟುಗಳು, ಚಪ್ಪಲಿಗಳು, ಸ್ಯಾಂಡಲ್‌ಗಳು,
ಪಕ್ಷಿ, ಮೋಡ, ವಿಮಾನ, ನಕ್ಷತ್ರಗಳು
ಹಾಲು, ನೀರು, ಸಕ್ಕರೆ, ಚಹಾಪುಡಿ, ಕುಡಿಕೆ, ಅಥವಾ
ಮೇಜು, ಕುರ್ಚಿ, ಡಸ್ಟರ್, ಕಪ್ಪುಹಲಗೆ, ಕಿಟಕಿ

Scoring : 1 point for every correct answer

Total————out of 5.

answers : i. praNigaLu

ii. kaalege haavudu vastugaLu.

iii. aakaSa

iv paaniiya, caha maadvudu

v. claasrumu.

c. Word naming fluency :

"naanu heLida akSaradinda aidu padagaLu heLi".

i P.

ii. a

iii. s

iv. i

v. t

Scoring : 1 point for 5 words on every letter.

If unable to name atleast 5 words on a letter, no point given for that item.

Note down time taken to complete task.

Total score————out of 5.

d. Generative naming

"kelavu praSNegaLu keLUttene adanna uttara koDi".

i. baravaNigeyalli eenu upayogistira? (pen)

ii. mhaLe bandre eenu upayogistrira ? (Kode)

in. samaya noDDakke eenu upayogistira ? (ghaDiyara)

iv. kaalalli eenu haakuttira ? (shu, bootu)

v. signalgaLalli Yavudu baNNa andre 'nillisi' anta? (kempu).

Scoring : 1 point for every correct answer

Total :———out of 5.

e. Sentence repetition

naanu kelavu padagaLu heLutene. adanna vaapas heLi.

i. kiTaki (1)

ii. nalavattaaidu (2)

iii. aivattaidu vare kilomeeter (5)

iv. raitanu hola uLutiddane (3)

Scoring :———out of 10.

1 point for every morpheme correctly repeated.

£ Carry out commands

"naanu iiga nimmage kelavu kelasa maDakke heLutene adu yesTaguto ausru maadi"

i. kurci torisi (1)

ii. pennu mattu bukku torisi (2)

iii. penninda bukku torisi (3)

iv. kaNNu torisi mattu kaalu torisi (4)

Scoring :———out of 10

Domain III : Problem solving

a. sentence disambiguation

"naanu kelavu vakya heLutene. ondu vakyage eradu artha ide. adu hege anta niivu tiLis beku".

Eg : Sripati tamma manege hoodaru.

i. tinDi aayita ?

ii. ii ramayaNa yarige beeku ?

iii. aa baNNada biisaNige nanage beDa

iv. huDugi huvu biDisuttidaLe.

v. govinda snana maaDi uuta maDlilla.

Scoring : 1 point for every correct interpretation 2 points given on an item only if both the interpretations are correctly explained.

Total score :————out of **10.**

b. sentence formulation.

"padakramavannu badalaaysida vakyagaLannu naniiga koDtini. niivu ivugaLannu biDisi sariyaada vaakya eenubudannu tiLisi".

1. ಬಾಗಿಲಿಗೆ ಮುಂದಿನ ಹಾಕಿದೆ ಬೀಗ
2. .ಯಾಗಿತ್ತು ತುಂಬಾ ನೀರು ಬಿಸಿ
3. ಹೋಯಿತು ಸೂರ್ಯನ ಐಸ್‌ಕ್ರೀಮ್ ಕರಗಿ ಬಿಸಿಲಿನಿಂದಾಗಿ
4. ದಂತವೈದ್ಯರುಹಲ್ಲನ್ನು ನನ್ನ ತುಂಬಿದರು.
5. ಹತ್ತು ನಿಮಿಷ ಕೈ ಗಡಿಯಾರ ಮುರಿದ ಹಿಂದಿತ್ತು

answers

i. mundina baagilige biiga haakide.

ii. niiru rumba bisiyagittu.

iii. suuryana bisilinindaagi aiskriim karagi hooyitu.

iv. dantavaidyaru nanna hallannu tumbidaru.

v. murida kaighaDiyaara hattu nimiSa hindittu.

Scoring : 1 point for each correctly arranged sentence.

Total score————————out of 5.

c. predicting cause.

i. aakasmakavaagi kurrent horaTu hoodare niiveenu maDuviri ?

ii. bereyavarinda keLipaDedu tanda dubaari padaartha kaLedu hoodaga enu maDuviri ?

iii. nimma biigadakai kaLedu hoodaaga enu maaDuviri ?

iv. patrakke stamp haakadeeya poost madibTTireni. aageenu maaDuviri ?

v. nimage huSaaru illadidaaga niivu doktar hattira hoogillavenni aageenaaguvudu ?

Scoring : 2 points if outcome stated clearly and is possible (cohorent answer). 1 point if outcome correct but not explained clearly.

No points scored if answer does not go with the theme of the question.

Total————————out of 10.

d. compare and contrast.

"naaniiga eraDeraDu padagaLannu heLuttene. avu heege hondukoLLuttave athava heege beereyaguttave embuvannu tiLisi.

i. fridge mattu stove

ii. cenDu mattu balloon

iii. taTTe mattu patre.

iv. vruttapatrike mattu magazinu

v. aaroplane mattu hakki.

Scoring : 1 point for a similarity and 1 point for a difference for each item.

Total————————out of 10.

e. predicting cause

"naaniiga yaavudaadaru ondu sthitibagge heeLittene. adakke kaaraNaveenirabahudu endu tiLisi.

i. nimma giDagaLu batti hoodaru.

ii. nimma koThaDiyalli hoge tumbide.

iii. biigada kai ii biigakke honnduttilla.

iv. nimmma aarogya keTTide.

v. nimma gaDiyara kelasa maDuttilla.

Scoring : subject is expected to give atleast two reasons for each problem. Score 1 point for each correct cause stated. Max 2 points per item.

Total————————out of 10.

f. why questions.

i. nityavu vyaayaama maaDabeeku, eeke ?

J

ii. sancaari signalgaLirabeeku, eeke ?

iii. penninalli biLi inkannu upayogisuvudilla, eeke ?

iv. buuTu haakuvudueeke ?

v. giDagaLige niiru haakabeeku, eeke ?

Scoring : 1 point for every correct answer.

Total————out of 5.

g. **sequential analysis**

yaarudaadarondu kelasavannu naanu heeLutteene. niivu aa kelasa maaDuva kramavannu tiLisabeeku.

i. patre toLeyudu.

ii. giDa niiDuvudu.

iii. SarT / siire khariidisuvudu.

iv. Ti maaDuvudu.

v. patravannu ancepTTigege haakuvudu.

Scoring : Subject expected to elaborate atleast 4 steps in each task analysis score 2 point for every correctly analysed item. 1 point for correct analysis, but in less than 4 steps. 0 points if analysis is not temporally correctly sequenced.

Total:————out 10.

<u>Domain IV : Organization</u>

a. categorization

"naaniiga nimma munde ondu vastuvina hesarannu heeLutteene. keeLikanDa kelavu beere hesaragaLalli modalu heeLida vastuvina gumpige honduvantaha eraDannu aDigere yeLedu gurtisi".

J

(a) ನಾಯಿ:
ಹೂವು, ಟೊಪ್ಪಿ, ಇಲಿ, ಪೆನ್ಸಿಲ್ಲು, ಸಿಂಹ

(b) ಸಕ್ಕರೆ:
ಗಿಣ್ಣು, ಬೆಲ್ಲ, ಮೆಣಸಿನಕಾಯಿ, ಜೇನುತುಪ್ಪ, ಗುಹೆ

(c) ಗುಂಡಿ:
ಸೇಫ್ಟಿಪಿನ್ನು, ಗಡಿಯಾರ, ಕ್ಲಿಪ್, ಬಳೆ, ಉಗುರು

(d) ಪುಸ್ತಕ:
ಲ್ಯಾಂಪ್, ವೃತ್ತ ಪತ್ರಿಕೆ, ಚಿತ್ರ, ಫೈಲ್, ಮ್ಯಾಗಜೀನು

(e) ಕತ್ರಿ:
ಸೂಜಿ, ಗಾಜು, ಬ್ಲೇಡು, ಚಾಕು, ಬೆಂಕಿಪೊಟ್ಟಣ.

Scoring : 1 point for every correctly identified coordinate category.

Total————————out of 10.

b. analogies

"naanu paraspara sambanDhisida eraDu vastugaLu hesaravannu heeLutteene. nantara onde ondu hesarannu heeLutteene. modalina padagaLa joDiyalli sambandhisiruvanteye idakke sambandhisida vastu yaavudirabahudu endu heLi".

Eg. pennu : bare.

Pustaka : (oodu)

i. chatri : maLe :: sweater:_____(chaLi)

ii. aane: ili :: samudra:_____ (kere/tore/nadi)

ii. aeroplane : aakaSa :: car :_____(raste)

iv. samaya : ghanTe :: bhara :_____(kg.)

v. doktor : aaspatre :: upadhyaya :_____(skool/Sale)

Scoring : 2 points for every correct answer.

Total————————out of 10.

c. sequencing events.

"vakyakramavannu badalaayisida kelavu kathegaLu illi bardide. Niivu ivugaLannu biDisi/sariyada vakyakramannu bardu, kathe eenubudannu tiLisi.

a) - ಅದಮರವೊಂದಕ್ಕೆ ಸಿಕ್ಕಿ ಹಾಕಿಕೊಂಡಿತು.
- ಆದರ್ಶ ಗಾಳಿ ಪಟವನ್ನು ಮಾಡಿದ.
- ಗಾಳಿ ಬಂದಾಗ ಮೇಲಕ್ಕೆ ಬಂತು.

b) - ವಿದ್ಯಾ ಆ ಬೀಜಗಳನ್ನು ಬಿತ್ತಿದಳು
- ವಿದ್ಯಳಿಗೆ ಒಂದು ತೋಟ ಮಾಡಬೇಕೆನಿಸಿತ್ತು
- ಒಂದುವಾರದ ಹೊತ್ತಿಗೆ ಚಿಕ್ಕ ಹಸಿರು ಮೊಳಕೆಗಳು ಒಡೆಯುವುದನ್ನು ನೋಡಿದಳು.
- ವಿದ್ಯಳ ತಾಯಿ ಅವಳಿಗೆ ಕೆಲವು ಬೀಜಗಳನ್ನು ತಂದುಕೊಟ್ಟರು.
- ಅವುಗಳಿಗೆ ವಿದ್ಯ ದಿನವೂ ನೀರು ಹಾಕುತ್ತಿದ್ದಳು.

c) - ಕಾರು ಸ್ಟಾರ್ಟ್ ಆಗುವುದಿಲ್ಲ ಎಂಬುದನ್ನು ಅರಿತ ವಿವೇಕ ಬಸ್ ಹತ್ತಿ
- ವಿವೇಕ ಬಹಳ ಲೇಟಾಗಿ ಎದ್ದ.
- ಹೊತ್ತಿಗೆ ಸರಿಯಾಗಿ ಕೆಲಸ ಮಾಡಬೇಕೆಂದುಕೊಂಡ ಮತ್ತು ಇನ್ನು ಮು ಏಳುತ್ತೇನೆಂದು ಸಂಕಲ್ಪ ಮಾಡಿಕೊಂಡ
- ಕಾರಿನಲ್ಲಿ ಕುಳಿತಮೇಲೆ ಅದು ಅಷ್ಟು ಸುಲಭವಾಗಿ ಸ್ಟಾರ್ಟ್ ಆಗುವುದೀ ಅವನಿಗೆ ಅನ್ನಿಸಿತು.
- ಆದಕಾರಣ, ಅವನು ಬೇಗೆ ಸ್ನಾನ-ಡ್ರೆಸ್‌ಗಳನ್ನು ಮುಗಿಸಿ ತನ್ನ ಕಾರಿನ

d) - ನನಗೆ ಕಿರುಚಲೂ ಆಗದಷ್ಟು ಭಯ ಆಗಿತ್ತು.
- ಅಂದು ಕಗ್ಗತ್ತಲಿರಾತ್ರಿ.
- ಅಬ್ಬಾ, ಅದೆಂತಹ ಶಬ್ದ
- ಇದ್ದಕ್ಕಿದ್ದಹಾಗೆ ನನ್ನ ಬೆಕ್ಕು ಹಾಸಿಗೆಯ ಮೇಲೆ ಹಾರಿತು.

- ಮನೆಯಲ್ಲಿ ನಾನೊಬ್ಬನೇ ಇದ್ದೆ
- ಹಾಸಿಗೆಯ ಮೇಲೆ ಕುಳಿತು (ಸಾಕಷ್ಟು) ಜೋರಾಗಿಯೇ ಕೇಳಿಸಿಕೊಂಡೆ

e) - ಬಸ್ ಸ್ಟಾಪ್ ನಲ್ಲಿ ಇನ್ನೂ ಕೆಲವು ಮಕ್ಕಳು ಬಸ್‌ಗಾಗಿ ಕಾಯುತ್ತಿದ್ದರು.
- ಶಾಲೆಯ ಬಳಿ ಇದ್ದ ಸ್ಟಾಪ್ ಬಂತು, ರೀಟಾಳನ್ನು ಬಿಟ್ಟು ಉಳಿದ ಮಕ್ಕಳೆಲ್ಲ ಬಸ್‌ನಿಂದ ಇಳಿದರು.
- ರೀಟಾ ಸ್ಕೂಲಿಗೆ ಬಸ್‌ನಲ್ಲಿ ಹೋಗಬೇಕಿತ್ತು ಆದ್ದರಿಂದ ಅವಳು ಬಸ್‌ಸ್ಟಾಪಿಗೆ ಬಂದಳು.
- ಅವಳು ಕಂಡಕ್ಟರರಿಗೆ ಬಸ್ ನಿಲ್ಲಿಸುವಂತೆ ಕೇಳಿಕೊಂಡು ಬಸ್‌ನಿಂದ ಇಳಿದಳು.
- ಮಕ್ಕಳೆಲ್ಲಾ ಬಸ್‌ಹತ್ತಿದರು
- ರೀಟಾ ಇದ್ದಕ್ಕಿದ್ದಹಾಗೆ ಎದ್ದು ಕುಳಿತಳು ಆಗ ಬಸ್ ಸ್ಕೂಲಿನ ಬಳಿ ಇದ್ದ ಬಸ್ ಸ್ಟಾಪ್ ಬಿಟ್ಟು ಮುಂದೆ ಹೋಗಿದೆ ಎಂಬುದು ಅವಳಿಗೆ ತಿಳಿಯಿತು.
- ಶಾಲೆಗೆ ಓಡಿಹೋಗಿ ಸರಿಯಾದ ಸಮಯಕ್ಕೆ ತನ್ನ ಕೊಠಡಿಯನ್ನು (ಕ್ಲಾಸನ್ನು) ತಲುಪಿದಳು.
- ಬಸ್‌ಬಂತು
- ರೀಟಾಳಿಗೆ ಬಸ್‌ನಲ್ಲಿ ನಿದ್ದೆ ಬಂದಿತು.

Scoring : use story (i) as example.

Correct sentence order for other stories are as follows ;

b. 3 1 5 2 4

c. 4 1 5 3 2

d. 4 1 3 6 2 5

e. 2 6 1 8 4 7 9 3 5

The first two items, are given 1 point for every correctly ordered sentence. Therefore item (ii), (iii) 5 points each. Item (iv) carries 2 points for every correctly orders sentence. Total of 12 points Items (v) carries 2 points for every correctly ordered sentence. Total of 18 points.

Total score :——out of 40.

SCORE SHEET

Name of subject _____

Age _____

Gender : M/F

Score on M.M.S.E. _____

Score on screening speech discrimination test

C.L.A.P.

I. Attention, perception **and** discrimination.

Subtest	Test Item	Subjects Score	Max. Score	Time in sees.
lsua	a. Letter cancellation		10	*
	b. Contingent letter cancellation		10	*
	c. Word cancellation		10	*
Auditory	a. sound count		10	-
	b. Letter pair discrimination		5	-
	c. Word pair discrimination		5	-
	d. Months backward naming		10	*

[Total: (Attention, perception discrimination): - /60]

II. Memory

Subtest	Test Item	Subjects Score	Max. Score	Time in secs.
Episodic	a. Orientation and recent memory questions		10	
	b. Digit forward		5	-
	c. Digit backward		5	

Semantic	a. Coordinate naming		5	-
	b. Superordinate naming		5	-
	c. Word naming fluency		5	*
	d. Generative naming		5	
	e. Sentence repetition		10	-
	f. Carry out commands		10	-

[Total (memory) : - /60]

III. Problem solving

Subject	Test Item	Subjects Score	Max. Score	Time in sees.
	a. Sentence disambiguation		10	-
	b. Sentence formulation		5	-
	c. Predicting outcome		10	-
	d. Compare and contrast		10	-
	e. Predicting cause		10	-
	f. Why questions		5	-
	g. Sequential analysis		10	-

[Total (Problem solving) : - /60]

IV. Organization

Subject	Test Item	Subjects Score	Max. Score	Time in sees.
	a. Categorization,		10	
	b. Analogies		10	
	c. Sequencing event			*

[Total (organization) : - / 60]