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ADAPTATION AND STANDARDISATION OF COGNITIVE LINGUISTIC QUICK TEST IN KANNADA (CLQT-K): COMPARISON BETWEEN MONOLINGUALS (KANNADA) AND BILINGUALS (KANNADA-ENGLISH)

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LIST OF CONTENTS

LIST OF TABLES

LIST OF GRAPHS

CHAPTER - I

INTRODUCTION

Language is the expression of human communication through which knowledge, belief, and behavior can be experienced, explained and shared. This sharing is based on systematic, conventionally used signs, sounds, gestures, or marks that convey understood meanings within a group or community (National Institute of Deafness and other Communication Disorders, 2008). Communication refers to the sending and receiving of messages, information, ideas, or feelings (Hulit & Howard, 2002). Communication is also multimodal. Though most of the communication is attained through speech, the process is enhanced by the use of facial expressions, gestures, eye gaze, etc.

Cognition can be defined as the processes an organism uses to organize information. This includes acquiring information (perception), selecting (attention), representing (understanding) and retaining (memory) information, and using it to guide behavior (reasoning and coordination of motor outputs). 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).

Language and cognition are tightly connected. Language was declared to be a "mental organ", but one governed by "rules and representations" distinct from structures and processes of consciousnesses, memory and communicative needs (Chomsky, 1986). Psycholinguistics studying the mechanisms of the so-called "language faculty" and computational linguistics, attempting to formalize and implement aspects of it *in machines* quite literally, were the two most"cognitive" approaches to language.

There are several factors affecting cognition in both monolinguals and bilinguals where in language proficiency plays a role. The impact of language proficiency is generally in the direction of disadvantage for bilinguals. Slower word retrieval seems to be specific to bilingualism and is independent of factors mediating language proficiency for bilinguals such as order of acquisition and language dominance (Ivanovo & Costa, 2008). The bilingual disadvantages in verbal tasks mainly depend on language proficiency, notably vocabulary size and level of executive control involved in the task. Bilingual disadvantages may disappear if monolinguals and bilinguals are matched on a measure of language proficiency such as vocabulary knowledge. Scores on category fluency reflects levels of language proficiency in bilinguals (Delis, Kaplan, & Kramer, 2001).

Aging is also associated with many cognitive linguistic changes. Normal aging often refers to the most common or usually encountered functional state of the nervous system in a population of older individuals (Whitehouse, 1991). 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. It is deterioration of a mature organism resulting from time independent, essential irreversible changes intrinsic to all members of species. Human aging involves molecular, cellular and biochemical changes across all body systems. Aging may be associated with deterioration in cognitive skills (Birren, 1970; Botwinik & Storandt, 1974; Burke & Light, 1981; Schaie & Hertzog, 1983). The incidence of cognitive impairment increases with age so that by age 85, up to one third of older persons have some degree of cognitive impairment. The cognitive abilities of older adults vary tremendously both within individuals and across age groups. Within individuals, some functions may change while others do not. One aspect of language – semantic knowledge - appears to decline with

age, although significant differences are not found until relatively late in the life span (greater than 70 years). Older adults show declines in visual-spatial abilities, which affect visual tasks such as identifying incomplete figures, recognizing embedded objects, or arranging blocks into a design. Aging also appear to affect both the ability to perceive and the ability to reproduce figures in three dimensions (Sailer, Dichgans, & Gerloff, 2000). As age advances time taken for retrieving a word increases, but there is no significant deterioration in cognitive linguistic flexibility (Vijaykumar & Prema, 2007).

There are several models proposed to explain these language changes during cognitive aging which includes the Transmission deficit hypothesis (Mackay & Burke, 1990) and Inhibitory deficit hypothesis (Hasher & Zacks, 1988; Hasher, Zacks, & May, 1999). But it is not adequately explored whether these cognitive linguistic changes with definite underlying neural mechanisms affect the linguistic representations of both languages of a bilingual similarly or not.

Other than aging and language proficiency, factors like education and socioeconomic status also plays a major role in cognitive linguistic performance. Educational effect on age dependent cognitive decline may be different depending upon the specific cognitive domain (Capitani, Barbarotto, & Laiacana, 1996), i.e the effect of education is not homogenous in different cognitive domains. Studies have reported that differences in memory loss during aging are related to socioeconomic status (Craik, Byrd, & Swanson, 1987). Research studies have pointed out that low socioeconomic status subjects receive quantitatively and qualitatively less stimulation at home in comparison with high socioeconomic status subjects.

Research into bilingual information processing has provided growing evidence towards enhanced performance in non linguistic cognitive tasks in bilinguals. Studies consistently report bilingual advantages in nonverbal executive control in both children (Bialystok, 2001; Mezzacappa, 2004; Carlson & Meltzoff, 2008) and adults (Bialystok, Craik, Klein, & Vishwanathan, 2004; Bialystok, Craik, & Ryan, 2006; Costa, Hernandez, & Sebastian-Galles, 2008). This advantage has been attributed to the enhancement of executive processes through their constant involvement in ordinary language use; bilingual language production necessarily involves the resolution of conflict between the two competing language systems, a process that involves frontal executive processes. Studies have reported that the extended experience of bilingualism thus builds up cognitive reserve and protects against the onset of dementia (Bialystok, Craik, & Freedman, 2007).

In the past few years, much work has been done in the field of bi/multilingualism by researchers from various fields such as psychology, linguistics, cognitive sciences and neurosciences. In addition to this, Speech language pathologists are also involved in the studies related to bilingual language processing in normals as well as in individuals with communication disorders and are also considering issues related to monolingualism and bilingualism while developing assessment protocols and treatments for various communication disordered population.

Modern research suggests that the bilinguals have no cognitive disadvantages compared to the monolinguals. Further, there are ample number of studies which were carried out subsequently that supported the view that speaking two languages does not tax either the cognitive or the linguistic system; rather bilingualism confers advantages upon adults with respect to various cognitive and linguistic abilities. A major turning point in the history of

relationship between bilingualism and cognition was by a set of studies in which bilingualism exerts systematic effects on cognitive performance. Bilingualism accelerates the development of executive control in children (Bialystok, 2001; Carlson & Meltzoff, 2008) using nonverbal control tasks such as flanker task (Mezzacappa, 2004; Yang, Shih, & Lust, 2005), perceptual analysis (Bialystok & Shapiro, 2005), and rule switching (Bialystok & Martin, 2004) but not tasks based on withholding responses, such as delay of gratification and these effects persists into adulthood (Costa, Hernandez, & Sebastian-Galles, 2008) and appear to protect bilingual older adults against the decline of these processes in older age (Bialystok, Craik, Klein, & Viswanathan, 2004 ; Bialystok, Craik, & Ryan, 2006). Moreover, the cognitive linguistic functions are larger in older age for bilinguals because the normal decline of these processes with aging is attenuated with for bilinguals. Studies have also shown that bilingualism is also associated with decrease in some cognitive linguistic abilities relative to monolinguals. Research over the past several decades effectively dispelled the notion that the effects of bilingualism on cognition and on cognitive development are deleterious.

There are several tools/ tests in English to assess the cognitive linguistic abilities in children e.g., Stanford-Binet test or Stanford-Binet Intelligence scale (Binet & Simon, 1905), Bayley Scales of Infant Development (Bayley, 1969), Griffiths Mental Development Scales (Griffiths, 1954) and The Weschler Intelligence Scale for Children (Weschler, 1949) etc . There are several tools/ tests in English to assess the cognitive linguistic abilities in adults, which include, Cambridge Cognition Examination (CAMCOG) by Roth, Tym, Mountjov, Huppert, Henrie, Verma, and Goddard (1986); American Speech-Language-Hearing Association Functional Assessment of Communication Skills for adults which assesses the functional communication of adults with speech, language and cognitive communicative

disorders (ASHA-FACS) by Frattali, Holland, Thompson, Wohl, and Ferketic (1995); Ross Information Processing Assessment (RIPA-2) by Deborah Ross- Swain (1996); Montreal Cognitive Assessment (MoCA) by Nasreddine, Philips, Bedirian, Charbonneau, Whitehead, Collin, Cummings, and Chertkow (2005) and Addenbrookes Cognitive Examination (ACE) by Mioshi, Dawson, Mitchell, Arnold, and Hodges (2006).

Need for the study

India being a multilingual country, lot of linguistic and ethno cultural issues will arise when we use the Western assessment batteries in our population. Moreover, it will be a challenge to the clinician while assessing a person from diverse ethnic, cultural and linguistic background as most of the tests may fail to give a true representation of population, in their standardization. Race/ethnicity is critical to the external validity of studies in adult neurogenic communication disorders (Ellis, 2009). Various tests have been developed in the course of years to test the cognitive linguistic abilities in adults. Few of them are listed viz; Boston Naming Test (Good glass & Kaplan, 1983), Scales for Cognitive Ability for Traumatic Brain Injury (SCTABI) [Admovich & Henderson, 1992], Western Aphasic Battery (Kertez & Poole, 1983), Cognitive Linguistic Quick Test (CLQT) (Helm Estabrooks, 2001), Measures of Cognitive Linguistic Abilities (MCLA) [Ellmo, Graser, Krchnavek, Calabrese, & Hauck, 1995], Arizona Battery for Communication Disorders of Dementia (ABCD) [Bayles & Tomoeda, 1993], Test of Problem Solving (TOPS-AdolescentVersion) [Bower, Huisingh, Barrett, Orman, & Logiudice, 1994], Peabody Picture Vocabulary Test, 3rd edition (PPVT) [Dunn & Dunn, 1997], Ross Test of Higher Cognitive process (Ross & Ross, 1979), and the Right Hemisphere Language Battery (Bryan, 1989).

Several tests are available in the Western context to assess cognitive linguistic aspects where as the same in Indian context are limited. Limited tests are available to study the pattern of cognitive linguistic performance in monolinguals and bi/multilinguals in Indian languages. Few studies have been done in the Indian context to explore the cognitive linguistic abilities in adults (Kamath & Prema, 2001; Rajsudhakar & Shyamala, 2005; Anuroopa & Shyamala, 2006; Anjana & Jayashree, 2010; Lakshmi & Goswami, 2010; Veena & Goswami, 2010). In Indian scenario, there is a dearth of studies addressing cognitive linguistic performance of monolingual and bilingual adults. The few available studies have not addressed factors like inclusion of both linguistic and nonlinguistic tasks, norms across wide age groups, large sample size, norms or prestandardisation values. Hence the present study was designed to adapt the Cognitive-Linguistic Quick Test (CLQT) by Estabrooks (2001) to Kannada (CLQT-K) and to standardise CLQT-K on Kannada speaking monolingual and bilingual (Kannada-English) adults in the age range of 20-80 years.

Objectives of the study:

- Adaptation of Cognitive Linguistic Quick Test by Estabrooks (2001) to Kannada (CLQT-K) and standardization of CLQT-K on Kannada speaking monolingual and bilingual participants in the age range of 20 to 80 years
- Assessment of cognitive linguistic abilities in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80years using Cognitive-Linguistic Quick Test in Kannada (CLQT-K).

- To see the age related changes in the performance on cognitive linguistic tasks in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80 years.

CHAPTER - II

REVIEW OF LITERATURE

Cognition is a term referring to the mental processes involved in gaining knowledge and comprehension, including thinking, knowing, remembering, judging and problem-solving. These are higher-level functions of the brain and encompass language, imagination, perception and planning. 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). Cognition is important because cognition plays a central role in understanding and changing affect and disorders.

Language is a set of arbitrary verbal symbols arranged in a conventional code that evolved as a social tool to communicate ideas and influence the behavior of others (Mc Laughlin, 2006). Cognitive skills and language abilities are associated. Cognitive development in infants and toddlers is strongly related to increased memory and to the ability to acquire symbols in language and gestures and in many other areas (Gopnick & Meltzoff, 1986). Like human adults, preverbal infants cannot draw on a language to express their memory of past events. So researches must rely on infants' overt nonverbal behavior as an index of their memory. Thought and language are processed by information processing system of the brain. This system includes cognitive processes involving attention, perception, organization, memory, concept formation, problem solving and transfer and management or executive function (Groome, 1999).

Communication can be defined as the sharing of information by means of a symbol system. It is linguistic when words are used and nonlinguistic when other symbol systems, such as mathematical notations are used (Bayles & Tomoeda, 1993). Communication is a manifestation of cognition. The linguistic representations for objects are part of long-term

lexical memory and must be retrieved and brought to consciousness. The simple act of object naming requires perception, access to long term memory, association, recognition, lexical retrieval, decision-making, motor planning, and self-monitoring. Cognition is a general term that refers to both stored knowledge and the processes for making and manipulating knowledge. Cognition is associated with mental content and with an intentional relation between the content and external world status it requires an inner, situational independent environment.

Domains of Cognition

Attention is defined as a multidimensional cognitive process that affects other domains of cognitions, such as learning, memory, problem solving, and perception (Sohlberg & Mateer, 1987). Attention can be divided into several components including focus, sustain, select, alternate, and divide. Directly related to attention, working memory refers to both the temporary storage and active processing of information (Baddeley, 1986).

Memory is defined as the acquisition and storage of information. Executive functions are understood as a set of processes involved in the control and regulation of simple cognitive actions, as well as goal-directed and future-oriented behaviors. It is a multidimensional construct, and can be understood as having four components, namely, volition, planning, purposive action and effective performance (Lezak, 1995; Spreen & Strauss, 1998). These components often involve attention and working memory, cognitive flexibility, decision making, judgment, and behavioral regulation. Language includes the symbolic representation of spoken, written, and non-verbal information and acquisition of auditory, printed or non-verbal messages. Visuo-constructional tasks (e.g. clock drawing) rely in part on linguistic output and comprehension as well as praxis, memory and visuo-motor co-ordination. Adequate performance also depends on reasonably intact attention.

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 is so important to human cognition because it places limits on what we think about at the same time that it also determine our thoughts, words, beliefs, and deeds at any given time (Groeger, 2000). The main components of attention are arousal, vigilance or sustained attention, and selective attention.

Attention can be of two types, viz., selective attention and sustained attention. Selective attention refers to leaving out irrelevant stimuli whereas sustained attention also refers to concentration of a particular stimulus without getting distracted. It refers to the capacity to maintain at tonic state of arousal and to be ready to receive information. Sustained attention does not change with age, but selective attention does (Maxim, 1999). Hochandel and Kaplan (1984) reported that deficit in sustained attention as well as selective attention accompanies normal aging. Isella, Mapelli, Morielli, Pelati, Franceschi and Appollonio (2008) reported a possible decrease in the ability to maintain sustained attention during complex and prolonged tasks as a known deficit underlying impaired decision making in normal aging.

Shiffrin and Schneider (1977) proposed two distinct and separate types of attention and cognitive processing, "Automatic and Controlled." Simple mathematics, word retrieval etc comes under automatic where as tasks, which are, novel effortful or strategic comes under controlled processing. Mirsky, Anthony, Duncan, Ahern, and Kellam (1991) demonstrated separate components of attention of normal adults and children.

Research has shown that elderly have more difficulty than younger people in allocating attention to the target task. This is true for both, auditory and the visual modality (Harley, 1992). Immediate and sustained auditory attention also affects oral word association tasks (Ruff**,** Light, Parker**,** & Levin, 1997). Impaired attention may lead to subject's missing information in spoken discourse or in written material, which may have an impact on their responses and cause communication breakdown (Boyle, & Strikowsky-Harvey, 1999).

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, Caruso, Languirand, & Berard, 1980). Responses to commands and matching task have also been employed for assessing attention in the clinical utility of Dementia Rating Scale for assessing Alzheimer's patients (Vitaliano, Breen, Russo, Albert, Vltlello, & Prinz, 1984). Effects of age (young versus elderly) and attention (full attention versus attention-demanding task) on true and false recognition of semantic and perceptual lures revealed that the elderly recognized fewer targets than younger adults, and that they falsely recognized more lures (Taconnat & Isingrini, 2008). Attention-demanding task only increased the false recognition of perceptual lures in the elderly adults (Taconnat & Isingrini, 2008).

Learning the structure of a sequence of target locations when target location is not the response dimension and the sequence of target locations is uncorrelated with the sequence of responses is called pure perceptual-based sequence learning. Remillard (2003) used this paradigm to determine whether orienting of visuospatial attention is an important component of the learning process. Experiments on this revealed that the presence of an attention-capturing distracter impaired learning, whereas the presence of a

distracter that was expected not to capture attention did not impair learning (Remillard & Gilbert, 2009).

To summarize, attention is very important for performance of cognitive-linguistic tasks involving auditory, visual and written modalities. Impaired attention may affect subjects performance on oral word association tasks, spoken discourse, written tasks and tasks involving discrimination and perception abilities, all of which ultimately leads to communication breakdown. This is particularly so in case of elderly population.

Memory

Memory is needed for encoding data into memory store, and for retaining language in the short term and long-term memory. Research on age-related changes in memory and language reveals a consistent pattern of spared and impaired abilities in normal old age. Relatively preserved in old age is memory performance involving highly practiced skills and familiar information. Relatively impaired in old age is memory performance that requires the formation of new connections. This may include the recollection of new experience and facts. This impairment in new learning in account with old learning brings the distinction between semantic memory, episodic memory, explicit memory, and implicit memory.

In terms of verbal memory, familiar verbal information is not completely preserved in old age and various aspects of language production, namely word finding and spelling, exhibit significant age-related declines. Critical and abstract thinking skills declined as age increases and the total number of words produced on both oral and written language tasks decreased with increasing age. The information which is held back will move to long term memory. Nilsson (2003) compared the effects of aging on episodic memory, semantic memory; short term memory and priming and reported that episodic memory is primarily

impaired in normal aging. Johnson (2002) attributed this deficit to the impairment seen in their ability to refresh recently processed information. Moreover, Johnson, Hashtroudi, and Lindsay (1993) that even when the older adults were equated in memory for a particular item or fact, they were likely to be worse at remembering the source of the information. Mitchell (2000) attributed this deficit to decline in the ability to bind information together in memory.

Executive aspects of working memory such as inhibition typically decline in normal aging as reported by Treitz, Heyder and Daumand (2007). Backward recall of automatic word sequences involves declarative and working memory abilities found to be impaired in the early stages of cognitive decline (Osterberg, Fernaeus, Bogdanovic, & Wahlund, 2008). It was believed that age related decline in episodic memory is inversely related to years of education. This notion was a poorly supported, in a study by Nyberg (1996) where he controlled the education.

A lot more of research done on memory and aging come up with the result where older adults perform less well at particular memory task. But there are studies which detail a different opinion like older adults use different strategies compared to younger adults. This was well supported by the neuro imaging study by Cabeza (2002), who revealed that older adults are more likely to use both hemispheres compared to younger adults in memory task, and hence a better performance in memory tasks.

Information in long-term memory can be considered either episodic or semantic (Tulving, 1972). Episodic memory encompasses representations of events that have been experienced by an individual and are tagged with respect to time and place of occurrence. Episodic memory shows an age related decrement. Age difference is reported to be minimal in primary memory (i.e., immediate recollection) (Craik, 1977). Young adults

recall more item than older adults, from the long-term memory, which has more permanent representation of item (Hultsch & Dixon, 1984). The magnitude of the deficit could be reduced with the help of cues (Laurence, 1967). A characteristic feature of the aging process is a decline in episodic memory.

It is assumed that parietal lobe contribute to episodic memory retrieval **(**Wagner**,** Shannon**,** Kahn**,** & Buckner, 2005).Women tend to outperform men on episodic memory tasks (Deisseroth, Singla, Toda, Monje, Palmer, & Malenka, 2004). The scene constructions require episodic memory (Hassabis, Kumaran, & Maguire, 2007). Evidence suggests age-related deficits in explicit memory and learning (Salthouse, McGuthry, & Hambrick, 1999; Salthouse 2001; Salthouse, & Ferrer-Caja, 2003). The parietal lobe appears to have a critical role in recollection aspects of episodic memory (Berryhill, Phuong, Picasso, Cabeza, & Olson, 2007)

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) (Admovich & Henderson, 1992), Western Aphasia Battery (Kertesz & Poole, 1983), Ross Information Processing Assessment (RIPA) (Ross-Swain, 1996) and other tests for Alzheimer's disease and Parkinson's disease.

Semantic memory refers to the store of knowledge about one's language, words, their meaning and interrelationship, and the rules necessary for their use. Semantic memory is well preserved in aging. Although older adults are slower than younger adults in making lexical decisions, there is typically no age difference in the ability to identify words and non-words (Bowles & Poon, 1982, 1988; Howard, 1983). Organization of semantic memory also appear to be unaffected by age. There is no age related difference

in the first response given on word association test (Howard, 1980; Bowles, Williams, & Poons, 1983; Bruke & Peters, 1986).

Baddleys and Hitch's (1974) proposed theory of working memory (WM), a set of mechanisms for retaining and manipulating limited amounts of information to use in ongoing cognitive tasks. Morey & Cowan (2005) proposed that the verbal retrieval interfered with visual memory maintenance than verbal maintenance of the memory. When the number of distracters increases the recognition of spoken words suffers in the presence of simultaneous speech from spatially distributed sources (Drullman & Bronkhorst, 2000; Lee, 2001). The relatively poor spatial resolution of the auditory system and its susceptibility to masking contribute to difficulty. When sequences of stimuli are presented in each spatial channel, memory for auditory information in multiple channels is better (Moray, Bates, & Barnett, 1965; Darwin et al., 1972)

Reduced speed of information processing is characteristic among older readers. Speed of information processing serves as an indicator for reduced processing capacity associated with aging. Researchers infer that self-paced reading time or reading duration is the behavioral manifestation of active cognitive processing (Frederiksen, Bracewell, Breuleux, & Renaud, 1990). The extent in which the language and aging focuses is almost on diminished abilities, without the consideration of preserved abilities and the ways that enhance those abilities (Kemper, 1992). There is a lack of evidence demonstrating that task switching actually places additional demands on working memory. Experiments demonstrate that recall performance decreased as a function of the number of task switches. These indicate that task switching induces a cost on working memory function (Baptist, Pierre, Andre, & Valerie, 2008).

The time-based resource-sharing model of working memory assumes that memory traces suffer from a time-related decay when attention is occupied by concurrent activities. Barrouillet, Bernardin, Portrat, Vergauwe, and Camos (2007) stated that any increase in time of the processing component of these tasks results in lower recall performance. Oberauer and Kliegl (2006) indicated that increased processing times are accompanied by a corollary decrease of the remaining time on which we refresh the memory traces. Barrouillet et al., (2007) said that the time available to repair memory traces would be compatible with an interference account of forgetting. Even if time to refresh memory traces is kept constant, increasing the processing time still results in poorer recall, confirming that time-related decay is the source of forgetting within working memory (Portrat, Barrouillet, & Camos, 2008).

Age related changes are observed in working memory; elderly subjects do worse than young subjects (Craik & Robinowitz, 1984). An age-related decline in working memory capacity measured in chunks appears to account for deficits in memory for spoken language (Hussain, Guez, & Bar-On, 2003). Miller (1956) emphasized that more items could be recalled when they were organized into super ordinate groups on the basis of pre-existing knowledge or associations, a process he called chunking. The number of chunks that can be maintained in working memory declines with age (Naveh-Benjamin et al., 2007). Young adults recalled considerably more chunks than older adults recall, and recalled somewhat larger chunks (Naveh-Benjamin, Cowan, Kilb, & Chen, 2007). The age-related decline is seen in chunk formation, in the chunk size (Naveh-Benjamin et al., 2007). This may be related to binding deficits found to occur with age. The recognition for a particular feature parallels recognition performance in young adults (Guez & Shulman, 2004). Age differences in binding are often greatest for novel associations. As meaningfulness increases between items through repeated pairing or greater semantic

associations, age differences in binding typically decline (Hay & Jacoby, 1999; Naveh-Benjamin et al., 2007).

Older adults encounter deficits in binding of multiple features of objects during short-term encoding (Raye, Mather, & D'Esposito, 2000). This is also noted when two objects must be associated into a single unit in long-term memory (Guez, Kilb, & Reedy, 2004; Bastin & Van der Linden, 2006). The long-term memory for component objects or features is relatively unaffected by aging, the ability to form or retrieve associations between features or objects significantly declines with age in adulthood (Chung & Healy, 2004).

To sum it up, memory is required for language learning and retention and is influenced by factors like automaticity of the task, education etc. Generally, memory functions are impaired for language functions that are new and unimpaired for highly automatic tasks. Episodic memory which mainly involves autobiographical events also shows an age related decrement.

Executive function

Executive functions are brain based cognitive skills that facilitate cognitive thinking and self regulation, which calls upon the prefrontal cortex of our brains to help with goal setting and decision making. Executive functions include a set of related skills that prioritize, regulate and orchestrate an individual's thoughts and behaviours. Currently it is quite clear that this decline is related to neuroanatomical, biochemical and electrophysiological changes, more specifically in the frontal lobe, and particularly in its most anterior portion, the prefrontal cortex. Cognitive skills, called executive functions, depend on the integrity of this region (Haug & Eggers, 1991; Parkin, 1993; Cowell, Turetsky, Gur, Grossman, Shtasel, & Gur, 1994; West, 2000; Raz et al., 1997; 2005).

Executive functions are understood as a set of processes involved in the control and regulation of simple cognitive actions, as well as goal-directed and future-oriented behaviors. It is a multidimensional construct, and can be understood as having four components, namely, volition, planning, purposive action and effective performance (Lezak, 1995; Spreen & Strauss, 1998). These components often involve attention and working memory, cognitive flexibility, decision making, judgment, and behavioral regulation. Many studies have shown a major impairment in these cognitive functions commonly found in the elderly (Lindenberger & Baltes, 1997; Smith & Baltes, 1997; Mungas, Reed, & Kramer, 2003; Carey et. al, 2008). Several research studies have investigated the components of these executive processes in the elderly and have found major impairments regarding memory (Spencer & Raz, 1994), learning ability, and cognitive flexibility (Finuncane et al., 2002; Wecker, Kramer, Hallam, & Delis, 2005; Yang, Krampe, & Baltes, 2006). In addition, deficits in judgment ability and decision making have been equally found in this population, showing more disadvantageous choices in the elderly when compared with young individuals (Deakin, Aitken, Robbins, & Sahakian, 2004; Denburg, Tranel, & Bechara, 2005; Fein, McGillivray, & Finn, 2007).

A Brazilian study evaluated memory, attention and verbal fluency in healthy elderly individuals aged 80 years and older (mean schooling of 2.5 years) at two distinct times with a 3-year interval. The sample performance in these tests was discussed, considering the participants' educational level. There was higher preservation of cognitive functions in the elderly who had higher educational level. A similar investigation evaluated individuals older than 80 years with low educational level from different Brazilian regions as to their verbal memory (immediate and late recall), working memory, attention and verbal fluency skills. The findings showed worse performance in working memory, attention and verbal fluency when compared with more educated populations. The results

mentioned above corroborate previous studies showing a protective factor of schooling throughout time in certain cognitive functions.

Thus, in addition to the age factor, which has been properly documented in the literature as associated with changes in cognitive performance, there is evidence that more years of study are associated with slower cognitive decline (Ardila, Feggy, Monica, & Cesar, 2000; Moering, Schinka, Mortimer, & Graves, 2004; Van der Elst, Van Boxtel, Van Breukelen, & Jolles, 2006; Lin, Chan, Zheng, Yang, & Wang, 2007). Although the influence of education on cognitive performance has been reported in several studies, significant misunderstanding exists with regard to this relation (Ardila, Solis, Rosselli, & Gomes, 2000).

In general, executive functions involve attention, working memory, cognitive flexibility, judgment and decision making which are very important factors for language related functions. Most of these functions show age related changes and may be differently affected in monolinguals, bi/multilinguals. Difference in performance in executive functions may also be attributed to educational variables.

Language

Understanding language is an important aspect of day to day functioning in adulthood. Understanding of written and spoken language relies on the ability to correctly process word and phrase meanings, sentence grammar, and discourse or text structure. Difficulties in any of these domains can produce comprehension problems. Elderly people have greater difficulty understanding sentences that are complex either in grammatical form or in terms of the sentence 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 understand (Jaccoby and Hay, 1998). 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 in their processing of 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, Hamm & Hasher, 1992).

Research by Connelly, Hasher, and Zack (1991) compared passage reading times and answers to probe comprehension questions for young and older adults for texts that did or did not have distracting material interspersed with target texts. The distracters, presented in a different type face, consisted of words or phrases conceptually related to the content of the target text and recurred over and over again throughout the target text. Connelly et al., (1991) reported that young adults not only read the texts containing the distracting material more rapidly than older adults but they also showed greater comprehension of the target material.

Age-related memory declines have been reported in many studies comparing younger and older adults on language comprehension tasks. Therefore, it is believed memory capacity limitations in older adults may cause language comprehension problems (Wingfield & Stine-Morrow, 2000). Stine-Morrow, Loveless, and Seidenberg (1996) found that young and older adults allocate reading time in similar ways to word-level and phrase-level processing. They found that young adults spent extra time in reading words that occurred at sentence boundaries, minor clause boundaries, and major clause boundaries. While older adults also allocated extra time to major and minor clause boundaries, they did not spend extra time at sentence boundaries, suggesting older adults spend less time on

sentence-level integration than young adults (Stine-Morrow, Loveless, & Soederberg, 1996).

Older adults report that one of their most annoying cognitive problems is the inability to produce a well-known word (Burke & Shafto, 2004). Although people of all ages encounters such word-finding failures, this type of error becomes more frequent with age, and has been reported as the cognitive problem most affected by aging (Burke & Shafto, 2004). Word knowledge has not been found to decline with increasing age (Bayles, Tomoeda & Boone, 1985; Salthouse, 1988).

Lexical access, confrontational naming, and word fluency tasks have been found to decline as age increases from middle age to young-old to old-old (Bowles & Poon, 1985; LeBarge, Edwards & Knesevich, 1986; Bayles & Kaszniak, 1987). For single word processing task, the normal healthy adults has retained memory store for vocabulary and the semantic association between words, but word retrieval is slower and more difficult for single words. Hence, elderly benefit more when asked to retrieve single words for a particular context. Less information is there about the ability to process the sentence, and large unit of text. The elderly perform less well on lengthy and complex sentence in correction and repetition task (Tun & Wingfield, 1993; Wingfield, 1999). Sensory declines may have some impact on decoding orthography of isolated words in text, but semantic processing remains intact for normal aging (Wingfield & Stine –Marrow, 2000)

A number of studies have shown that older adults make more errors in naming pictures than young adults do (Feyereisen, 1997). During discourse, which is a more natural form of speech than picture naming, older adults produce more ambiguous references and more filled pauses (e.g., saying “um” or “er”) and reformulate their words more than young adults do (Kemper, 1992; Schmitter-Edgecombe, Vesneski, & Jones,

2000). These dysfluencies suggest that they have difficulty retrieving the appropriate words when speaking. Older adults were more likely than young adults to omit sounds (e.g., saying "rip," given "ribbed") (MacKay & James, 2004). These omissions suggest they had difficulty retrieving the phonology (i.e., the sounds) of words. In contrast to this, young adults had multiple sounds available.

Any conclusion about the age related effect on picture naming must consider the between-study variability. Large within study variability observed among older subjects (VanGorp, Satz, Kiersch, & Henry, 1986) should also be taken into account. According to Albert, Duffy and Naeser (1987) age related decline in picture naming abilities can be attributed to nonlinear modifications in cognitive function related to selective changes in the brain evolved at differential rates across the life span.

Vijaykumar and Prema (2007) studied 60 normal healthy adults in the age range of 30 years to 80+ years to examine the cognitive linguistic flexibility across different age groups. Results indicated that there is no significant deterioration in cognitive linguistic flexibility as age advances. They also studied the relationship between aging and reaction time for picture naming which indicated that as age advances time taken for retrieving a word also increases.

Studies regarding the spontaneous production of older adults, suggests that they may be impaired in full sentence formulation (Davidson, Ferreira & Zacks, 2003). Kemper (1992) suggested that older adults might produce sentences that are less syntactically complex than those of younger adults. Kemper (1992) reported that older adults produce fewer syntactically complex sentences in a number of language production tasks (e.g., sentence repetition, spontaneous speech, and written production) and make more errors or are more dysfluent when they do attempt to produce them (Kynette &

Kemper, 1986; Kemper, 1986, 1988). Kemper (1992) linked these patterns to deficits in working memory.

Kemper, Thompson, and Marquis (2001) showed a decline in the production of grammatically complex constructions from speech samples. The grammatical assembly processes do not decline to the same extent as other aspects of grammatical processing (Salthouse, 1996). This suggests that some aspects of language use, during grammatical encoding, resist the decline typically observed with age (Tun & Wingfield, 1993; Wingfield, 1999). Kemper, Kynette, Rash, O'Brien, and Sprott (1989) found that forward and backward digit span was positively correlated with the number of left-branching constructions in oral or written production among a group of older adults. .

Older adults experience more Tip of the Tongue (TOT) s than do young adults (Burke, MacKay, Worthley, & Wade, 1991; Heine, Ober, & Shenaut, 1999). This is evident especially when answering low frequency questions (Burke & Shafto, 2004). Compared with young adults, they report less partial phonological information (Maylor, 1990). MacKay and Abrams (1998) demonstrated an age-related decline in the ability to spell words correctly. Older adults made more errors than younger adults did, and more errors were made for low- than high-frequency words. Low-frequency words are particularly vulnerable to retrieval failures in old age. MacKay and Abrams (1998) found that most spelling errors involved irregularly spelled components of words, and the age decline in performance was greater for irregular than regular components. Several researchers have reported that older adults are less efficient at using selective attention (Houx, Jolles, & Vreeling, 1993; Li & Bosman, 1996; Spieler, Balota, & Faust, 1996; Kieley & Hartley, 1997; Verhaeghen & de Meersman, 1998).

To summarize, all of this evidence suggests that elderly speakers are likely to have more difficulty producing sentences than younger speakers. Research thus reveals an intact language competence and minimally impaired language performance for older adults, both in understanding and language production.

In naming tasks, older adults are less accurate at naming objects and actions (Nicholas, Brath, Obler, Au, & Albert, 1997). In picture or scene description tasks, older adults take longer pauses while retrieving names and use more indefinite terms, suggesting retrieval difficulty (Cooper, 1990). Studies on age deficits in lexical selection and retrieval suggest that older adults are impaired in full sentence formulation (Bock & Levelt, 1994).

Confrontation naming test typically consists of the presentation of pictured objects that subjects are asked to name. The picture stimulus is thought to directly activate its semantic representation, then to indirectly activate the word name at lexical level (Carr, McCauley, Sperber, & Parmelee, 1982). Borod, Goodglass, and Kaplan (1980) found that subjects over 70 years of age named significantly fewer items than younger subjects in Boston naming test. Nicholas, Obler, Albert, and Goodglass (1985) reported similar results for the naming of action pictures. They also found that older subjects more often required phonological cues (the initial sound of target name) to elicit a correct response than did younger subjects. In the absence any phonological information, older subjects had more difficulty in spontaneously retrieving the target word than did younger subjects. When partial phonological information was provided, elderly subjects were just as likely as younger subjects to correctly retrieve the target word.

To summarize, literature suggests that naming ability decline with advancing age. One of the commonly noticed complaints in elderly is the increased difficulty of finding

words in day to day situations. While word recognition is maintained or even increased with age, the ability to access vocabulary appears to decrease with increasing age. Furthermore, some evidences suggest that object naming, naming latency, and word fluency declines with age. In contrast to lowered performance on word generation task, elderly adult speakers demonstrated higher performance in the conversational speech as measured than did younger speakers. Older adults may display a more varied vocabulary in conversation than they demonstrated on more artificial naming tasks. Elderly individuals show a language decline, but not a necessary decline in functional communication.

Discourse represent that level of communicative function where the interaction between linguistic and cognitive abilities is most clearly manifested, and even were the complexity of language is quiet high. Referencing is an important component of discourse process. Usually in normal discourse, reference is used to specify the thing and people that we are talking about. It can be both nominal and even pronoun. The elderly adults are admired and recognized for their story telling skills (Obler, 1980). The stories are rich of content, more elaborative, and characterized with repetition and artful chunking. Sandson, Obler, and Albert (1987) conclude that older subject uses more word per content than younger subject, on the administration of pictured description of story (the cookie theft picture from Boston diagnostic aphasic examination (Good glass & Kaplan, 1983). Elderly subjects produce reduced range of complex sentences and generate significantly more right branching sentences than younger subjects (Kynette & Kemper, 1986). The discourse of older adults is impaired and they shows a shorten response for the prose recall task, and this shortening is related to their poor recall of specific item (Cohen, 1978; Obler, 1980). The elderly adults discourse differs qualitatively from that of younger ones.

Although the discourse content changes with age, the ability to communicate does not change.

It must also be pointed out that deterioration in learning is common in old age, and this factor affect the individual's day to day ability to understand. Some evidences suggest that object naming, naming latency, and word fluency declines with age. This deterioration is more obvious in the presence of conditions like dementia or cerebrovascular accidents, which can have significant and serious consequences on cognitive-linguistic functions. However, in the absence of any such conditions, older adults perform more or less similar to younger adults, particularly on language comprehension tasks. Literature also indicates that that vocabulary and other kinds of cognitive-linguistic functions can increase throughout the life span of an individual.

To summarize, elderly people have difficulty understanding sentences that are complex in grammatical form or sentence structure. It is also reported in literature that memory capacity limitations in older adults may be the reason for language comprehension problems. Lexical access, confrontation naming and word fluency tasks are also differently affected with aging.

Visuospatial skills

Visuo-constructional tasks (e.g. clock drawing) rely in part on linguistic output and comprehension, as well as praxis, memory and visuo-motor co-ordination. Adequate performance also depends on reasonably intact attention. Effect of frontal system damage can affect performance. Typical tasks for visuo-constructional abilities include asking patients to copy a pattern of blocks arranged by the examiner, or the copying of geometric drawings. Glosser, Gallo, Clark, & Grossman (2002) documented reading problems associated with visual processing deficits.

Monolingualism and bi/multilingualism and cognition

Bilingualism is defined as the regular use of two languages, which has equal consequences for both language and cognitive performance. There are disadvantages as well as advantages for bilinguals within and beyond the language domain. Bilinguals typically show lower levels of performance than monolinguals in simple, highly constrained verbal tasks (Luo, Luk, & Bialystok, 2010).

Delays in the vocabulary development of bilingual children have been reported in standardized receptive and expressive vocabulary tests (Oller, Pearson, & Cobo-Lewis, 2007; Bialystok & Feng, 2009). Some studies have found that vocabulary deficits persist into at least early adulthood (Portocarrero, Burright, & Donovick, 2007), whereas other studies have reported equivalent vocabulary scores in young and older bilingual adults relative to their monolingual counterparts (Bialystok, Craik, Klein, & Viswanathan, 2004).

Bilinguals also show poorer performance in tasks that require lexical access, such as picture naming tasks. Gollan,Montoya, Fennema-Notestine, and Morris (2005) reported that bilinguals named pictures more slowly than monolinguals, even though the naming task was done in their dominant language in adults. Ivanova and Costa (2008) replicated the finding with bilinguals who named pictures in their dominant and first language. They showed that the slower lexical access persisted in bilinguals, even when their performance was as accurate as monolinguals (Gollan, Bonanni, & Montoya, 2005). Therefore, slower word retrieval seems to be specific to bilingualism and is independent of factors mediating language proficiency for bilinguals such as order of acquisition and language dominance (Ivanova & Costa, 2008).

Studies have reported bilingual advantages in a variety of nonverbal cognitive tasks of executive functioning (Bialystok, 2005, 2007). These tasks typically involve the need to

resolve conflict (Bialystok et al., 2004; Carlson & Meltzoff, 2008; Costa, Hernandez, & Sebastián-Gallés, 2008), to suppress distracting information (Bialystok, Craik, & Ruocco, 2006; Colzato et al., 2008), or to switch between multiple rules (Bialystok & Martin, 2004; Bialystok & Viswanathan, 2004). Such effects are especially strong in children and older adults (Bialystok & Martin, 2004; Bialystok et al.,2004) and are smaller but still reliable in younger adults (Costa, Hernandez, Sebastiangalles, 2008).

Bilingual disadvantages are found in verbal tasks based on lexical access but bilingual advantages have been observed in nonverbal tasks requiring executive control. Studies on verbal memory performance in bilinguals revealed that they recalled fewer words from both semantic knowledge (Gollan, Montoya, & Werner, 2002) and newly acquired information (Fernandes, Craik, Bialystok, & Kreuger, 2007) in free recall and in a proactive interference (PI) paradigm (Bialystok & Feng, 2009). Fernandes, Craik, Bialystok, and Krenger (2007) reported that the group difference between monolinguals and bilinguals in recall was eliminated after controlling for vocabulary difference.

Bialystok and Feng (2009) also found that bilinguals recalled more words in a release from PI paradigm when their lower vocabulary performance was taken into account. In addition, bilinguals who achieved vocabulary scores equivalent to monolinguals also showed comparable levels of performance in category fluency (Bialystok, Craik, & Luk, 2008), a task in which it shows a bilingual disadvantage (Gollan, Montoya, & Werner, 2002). Therefore there is evidence of role for vocabulary knowledge in monolingual and bilingual performance on tasks of lexical access. Wodniecka, Craik, and Bialystok (2007) analyzed verbal memory performance in younger and older monolinguals and bilinguals and found that bilinguals outperformed monolinguals in recollection but groups performed comparably on familiarity, especially for the older participants.

To summarize, bilingual disadvantage in verbal tasks depends on language proficiency, vocabulary size, and level of executive control involved in the task. Bilingual disadvantages may disappear if monolinguals and bilinguals are matched on a measure of language proficiency such as vocabulary knowledge.

Verbal fluency test is a widely used word retrieval task that includes the roles of executive control and language representation. Verbal fluency tasks typically have two conditions, phonemic (or letter) fluency and semantic (or category) fluency (e.g., the Controlled Oral Word Association Test, COWAT, Strauss, Sherman, & Spreen, 2006). There are two conditions that place different cognitive demands on word retrieval. Both conditions rely on vocabulary knowledge and executive control. Generating words in the category condition is similar to accessing a lexical item in interconnecting networks. In case of word production, a word is first selected on the basis of its semantic features; the semantic level is activated before the phonological level which leads to the oral production of the word (Levelt, 1999). Therefore, retrieving words based on their semantic categories is an overlearned process of language production. As a result, performance in category fluency is largely automatic and relies on linguistic representation. The demands of the letter fluency are that one needs to generate words from a phonemic category instead of from a semantic category. And this is more effortful because phonemic generation is not a common strategy in word retrieval (Strauss, Sherman, & Spreen, 2006). Delis, Kaplan, and Kramer (2001) reported that in verbal fluency test the difference between category and letter conditions is the increased demands for executive control in letter fluency.

Neuroimaging studies reported that performance in letter fluency tasks is associated with frontal areas, specifically the posterior opercular area of Broca's area (Paulesu et al., 1997), which is also cognitive task free of language production (Yeung, Nystrom, Aronson, & Cohen, 2006). A recent study stated that high-proficiency bilinguals

showed dissociating functional and structural correlates in letter and category fluency tasks (Grogan, Green, Ali, Crinion, & Price, 2009). Grey matter density in pre-supplementary motor area and left caudate, along with higher activation in these areas, was related to letter fluency relative to semantic fluency performance whereas greater activation and higher grey matter density in left inferior temporal cortex was related to semantic fluency relative to letter fluency performance. Clinical studies have shown that impaired performance in letter fluency is seen in patients with frontal lesions and executive dysfunctions, whereas impaired performance in category fluency is observed in patients with deficient semantic knowledge structures, such as patients with Alzheimer's disease (AD; Martin, Wiggs, Lalonde, & Mack, 1994; Rascovsky, Salmon, Hansen, Thal, & Galasko, 2007). Perret (1974) reported the poor performance in letter fluency by patients with left frontal lesions is because even though they fails in verbal production associated with left frontal areas, they also fail to inhibit the semantic word generation strategy.

Compared to monolinguals, bilinguals name fewer pictures on standardized tests such as the Boston Naming Test (Roberts, Garcia, Desrochers, and Hernandez, 2002; Gollan, Fennema-Notestine, Montoya & Jernigan, 2007), name pictures more slowly (Gollan, Montoya, Fennema-Notestine & Morris, 2005), experience more tip-of-the-tongue (TOT) retrieval failures (Gollan & Silverberg, 2001) and have reduced verbal fluency (Gollan, Montoya, & Werner, 2002). Bilinguals are less fluent than monolinguals, even when tested exclusively in their dominant (Gollan & Acenas, 2004, Gollan, Bonanni & Montoya, 2005) and first-learned language (Ransdell & Fischler, 1987; Ivanova & Costa, 2008).

Bilinguals may demonstrate a disadvantage in verbal fluency for two reasons: (1) smaller vocabulary in bilinguals (Bialystok & Feng, in press; Portocarreroet, Burright, & Donovick, 2007) may lead to fewer items that they are able to generate relative to

monolinguals; (2) slower lexical retrieval (Gollan et al., 2005; Ivanova & Costa, 2008) may cause bilinguals to produce fewer words than monolinguals in the given time, possibly because of weaker links pointing to each target lexical item. Category fluency performance depends on the linguistic representation and therefore bilinguals often perform more poorly in this task (Gollan et al., 2005; Rosselli et al., 2002). Impact on language proficiency in bilinguals shows that bilingual children develop vocabulary more slowly in each language than monolingual speakers of that language and perform more poorly on measures of language proficiency (Oller & Eilers, 2002) and bilingual adults have a smaller vocabulary (Portocarrero, Burright, & Donovick, 2007), produce fewer words in verbal fluency tasks (Gollan & Kroll, 2001; Michael & Gollan, 2005) with more tip -of -the tongue experiences (Gollan & Acenas, 2004) and record longer reaction times on picture naming (Roberts, Garcia, Desrochers, & Hernandez, 2002), and lexical decision tasks (Randsell & Fischler, 1987).

Researchers have shown that bilinguals have cognitive advantages compared to monolingual speakers on a variety of verbal and non-verbal tasks, involving the resolution of conflicting information and the inhibition of irrelevant information (Hamers & Blanc, 1989; Cook, 1997, Bialystok, 2005) including disadvantages such as smaller vocabulary size, higher number of TOTs, slower picture naming reaction times (Rivera et al , 2008). Bilinguals outperform monolinguals on tasks taxing cognitive control functions, such as the Simon task (Bialystok, Craik, Klein, & Viswanathan , 2004) and the attention network task (ANT) (Costa, Hernández, & Sebastián-Gálles, 2008). Greater advantage for cognitive control of information processing and attention, and more effective use of cognitive functions was reported for Simon task and attention network task (Bialystok, 1988; Bialystok, 2005; & Bialystok et al, 2005). Superior inhibitory control has developed as a result of bilingual experience (Green, 1998; Bialystok, 2001; & Bialystok & Martin,

2004). Recent research have found out better development of executive function in bilingual children (around the age of 3 years) as compared to monolinguals (at approximately 4-5 years of age) (Bialystok, 1999; Zelazo et al , 2003; Diamond, Carlson, & Beck, 2005). Eventhough there are differences in cognitive linguistic functions when compared with monolinguals and bililinguals, it is also important to point out the changes in cognitive domains due to aging.

In summary, bilinguals show poorer performance than monolinguals in simple highly constrained verbal tasks. One noticeable aspect throughout literature is that there is a differential performance across tasks with bilinguals performing poorer on verbal tasks compared to nonverbal tasks. On the contrary, monolinguals showed a better performance on verbal tasks compared to nonverbal tasks. Among verbal tasks like confrontation naming and generative naming, bilinguals showed a better performance on generative naming task compared to confrontation naming task and the opposite effect was seen in monolinguals. This may be attributed to more involvement of executive functions in tasks involving generative naming and hence better performance of bilinguals.

Aging and Cognition

Aging process is characterized by several psychological and biological changes; predominantly changes are seen in cognitive functioning (Baldelli, Salvioli, Neri, & Pradelli, 1996; Lindenberger & Baltes, 1997; Mungas, Reed, & Kramer, 2003). Number of studies state that cognitive impairment seems to be a universal phenomenon in the elderly. Cognitive decline is related to neuroanatomical, biochemical and electrophysiological changes, more specifically in the frontal lobe, and particularly in its most anterior portion, the prefrontal cortex. Cognitive skills, called executive functions, depend on the integrity

of this region (Haug & Eggers, 1991; Parkin, 1993; Cowell et al., 1994; West, 1996, 2000; Raz et al., 1997, 2005).

Age effects on various vocabulary measures (decreasing performance with increasing age) have been reported for middle- and older-aged individuals although some researchers report finding such effects only in persons older than 70 (Nicholas, Obler, Albert, & Goodglass, 1985) or 75 years (Welch, Doneau, Johnson, & King, 1996). The positive effects of years of schooling on performance on these tasks are generally more robust (Borod, Goodglass, & Kaplan, 1980; Nicholas, Brookshire, Maclennan, Schumacher, & Porrazzo, 1989; Worrall, Yiu, Hickson, & Barnett, 1995; Ross, Lichtenberg, & Christensen, 1995; Ivnik, Malec, Smith, Tangalos, & Petersen, 1996; Tombaugh & Hubley, 1997; Saxton et al., 2000; Piguet, Miller, Bennett, Lye, Creasey, & Broe, 2001). As people age, language-processing ability changes and it is not unusual to observe older adults misinterpreting information they hear in discourse, either in story narratives or conversation (Cohen, 1979; Murphy, Daneman, & Schneider, 2006). Many studies have shown that discourse comprehension ability declines with increasing age (Cohen, 1979, 1981; Cohen & Faulkner, 1981; Kemper, 1987; Stine & Wingfield, 1990; MacKenzie, 2000; Radvansky, Copeland, & Zwaan, 2003).

Several factors that have been found to affect auditory discourse processing in older adults are: semantic density of propositions and presentation rate of discourse stimuli (Stine, Wingfield, & Poon, 1986), modality of presentation, e.g., auditory vs audiovisual (Stine, Wingfield, & Myers, 1990), inferential processing (Ulatowska, Hayashi, Cannito, & Fleming, 1986; Zacks, Hasher, Doren, Hamm, & Attig, 1987) and level of education (MacKenzie, 2000). Experimental studies have shown that the ability to process syntactically complex sentences in isolation decreases in older adults (Kemper, 1986; Davis & Ball, 1989; Obler, Fein, Nicholas, & Albert, 1991; Christianson, Williams Zacks,

& Ferreira, 2006; & Edwards & Salis, 2008). Differences in sentence-processing ability between simple and complex structures in older adults have been attributed to working memory (WM) limitations (Kemper & Kliegl, 1999; Waters & Caplan, 2005). Changes in the ability to retain and recall information from discourse in older adults may be due to WM limitations (Cohen, 1981; Light & Anderson, 1985).

Normally ageing adults often demonstrate reduced ability to complete cognitive tasks in distraction as compared to younger individuals (Hasher, Tonev, Lustig, & Zacks, 2001). Evidences are there for both attention and working memory skills which are affected by the ageing process (Park, 2000); both are also thought to be affected by auditory distraction in ageing (Persad, Abelas, Zacks, & Denburg, 2002). Age related declines in cognitive function are often attributed to reduced executive functioning; these behavioural observations have been supported by imaging studies (Reuter-Lorenz, 2002). A potentially more sensitive measure of word retrieval than accuracy is the latency of naming response.

Older participants take longer to name pictures than younger participants (Feyereisen, Demaeght, & Samson, 1998), but that this age effect also often interacts with stimulus characteristics such as the familiarity or age of acquisition of the target (Morrison, Hirsh, Chappell, & Ellis, 2002; Poon & Fozard, 1978). In comparison of young, young-elderly, and old-elderly groups, Coppens and Frisinger (2005) found that their two older groups demonstrated significantly better confrontation naming of artifact than living pictures, while the young adult group exhibited no significant category effect. However, the groups were not matched for years of education (the group of young adults had completed more years of education than the two elderly groups); thus the results must be interpreted with caution.

Several biological, neuroanatomical andelectrophysiological changes coexist with aging. These changes can have an effect on cognitive-linguistic functions like discourse comprehension naminf etc. The research done so far, has thrown light on vocabulary and naming skills among monolinguals and bilinguals. There is a dearth of research studies in the domains of cognition among monolinguals and bilinguals.

Apart from factors like age and language proficiency, cognitive linguistic functions are also influenced by several other factors, like socioeconomic status (SES) and education. Most of the tests for evaluating cognitive linguistic functions consider the influence of educational variables and socioeconomic status on the cognitive linguistic performance and scores.

Influence of Education and Socioeconomic status on Cognitive Linguistic functions

Education may increase cultural competency, improving reading, math, and reasoning skills as well as test taking abilities. At the same time education also improves brain function because enriched environments result in a greater number of synapses (Jacobs, Schall, & Schiebel 1993), individuals with higher education may enter old age with a greater synaptic density.

Higher educational attainment is related to higher levels of cognitive performance in late life (Sachie 1996; Weschler; 1981). Education and cognitive change in old age has a relationship that lower educational levels are associated with a greater risk of poor cognitive performance (Albert et al, 1995; Lysetkos, Chen, & Anthony 1999; Lee, Sunmin, Ichiro, Lisa, & Francine, 2003). Literature also states that higher education does not protect against cognitive decline (Helen, Scott, Andrew, Aillsa, Anthony, & Scott, 2001) or may even result in a greater rate of decline (Stern, Gurland, Tatemichi, Tang, Wilder, & Mayeux, 1999; Ardila et al, 2000).

As reported by Cornelious and Caspi (1987) educational level has a substantial relationship with performance on verbal meaning tests but was not systematically related to everyday problem solving (i.e., functional criterion of intelligence). Craik, Byrd, and Swanson (1987) observed that differences in memory loss during aging are related to socioeconomic status. Ardila and Rosselli (1989) reported that during normal aging the educational variable was even more influential on neuropsychological performance than the age variable. Albert and Heaton (1988) argue that, when education is controlled, there is not longer evidence of an age-related decline in verbal intelligence. Capitani, Barbarotto, and Laicana (1996) opened that the protective effect of education is not always observed but depends upon the specific cognitive ability that is measured.

Several studies have demonstrated a similarly strong association between educational level and performance on various neuropsychological measures. However, some tests are more sensitive to educational variables (e.g., language tests) than others like the Wisconsin Card Sorting Test (Rosselli & Ardila, 1993). Extremely low scores in current neuropsychological tests are observed in illiterate people (Ardila, & Rosselli, 1989). Low scores in neuropsychological tests observed in illiterates can be partially due, not only to differences in learning opportunities of those abilities that the examiner considers relevant (although, evidently, they are not the really relevant abilities for illiterates' survival), and to the fact that, illiterates are not used to being tested (i.e., they have not learned how to behave in a testing situation), but also, that testing itself represents a nonsense (nonrelevant) situation (Ardila, 1995). Education may positively influence performance on category naming tasks (Capitani et al., 1999).

Education is also related to adult occupation and lifestyle, and higher education early in life results in greater mental activity in occupation and leisure pursuits throughout life (Richards, Hardy and Wadsworth 2003; Richards & Sacker, 2003). Cornelious and

Caspi (1987) found that educational level has a relationship with performance on verbal meaning tests but not related to everyday problem solving.

To summarize, the review of literature indicates that cognitive decline is not uniform across domains and across verbal and nonverbal tasks and it also varies according to educational variables. Although there are some interactions among cognitive domains, it seems evident that they have some degree of independence too. Thus, it leads to general impairment in communication.

In Indian context, studies have been done by Kamath and Prema (2001) so as find out the cognitive linguistic interaction in adult population. The study has been done on normal Kannada speaking individuals ranging from 40-70 years with equal number of males and females (3 in each group). Their results revealed decline in visual attention, perception and discrimination score, episodic memory, working memory with age. However, they reported that these were not of statistical significance. Rajasudhakar and Shyamala (2005) found out the age related changes in the performance of various cognitive linguistic tasks in bilinguals. The study was done on normal Kannada speaking monolinguals (Kannada) and bilinguals (Kannada-English) with equal number of males and females in the age range of 20 to 30 years and 70 to 80 years. The results revealed that younger bilingual performance was significantly high on all domains of cognitive linguistic assessment protocol. Both monolingual and bilingual adults in the younger age group 20 to 30 years were faster in all the timed tasks on cognitive linguistic assessment protocol than the elderly individuals. Anuroopa and Shyamala (2006) developed a protocol to identify cognitive linguistic problems in children ranging from 4 to 8 years with equal number of males and females (3 in each group). The protocol consisted of three different domains i.e. attention/discrimination, memory and problem solving. Each domain was assessed in both the auditory and visual modality. The results indicated that the scores in

each domain increased linearly with increase in age, (better performance with increased age) thereby indicating a developmental trend. Kavya and Shyamala (2007) developed a cognitive-linguistic assessment protocol for children with learning disabilities ranging from 8 to 14 years with equal number of males and females in normal group (5 in each group) and unequal sample size of males and females in clinical group. This protocol was developed considering the Cognitive-Linguistic Assessment Protocol for Children (CLAP-C) by Anuroopa and Shyamala (2006) as the base, with suitable modifications. The protocol included three domains i.e. attention, memory and problem solving. Each domain consisted of different tasks, and set of item of each task were arranged in a hierarchy from simple to complex, from first to the fifth level. Each domain was assessed both in auditory and visual modalities. Results indicated that there was a significant difference between the scores of the normal children and children with LD in all the age groups in the domains of attention, memory and problem solving. Lakshmi and Goswami (2010) and Veena and Goswami (2010) adapted the Cognitive-Linguistic Assessment Protocol for Adults (CLAP) – Kannada by (Kamath & Prema, 2001) to Malayalam speaking persons and Telugu speaking persons respectively. The participants were in the age range of 65-80 years with equal number of males and females in three age groups. They examined various cognitive processes under four domains (attention, perception & discrimination, memory, problem-solving and organization) which were again divided into various test items. Results showed that all the four domains showed a general trend where in, as age increases there is degradation in cognitive performance. Anjana and Jayashree (2010) developed an assessment protocol for persons with Dementia in Malayalam in the age range of 40 to 60 years and above 60 years with equal number of samples in younger and older group (30 in each group) and a clinical group of 10 samples. It examined the various cognitive processes under six domains (memory, linguistic comprehension, linguistic expression, problem solving, organization and visuo-spatial construction). Results revealed that as age

advanced there was a significant deterioration in the performance of normal individuals or tasks related to memory, linguistic comprehension, linguistic expression, problem solving, organization and visuospatial task decreases. In case of dementia significant reduction in performance was noticed across all the cognitive domains.

The western assessment batteries which have been standardized is not applicable to our Indian context, as our country is a multilingual country and the western assessment batteries are liable to linguistic and ethno cultural issues when administered on Indian population. There is a dearth of standardized/preliminarily validated tests to assess the cognitive linguistic abilities in monolinguals and bilinguals. Most of the tests that are generally used for assessing cognitive functions such as memory, attention, executive functions etc. The socioeconomic status and educational background of an individual can also influence the performance of monolinguals and bilinguals in various cognitive and linguistic tasks. There are no standardized tests which are available in our Indian context which can investigate the pattern of cognitive linguistic performance in monolinguals and bi/multilinguals. Therefore, we need to have appropriate test to assess the cognitive linguistic abilities of monolinguals and bilinguals in Indian context. Hence the present study aims to adapt the Cognitive Linguistic Quick test (CLQT) by Estabrooks (2001) to Kannada (CLQT-K) and to standardize CLQT-K on monolingual (Kannada) and bilingual (Kannada-English) participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 80 years.

Objectives of the study:

- Adaptation of Cognitive Linguistic Quick Test by Estabrooks (2001) to Kannada (CLQT-K) and standardization of CLQT-K on Kannada speaking monolingual and bilingual participants in the age range of 20 to 80 years

- Assessment of cognitive linguistic abilities in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80 years using Cognitive-Linguistic Quick Test in Kannada (CLQT-K).

- To see the age related changes in the performance on cognitive linguistic tasks in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80 years.

CHAPTER III

METHOD

Aim of the study was adaptation of the Cognitive Linguistic Quick test (CLQT) by Estabrooks (2001) to Kannada (CLQT-K) and standardisation of CLQT-K on monolingual (Kannada) and bilingual (Kannada-English) participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 80 years on the CLQT-K.

Participants:

180 normal healthy adults in the age range of 20 years to 80 years were chosen for study as shown in Table 1. They were divided into three age groups viz; 20-40, 40-60 and 60-80 years. Each age group consisted of 60 subjects. Of the 60 subjects in each age group, 30 were Kannada monolinguals and 30 were Kannada-English bilinguals. Participants were from different educational, cultural, professional and linguistic background. The participants varied from diverse cultural backgrounds and educational background, from Xth graders to those employed in various professional fields. They were chosen from among the regular employees of All India Institute of Speech & Hearing (AIISH), regular therapy seeking clients parents at AIISH, parents and grandparents of students of AIISH and residents of old age homes in and around Mysore.

Table 1: Distribution of participants across age groups

Age groups	Monolinguals	Bilinguals
20-40years	30	30
40-60 years	30	30
60-80 years	30	30

Participant selection criteria

The following criteria were considered for the selection of participants.

Inclusion criteria:

1) Participant**s** with Kannada as mother tongue.
2) All the participants should have a minimum of Xth grade education.
3) Bilingual Kannada-English participants were selected on the basis of a score of 1 or above in Kannada in the International Second Language Proficiency Rating Scales [ISLPR] by Wylie (2006). [Appendix I A]
4) All the participants were selected on the basis of a score of 2 or above for education and a score of 1 or above for occupation in NIMH Socio Economic Status Scale [N.I.M.H. (1999)] [Appendix I B].
5) Only those participants with a score of 25 or above on Mini Mental State Examination (MMSE) were selected for the study [MMSE by Folstein & Mc Hugh (1975)] [Appendix I C].

Exclusion criteria:

1) Participant**s** with any history of neurological / psychologic illnesses.
2) Participants with any deficits in hearing /speech, language and communication.
3) Participants with a history of drug/ alcohol abuse.
4) Participant**s** having problems with vision (uncorrected).

Procedure

Participants were explained the purpose and procedures of the study and informed verbal consent was taken. The various tasks in the CLQT (2001) and the relevant cognitive

domains involved are given in Table 1 .These tasks assess five primary domains of cognition. i.e., attention, memory, executive functions, language and visuospatial skills.

Table 2: Cognitive domains & tasks in CLQT (2001)

	Cognitive Domains				
CLQT tasks	Attention	Memory	Executive functions	Language	Visuospatial skills
Personal facts		×		×	
Symbol cancellation	×				×
Confrontation naming				×	
Clock drawing	×	×	×	×	×
Story retelling	×	×		×	
Symbol trails	×		×		×
Generative naming		×	×	×	
Design memory	×	×			×
Mazes	×		×		×
Design generation	×		×		×

Phase 1: Adaptation of CLQT to Kannada (CLQT-K)

CLQT by Nancy Helm Estabrooks (2001) was adapted into Kannada (CLQT-K) by incorporating culturally relevant modifications to certain tasks like confrontation naming and story retelling. Tasks like personal facts and story retelling were translated into Kannada after making culturally relevant modifications, wherever necessary. Pictures for confrontation naming task were adapted from CLQT (2001) and given for familiarity testing. Two of the pictures were changed based on culturally relevant changes. Only the pictures which were rated as most familiar by at least 3 out of 5 judges (Speech Language Pathologists) were

selected for the study. The story was adapted from CLQT (2010) and translated in Kannada language. Decision of the story elements was finalized based on the content words of the story. The story elements were rated by five Speech Language Pathologists who were native speakers of Kannada and the story elements which were consistently rated by 4 out of 5 judges were finalized.

Phase 2: Standardisation of Cognitive Linguistic Quick Test in Kannada (CLQT-K)

The adapted version of CLQT-K was administered on 180 participants in the age group of viz; 20 to 40 years, 40 to 60 years, & 60 to 80 years. Each age group included 30 monolingual and 30 bilingual participants.

Tasks

1. Personal facts

This task primarily assesses memory and verbal language production. This was tested by asking ask four questions relating to the examinee's date and place of birth , current age and address. A score of one point was given for each correct element (Appendix II) - [A].

2. Symbol cancellation

This task primarily assesses attention and visuospatial skills. It is a paper and pen task in which thirty six abstract symbols were arranged in a pseudo-random fashion with the target stimulus appearing three times in each quadrant of space to allow for assessment of visual field deficits and visual neglect. Foils bear resemblance to the target to increase visual and attention demands. The participants were instructed to cross out target symbols. A score of one point was given for each correct symbol cancelled and one point was subtracted for each incorrect symbol cancelled (Appendix II) - [B].

3. Confrontation naming

The purpose of this task was to primarily assess language skills. Ten common pictured items were presented one -at- a -time for naming and in this task participants were asked to name the pictures in Kannada. A scoring of 3-point system allows for full , partial or no credit depending on correctness of responses (Appendix II) - [C].

4. Clock drawing

The purpose of this task was to assess attention, memory, executive functions, language and visuospatial skills. The examinee was asked to draw a clock on a page and instructed to put all the numbers inside the circle and then set the hands to "ten minutes past eleven". Points were given for placing numbers in the correct segment as well as producing a clear 'short' and 'long' hand, and getting the time right. A maximum possible score of 13 points was given (Appendix II) - [D].

5. Story retelling

The purpose of this task was to assess attention, memory, language and visuospatial skills for verbally presented facts embedded in a story narrative and auditory comprehension of the key elements of the story. Participants were instructed to listen to the story which is read aloud by the tester and asked to repeat the story verbatim. Story retelling was followed by three pairs of "yes"/ "no" questions to probe auditory comprehension. The raw scores were converted to a 10 point scale (Appendix II) - [E].

6. Symbol trails

The primary purpose of this task was to assess attention, executive function and visuospatial skills. The task involved drawing a single line to connect a total of 11 circles and triangles in an alternating fashion according to size and shape beginning with the smallest circle. Participants were instructed to join the shapes starting from the smallest circle and then go on. A maximum possible score of 10 points was given (Appendix II) - [F].

7. Generative naming

This task primarily assesses memory, executive function and language skills. Participants were instructed to list out as many names of animals and as many words (excluding proper nouns) beginning with letter 'm' in 1 minute. Total raw scores for both lists were converted to a 9-point scale (Appendix II) - [G].

8. Design memory

The purpose of this task is to test memory, visuospatial skills and attention without language demands. Three target abstract designs were presented one-at-a- time for memorization. Participants were instructed to identify the designs immediately from arrays of six that included four foils similar to the targets (Appendix II) - [H].

9. Mazes

This task was designed to assess attention, executive functions and visuospatial skills. Two mazes of two levels of difficulty were used. Participants were instructed to trace a continuous line through the maze " alleys" without entering any dead-ends or crossing any line. The highest possible score for each maze was four (correct solution) for a total of eight

points. Even with a correct solution, one point was subtracted when the participants line travels at least halfway up an incorrect path but was self corrected (Appendix II) - [I].

10. Design generation

This task was designed to assess attention, executive functions and visuospatial skills. Participants were provided with four dots and four lines and were instructed to construct different designs using those four dots and four straight lines. A maximum possible score of 13 points was given (Appendix II) - [J].

Administration of CLQT-K:

The participants were seated in a comfortable and non distractible surrounding. All the participants were tested individually in relatively quiet and familiar surroundings. Instructions were given by the tester, stimuli were spoken out wherever necessary and the tasks were timed and scored. Responses were recorded online using a digital recorder (Ikon ik885). Nine out of the ten tasks (except personal facts) were timed and total time for testing was approximately 20 to 25 minutes. Testing was continuous and was completed in single session. All were administered in the following temporal order as given in CLQT (2001) i.e, personal facts, symbol cancellation, clock drawing, confrontation naming, story retelling, symbol trails, generative naming, design memory, mazes, and design generation. Instructions were given in Kannada for both monolinguals and bilingual participants. Both monolingual and bilingual participants were to respond in their dominant or first language (Kannada) for the relevant cognitive linguistic tasks.

Reliability and validity

Test was repeated on 15 % of participants in each of the three age group 20 to 40 years, 40 to 60 years, & 60 to 80 years for monolingual and bilingual participants after an interval of one month. The scores obtained by the participants during first and second testing were compared and test-retest reliability analysis was done. The coefficient alpha (α) was obtained from the reliability analysis. Discriminant validity was done on a stratified sample of clinical population based on availability of clinical population.

Statistical analysis

SPSS (version 17) was used for the analysis. Data was subjected to the following statistical procedures.

1. Descriptive statistics was done for various tasks of CLQT-K
2. Confidence interval for monolingual and bilingual participants in the three age groups for the ten tasks of CLQT-K.
3. MANOVA and Post hoc Duncan's test were employed in order to find out which group was significantly different.
4. Reliability coefficient alpha (α) was obtained for test retest reliability.

CHAPTER - IV

RESULT AND DISCUSSION

The aim of the study was to adapt the Cognitive Linguistic Quick test (CLQT) by Estabrooks (2001) to Kannada (CLQT-K) and standardization of CLQT-K on monolingual (Kannada) and bilingual (Kannada-English) participants in the age range of 20 to 40, 40 to 60 and 60 to 80 years.

Total of 180 participants were included in the present study. There were three age groups, 20 to 40 years, 40 to 60 years, & 60 to 80 years, with each age group having equal number of monolingual and bilingual participants (30 monolingual and 30 bilingual participants). The adapted version of the test (i.e.) Cognitive Linguistic Quick test in Kannada (CLQT-K) was administered in Kannada - speaking monolingual and Kannada-English bilingual adults in the age range of 20 years to 80 years. Total time taken to administer the test was approximately 25 to 30 minutes. Data was tabulated and subjected to statistical analysis using the SPSS software (version 17).

The results of performance on cognitive linguistic tasks were analyzed to evaluate the objectives of the study as mentioned below:

- Assessment of cognitive linguistic abilities in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80years using Cognitive-Linguistic Quick Test in Kannada (CLQT-K).
- To see the age related changes in the performance on cognitive linguistic tasks in Kannada speaking monolingual and bilingual (Kannada-English) participants in the age range of 20 to 80years .

Results are reported and discussed as follows:

I. Performance of monolingual and bilingual participants in the CLQT-K tasks in the age groups 20 to 40 years, 40 to 60years, and 60 to 80years. The tasks used in the adapted CLQT-K are as follows:

   a) Personal facts
   b) Symbol Cancellation
   c) Confrontation naming
   d) Clock drawing
   e) Story retelling
   f) Symbol trail
   g) Generative naming
   h) Design memory
   i) Mazes
   j) Design generation

II. 95 % Confidence interval for the performance on the adapted CLQT- K for monolingual and bilingual participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 80 years.

III. Cognitive linguistic performance of monolingual participants and bilingual participants across the three age groups.

IV. Comparison of the performance of monolingual and bilingual participants in the CLQT-K tasks within the age groups 20 to 40 years, 40 to 60 years and 60 to 80 years.

I. Performance of monolingual and bilingual participants in the CLQT-K tasks in the age groups 20 to 40 years , 40 to 60years , and 60 to 80years.

The performance of participants (monolingual and bilingual) on the ten tasks of the adapted CLQT-K was assessed. This was done for three age groups of 20 to 40 years, 40 to 60 years and 60 to 80 years. The following were the various tasks in the adapted CLQT-K.

a) Personal facts

b) Symbol Cancellation

c) Confrontation naming

d) Clock drawing

e) Story retelling

f) Symbol trail

g) Generative naming

h) Design memory

i) Mazes

j) Design generation

Table 3 depicts the mean and standard deviation scores of ten CLQT-K tasks for monolinguals and bilinguals for the three age groups

Table 3: Mean and SD values of the tasks of CLQT-K for monolingual and bilingual participants in the age groups 20 to 40 years , 40 to 60years, and 60 to 80years

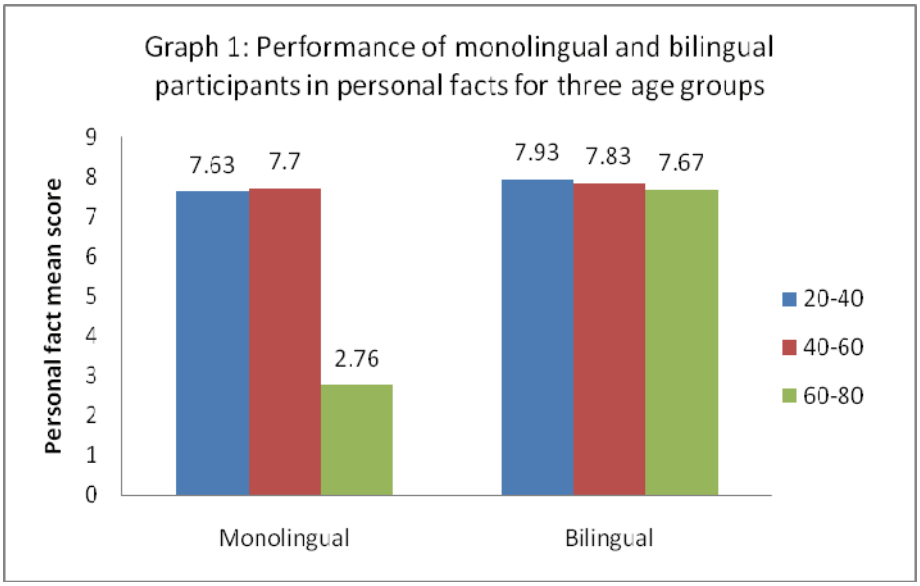
Tasks	Age group	Monolinguals		Bilinguals	
		Mean	SD	Mean	SD
PF	20 - 40	7.63	0.81	7.93	0.25
	40 – 60	7.70	0.53	7.83	0.75
	60 - 80	2.77	1.83	7.67	0.61
SC	20 - 40	10.10	3.67	11.87	0.35
	40 – 60	8.67	4.64	9.97	3.76
	60 - 80	9.70	3.73	10.27	2.55
CN	20 - 40	9.13	0.97	9.40	0.86
	40 – 60	8.67	0.92	9.48	0.86
	60 - 80	8.13	1.04	3.17	0.79
CD	20 - 40	9.60	3.55	12.60	0.56
	40 – 60	10.23	0.73	11.17	1.55
	60 - 80	10.30	1.60	2.23	0.90
SR	20 - 40	5.17	1.05	5.63	0.67
	40 – 60	4.90	0.76	6.13	0.94
	60 - 80	5.00	0.79	6.00	0.91
ST	20 - 40	4.27	3.63	9.10	1.78
	40 – 60	6.23	3.90	6.67	2.79
	60 - 80	4.63	2.27	7.20	1.65
GN	20 - 40	4.27	1.08	6.40	1.07
	40 – 60	4.93	1.23	6.80	1.09
	60 - 80	4.53	0.82	6.03	1.03
DM	20 - 40	4.63	1.01	5.33	0.99
	40 – 60	5.17	0.84	4.97	0.89
	60 - 80	4.23	0.68	5.37	0.93
MZ	20 - 40	6.10	2.42	7.53	1.04
	40 – 60	5.37	2.95	6.57	2.11
	60 - 80	4.70	1.93	6.90	1.32
DG	20 - 40	4.13	3.50	9.43	2.93
	40 – 60	2.37	2.43	4.60	3.01
	60 - 80	4.53	2.14	5.10	3.49

(*PF - Personal Facts, SC - Symbol Cancellation, CN - Confrontation Naming, CD - Clock Drawing, SR - Story Retelling, ST - Symbol trail, GN - Generative Naming, DM - Design Memory, MZ - Mazes, DG - Design Generation*)

Personal facts (PF)

The monolingual participants scored a mean of 7.63 (SD=0.81), 7.70 (SD=0.53) and 2.77 (SD=1.83) in the task personal facts for age groups 20 to 40 years, 40 to 60 years and 60 to 80 years respectively. The bilingual participants scored a mean of 7.93 (SD=0.25), 7.83 (SD=0.74) and 7.67 (SD= 0.61) in the same task for age groups 20 to 40 years, 40 to 60 years and 60 to 80 years respectively (Table 3).

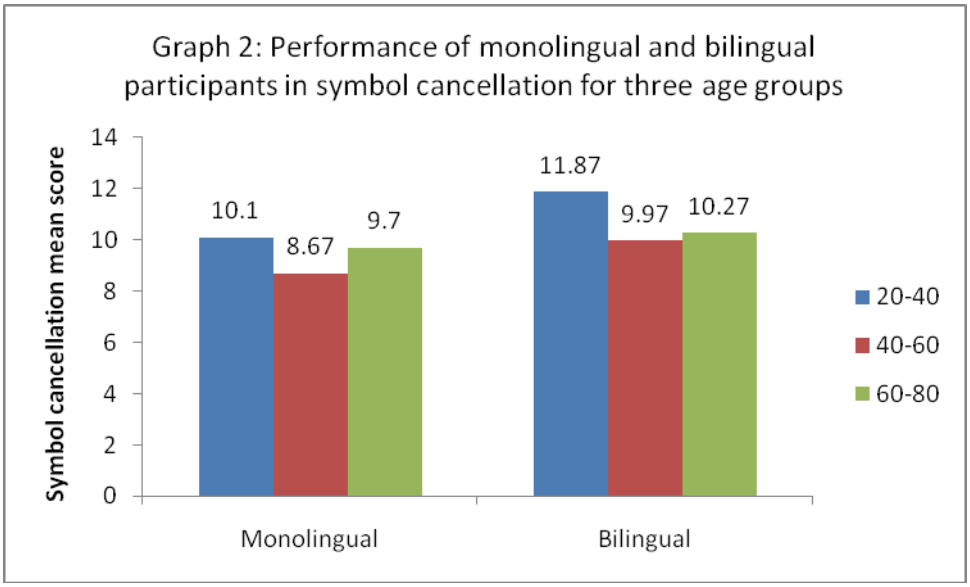
As depicted in Graph 1, it is evident that monolingual participants in the age group of 60 to 80 years had poorer mean scores on the task personal facts compared to participants in 20 to 40 years and 40 to 60 years. This indicates a poorer performance with age in monolingual participants for the task personal facts. On the other hand, bilingual participants had similar mean scores for this task across all three age groups.



The monolingual participants in the 20 to 40 year and 40 to 60 year age group had similar mean scores as that of bilingual participants in the 20 to 40 year, 40 to 60 year and 60 to 80 year age groups.

Symbol cancellation

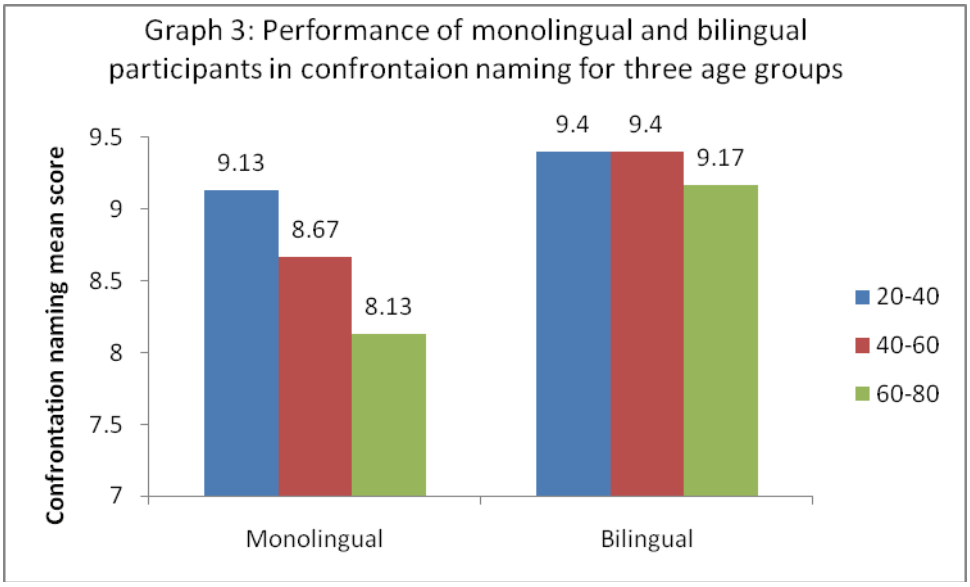
The bilingual participants had slightly better mean scores of 11.87 (SD=0.35), 9.97 (SD=3.76) and 10.27 (2.55) for the age group of 20 to 40 years, 40 to 60 years and 60 to 80 years compared to the monolingual participants. The corresponding mean scores for the monolingual participants were 10.10 (SD=3.67), 8.67 (SD=4.64) and 9.70 (SD=3.73) for the three age groups.



Graph 2 illustrates that monolingual participants showed an inconsistent performance on this task with similar mean scores for the 20 to 40 year [10.10 (SD=3.67)] and 60 to 80 year age groups[9.70 (SD=3.73)], but a reduced mean score for 40 to 60 year age group [8.67 (SD=4.64)]. The bilingual participants, on the other hand showed reduced mean scores for the 40 to 60 year and 60 to 80 year age group compared to 20 to 40 year age group. Bilingual participants in the 40 to 60 year and 60 to 80 year age group have similar mean scores of 9.97 and 10.27 respectively.

Confrontation naming

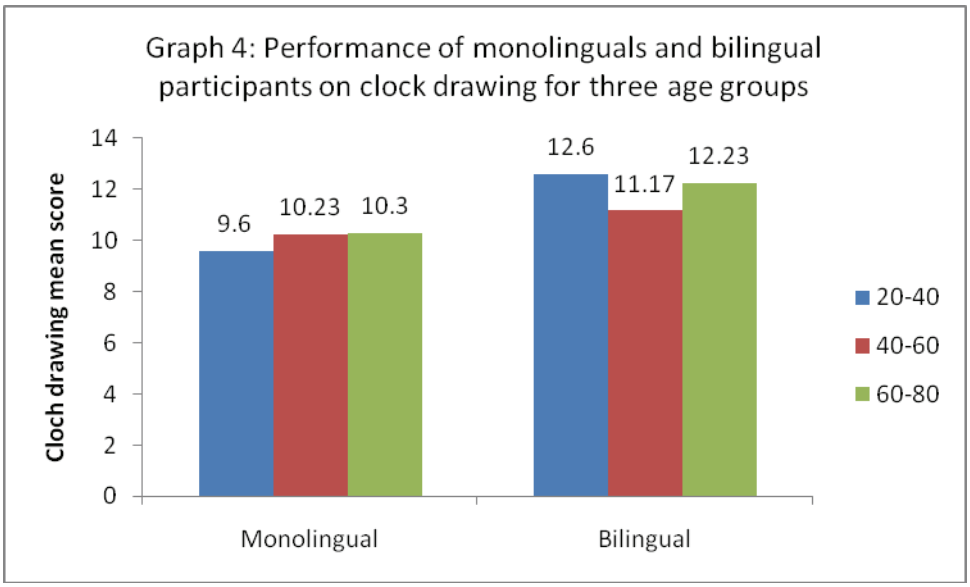
There was an age related decline in the performance of monolingual participants in the confrontation naming task. This is evident from the mean scores of 9.13 (SD=0.97), 8.67 (SD=0.92) and 8.13 (SD=1.04) for the 20 to 40 year, 40 to 60 year and 60 to 80 year age group respectively. Meanwhile, bilingual participants showed a different pattern of performance with similar mean score of 9.40 (SD=0.86) for 20 to 40 year and 40 to 60 year and mean score of 9.48 (0.85) for the 60 to 80 year age group.



Graph 3 depicts that the monolingual and bilingual participants in the 20 to 40 year age group had similar mean scores, whereas the mean score of the bilingual participants [9.97 (SD= 3.76)] were better than monolingual participants [8.67 (SD=0.92)], in the age group of 40 to 60 years. It is also evident that the performance of bilingual participants in the 60 to 80 year age group was much poor compared to the same for monolingual participants.

Clock drawing

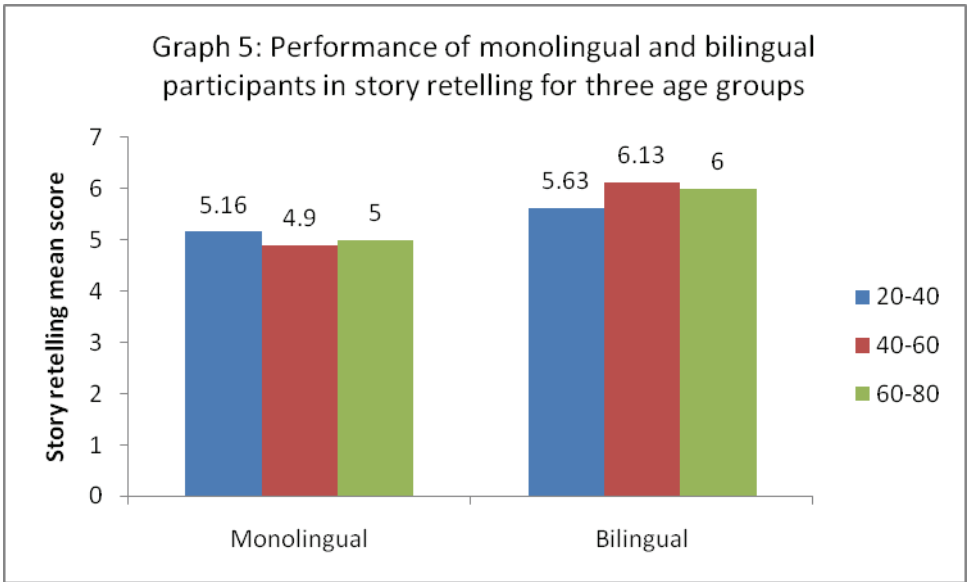
It was observed that monolingual showed a better mean score with aging, with a mean score of 9.60 (SD=3.56), 10.23 (SD=0.73) and 10.30 (SD=1.60) respectively for 20 to 40 year, 40 to 60 year and 60 to 80 year age groups. From Graph 4, it is noticeable that the mean scores of the 40 to 60 year and 60 to 80 year age groups are similar for monolingual participants. On the other hand, the bilingual participants showed reduced mean scores for 40 to 60 year age group compared to 20 to 40 year and 60 to 80 year age groups. The mean scores and SD for bilingual participants in the age group 20 to 40 years, 40 to 60 year and 60 to 80 year were 12.60 (SD=0.56), 11.17 (SD=1.56) and 12.23 (SD=0.90) respectively.



It is evident from Graph 4 that bilingual participants in all three age groups performed better and had better mean scores compared to performance of monolingual participants in all three age groups.

Story retelling

The mean score of 5.17 (SD=1.05), 4.90 (SD=0.76), 5.00 (SD=0.79) was obtained for the monolingual participants in the age group of 20 to 40 years, 40 to 60 years and 60 to 80 year age groups respectively. The bilingual participants also showed a similar trend with similar mean values across the three age groups i.e. mean scores of 5.63 (SD=0.67), 6.13 (SD=0.94) and 6.00 (SD=0.91) for 20 to 40 years, 40 to 60 years and 60 to 80 years age group respectively.

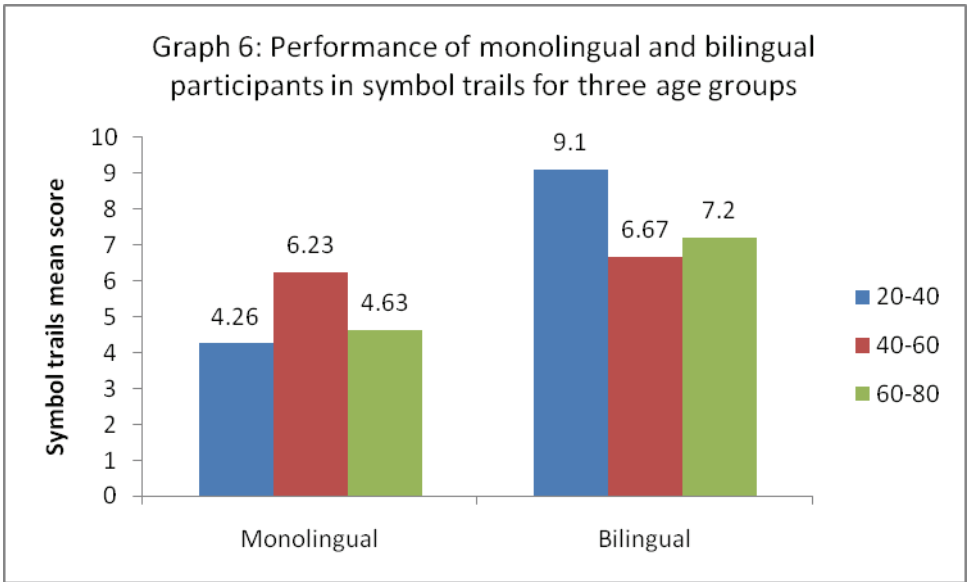


Graph 5 illustrates that monolingual participants showed similar mean scores across the three age groups. There was no change in performance on this task with age for bilingual participants also. However, the mean scores of bilingual participants were slightly better than the monolingual participants in all three age groups for the story retelling task.

Symbol trails

In this task, the monolingual participants had better mean scores for the 40 to 60 year group [6.23 (SD=3.90)] than the 20 to 40 year [4.27 (SD=3.63)] and 60 to 80 year

age group [4.63 (SD=2.27)]. On the other hand, bilingual participants had better mean scores for 20 to 40 year age group [9.10 (SD=1.79)] and 60 to 80 year group [7.20 (SD=1.65)] compared to 40to 60 year age group [6.67 (SD=2.79)].

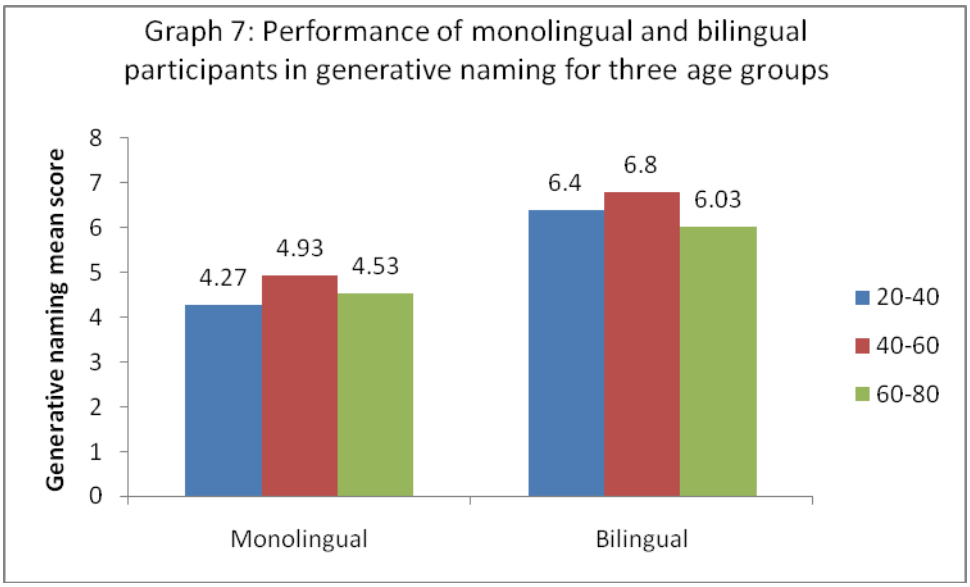


Graph 6 indicates that the mean scores for bilingual participants in all three groups were better than the mean scores obtained for monolingual participants. However monolingual and bilingual participants exhibited different trends in the performance with age.

Generative naming

A mean value of 4.26 (SD = 1.08) was scored by monolingual participants in 20 to 40 age group, whereas the corresponding mean value for bilingual participants was 6.40 (SD = 1.07). In the 40 to 60 age group, the mean score for monolingual participants was 4.93 (SD = 1.23) and the mean value for bilingual participants was 6.80 (SD = 1.09).

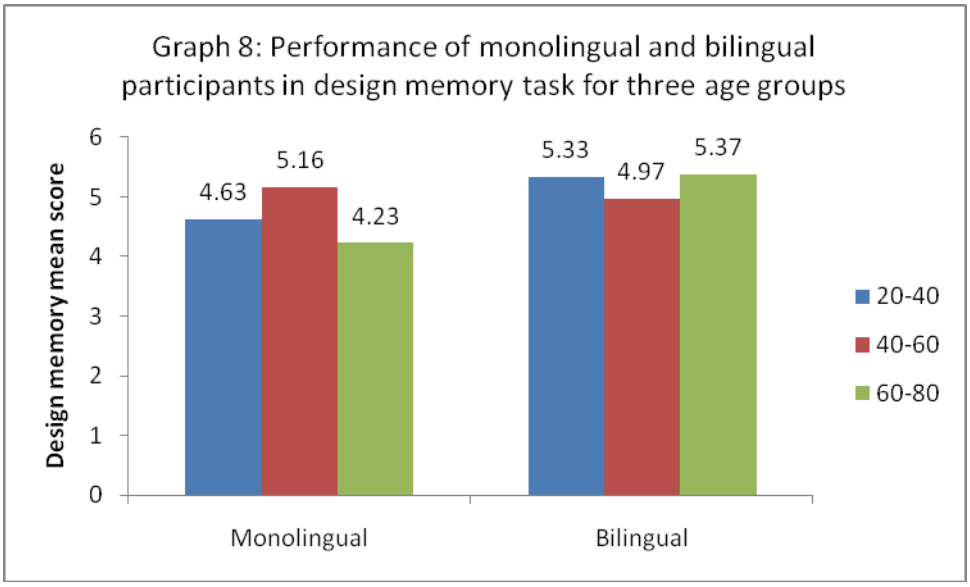
The mean score in the 60 to 80 year age group [6.03 (SD = 1.03)] was also better for the bilingual participants compared to monolingual participants [4.53 (SD = 0.82)].



Graph 7 illustrates that both monolingual and bilingual participants had similar mean scores across the three age groups, with the mean scores of the bilingual participants being better than the mean scores of monolingual participants for all three age groups.

Design memory

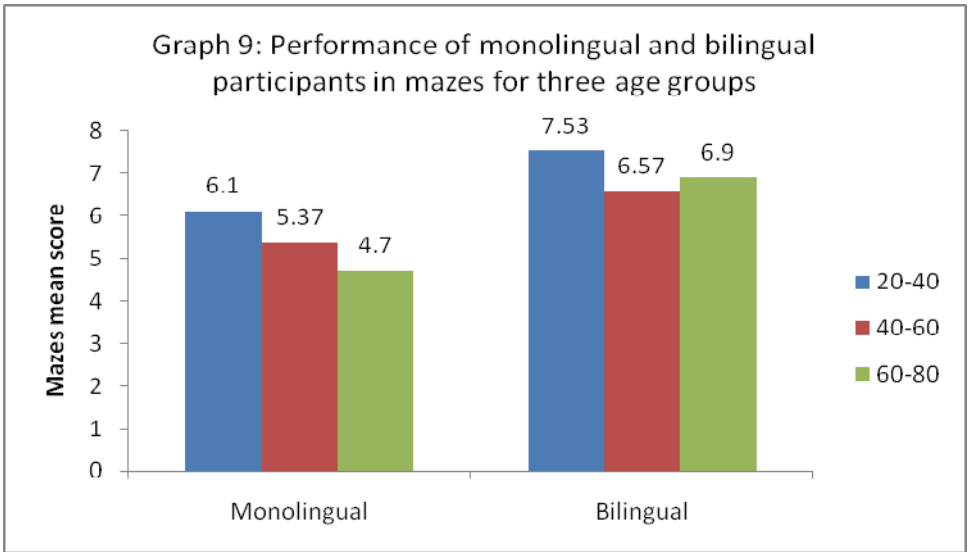
In the task of design memory for the monolingual participants, the participants in the 40 to 60 age group showed better mean score of 5.16 (SD=0.84) compared to mean score of 4.63 (1.01) for 20 to 40 year age group and mean score of 4.23 (SD=0.68) for the 60 to 80 year age group. The bilingual participants showed an opposite trend with better mean scores in the 20 to 40 year age group [5.33 (SD=0.91)] and 60 to 80 year age group [5.37 (SD=0.93)] compared to the mean scores of 40 to 60 year age group [4.97 (SD=0.88)].



As is evident from Graph 8, the bilingual participants in general had better mean scores in the design memory task compared to monolingual participants.

Mazes

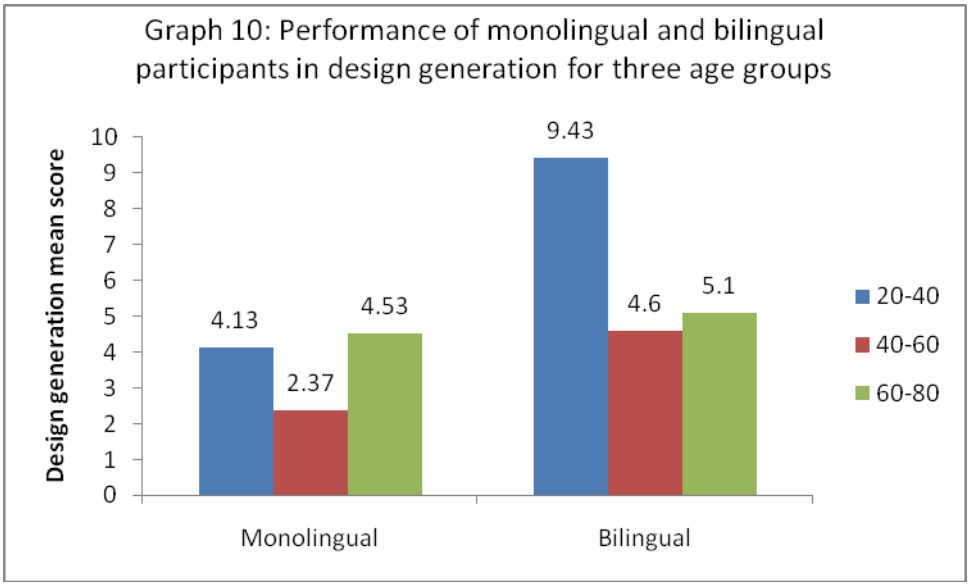
In the task mazes, the monolingual participants showed reduced mean scores with aging. The mean scores of the monolingual participants were 6.10 (2.42), 5.37 (2.95) and 4.70 (1.93) respectively for 20 to 40 years, 40 to 60 years and 60 to 80 year age groups. The corresponding mean scores for the bilingual participants were 7.53 (1.04), 6.57 (2.11) and 6.90 (1.32).



It is evident that that the mean scores of the bilingual participants were better than the mean scores of the monolingual participants for all three age groups for the task mazes as is also illustrated in Graph 9.

Design generation

Varied results were obtained for the monolingual participants and bilingual participants in this task. In the monolingual participants, the mean scores in the 20 to 40 year age group [4.13 (3.50)] and 60 to 80 year age group [4.53 (2.14)] were better than the mean score of 2.36 (2.43) for the 40 to 60 year age group. On the other hand, bilingual participants in the 20 to 40 year age group had much better mean score of 9.43 (2.93) compared to the mean score of 4.60 (3.01) and 5.10 (3.49) for the 40 to 60 year and 60 to 80 year age groups respectively. As is evident from Graph 10, the bilingual participants in general had better mean scores and performed better than monolingual participants on the task of design generation.



To summarize, the bilingual participants in general had better mean scores compared to monolingual participants, especially for tasks like clock drawing, story retelling, symbol trails, generative naming, design memory, mazes and design generation. Age related changes in performance on the tasks of adapted CLQT-K was found for monolingual participants, especially in tasks like personal facts, confrontation naming, design memory and design generation. Even the bilingual participants showed some age related differences in mean scores, especially in tasks like symbol cancellation, clock drawing, symbol trail, generative naming and design generation.

II. Confidence intervals for three age groups for monolingual and bilingual participants

The confidence interval scores were calculated for all the tasks in the adapted Cognitive Linguistic Quick Test in Kannada (CLQT-K). The confidence interval scores are given separately for monolingual and bilingual participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 70 years.

Table 4: 95 % Confidence Interval Scores for the tasks in adapted Cognitive linguistic quick test in Kannada (CLQT-K)

Tasks	20-40		40-60		60-80	
	Monolingual	Bilingual	Monolingual	Bilingual	Monolingual	Bilingual
PF	7.33 - 7.94	7.84 - 8.03	7.50 - 7.90	7.55 - 8.11	2.08 - 3.45	7.44 - 7.89
SC	8.73 - 11.47	11.74 – 12.00	6.93 - 10.40	8.56 - 11.37	8.30 - 11.09	9.31 - 11.22
CN	8.77 - 9.50	9.08 - 9.72	8.32 - 9.01	9.08 - 9.72	7.74 - 8.52	8.87 - 9.46
CD	8.28 - 10.93	12.39 - 12.81	9.96 - 10.51	10.58 - 11.75	9.70 - 10.89	11.90 - 12.57
SR	4.77 - 5.56	5.38 - 5.88	4.62 - 5.18	5.78 - 6.48	4.71 - 5.29	5.66 - 6.34
ST	2.91 - 5.62	8.43 - 9.77	4.78 - 7.69	5.62 - 7.71	3.79 - 5.48	6.58 - 7.82
GN	3.86 - 4.67	6.00 - 6.80	4.47 - 5.39	6.39 - 7.21	4.23 - 4.84	5.67 - 6.42
DM	4.26 - 5.01	4.96 - 5.70	4.86 - 5.48	4.63 - 5.30	3.98 - 4.49	5.02 - 5.71
MZ	5.19 - 7.00	7.14 - 7.92	4.26 - 6.47	5.78 - 7.35	3.98 - 5.42	6.40 - 7.39
DG	2.83 - 5.44	8.34 - 10.53	1.46 - 3.27	3.48 - 5.72	3.73 - 5.33	3.80 - 6.40

(*PF - Personal Facts, SC - Symbol Cancellation, CN - Confrontation Naming, CD - Clock Drawing, SR - Story Retelling, ST - Symbol trail, GN - Generative Naming, DM - Design Memory, MZ - Mazes, DG - Design Generation*)

Confidence intervals were obtained for the values obtained for all the tasks of the adapted version of CLQT-K. The 95% confidence intervals for all the tasks give the estimated lower and upper limit for the population mean. The confidence intervals given in Table 4 represent the range for mean for monolingual and bilingual participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 80 years.

III. Cognitive linguistic performance of monolingual participants and bilingual participants across the three age groups.

MANOVA was employed for comparison of performance on different tasks across the three age groups 20 to 40 years, 40 to 60 years and 60 to 80 years for monolingual and bilingual participants. Post hoc Duncans test was done to identify which age groups were significantly different from each other in the different tasks. Results are shown in Table 5 and Table 6.

Table 5: Mean Score (and standard deviation) for the Cognitive Linguistic tasks by age groups for monolinguals.

Tasks	20-40 years		40-60 years		60-80 years		F-value
	Mean	SD	Mean	SD	Mean	SD	
PF	7.63	0.81	7.70	0.53	2.77	1.83	*167.62
SC	10.10	3.67	8.67	4.64	9.70	3.73	1.01
CN	9.13	0.97	8.67	0.92	8.13	1.04	*7.82
CD	9.60	3.56	10.23	0.73	10.30	1.60	0.85
SR	5.17	1.05	4.90	0.76	5.00	0.79	0.71
ST	4.27	3.63	6.23	3.90	4.63	2.27	2.94
GN	4.27	1.08	4.93	1.23	4.53	0.82	3.02
DM	4.63	0.10	5.17	0.83	4.23	0.68	*9.16
MZ	6.10	2.41	5.37	2.95	4.70	1.93	2.42
DG	4.13	3.50	2.37	2.43	4.53	2.14	*5.26

*$p \leq 0.05$ level of significance

(PF - Personal Facts, SC - Symbol Cancellation, CN - Confrontation Naming, CD - Clock Drawing, SR - Story Retelling, ST - Symbol trail, GN - Generative Naming, DM - Design Memory, MZ - Mazes, DG - Design Generation)

The results of MANOVA for monolingual participants indicated significant difference across the three age groups for tasks like personal facts ($F(2,87) = 167.62$, $p \leq 0.05$), confrontation naming ($F(2,87) = 7.81$, $p \leq 0.05$), design memory ($F(2,87) = 9.156$, $p \leq 0.05$) and design generation ($F(2,87) = 5.257$, $p \leq 0.05$). Post hoc test (Duncans) test also suggested significant difference between three age groups for tasks personal facts, confrontation naming, design memory and design generation.

Participants in the age group 60 to 80 years were significantly different from participants in age groups 20 to 40 and 40 to 60 in tasks like personal facts and confrontation naming. The performance of participants in the age group 60 to 80 years was poorer than the other two groups in tasks like personal facts and confrontation naming on the CLQT-K. Similar findings were reported by Obler, Albert, and Goodglass (1985), Au et al., (1995) and Nicholas, Welch, Doneau, Johnson, and King (1996). These studies reported decreased performance with increased age in various vocabulary measures for middle and older-aged individuals. The findings are in accordance with the studies which reports decreasing ability in older adults to process complex sentences in isolation (Kemper, 1986; Davis & Ball, 1989; Obler, Fein, Nicholas, & Albert, 1991, Christianson, Williams, Zacks, & Ferreira, 2006; Edwards & Salis, 2008). The present findings are also partially supported by the study by Vijaykumar and Prema (2007) which reported that as age advances time taken for retrieving a word increases in the picture naming task for adults.

Table 6: Mean Score (and standard deviation) for the Cognitive Linguistic tasks by age groups for bilinguals.

Tasks	20-40years		40-60years		60-80years		F-value
	Mean	SD	Mean	SD	Mean	SD	
PF	7.9333	0.2537	7.8333	0.7466	7.6667	0.6064	1.650
SC	11.8667	0.3457	9.9667	3.7644	10.2667	2.5587	*4.506
CN	9.4000	0.8550	9.4000	0.8550	9.1667	0.7914	0.782
CD	12.6000	0.5632	11.1667	1.5554	12.2333	0.8976	*14.086
SR	5.6333	0.6686	6.1333	0.9371	6.0000	0.9097	2.802
ST	9.1000	1.7878	6.6667	2.7957	7.2000	1.6484	*10.724
GN	6.4000	1.0699	6.8000	1.0954	6.0333	1.0333	*3.878
DM	5.3333	0.9942	4.9667	0.8899	5.3667	0.9278	1.678
MZ	7.5333	1.0416	6.5667	2.1120	6.9000	1.3222	2.975
DG	9.4333	2.9323	4.6000	3.0126	5.1000	3.4874	*21.310

*$p \leq 0.05$ level of significance

(PF - Personal Facts, SC - Symbol Cancellation, CN - Confrontation Naming, CD - Clock Drawing, SR - Story Retelling, ST - Symbol trail, GN - Generative Naming, DM - Design Memory, MZ - Mazes, DG - Design Generation)

The results of MANOVA for bilingual participants indicated significant difference across the three age groups in tasks like symbol cancellation ($F(2,87) = 4.506$, $p \leq 0.05$), clock drawing ($F(2,87) = 14.08$, $p \leq 0.05$), symbol trail ($F(2,87) = 10.724$, $p \leq 0.05$), generative naming ($F(2,87) = 3.878$, $p \leq 0.05$) and design generation ($F(2,87) = 21.310$, $p \leq 0.05$). Post hoc test (Duncans) test indicated significant difference between age groups only for the tasks symbol cancellation, symbol trail, design generation and clock drawing. Participants in the age group 20 to 40 years were significantly different from participants in the age groups of 40 to 60 years and 60 to 80 years in tasks like symbol cancellation, symbol trail and design generation and participants in the age group 40 to 60 years were

significantly different from participants in the age groups 20 to 40 years and 60 to 80 years for the task clock drawing. The performance of participants in the age group 20 to 40 years was better than the other two groups in tasks like symbol cancellation, symbol trail and design generation and the performance of participants in the age group 40 to 60 years was better than the other two groups in clock drawing task on the CLQT-K. When the three groups were compared on the generative naming task, a significant difference was obtained only between the participants in the age groups 40 to 60 years and 60 to 80 years. The participants in the age group of 20 to 40 years were better in the generative naming tasks when compared to the other two groups. Similar findings were reported by Rajasudhakar and Shyamala (2005) who studied monolingual and bilingual participants in the age range of 20 to 30 years and 70 to 80 years on various cognitive linguistic measures. Their results revealed that bilingual performance was better on all cognitive linguistic tasks, but there was an interaction effect noticed among age and gender. In their study, participants in the age group of 20 to 30 years were better in all cognitive linguistic tasks compared to the performance of participants in 70 to 80 years age group in both monolinguals and bilinguals. The findings reveal that bilinguals show poorer performance on most of the verbal tasks. These findings are contradictory to the findings by Vijaykumar and Prema (2007) who reported increased time in picture naming with age.

III. Comparison of the performance of monolingual and bilingual participants in the CLQT-K tasks within the age groups 20 to 40 years, 40 to 60 years and 60 to 80 years.

MANOVA was employed for the comparison of the performance of monolingual and bilingual participants within the age groups of 20 to 40 years, 40 to 60 years and 60 to 80years on various cognitive linguistic tasks. Post hoc Duncans test was done. The results are shown in Table 7.

Table 7: Comparison of cognitive task performance of monolinguals and bilinguals within age groups 20 to 40, 40 to 60, and 60 to 80 years in CLQT- K

Age Groups			PF	SC	CN	CD	SR	ST	GN	DM	MZ	DG
20 - 40	Monolingual	Mean	7.63	10.10	9.13	9.60	5.17	4.27	4.27	4.63	6.10	4.13
		SD	0.81	3.67	0.97	3.55	1.05	3.63	1.08	0.99	2.41	3.50
	Bilingual	Mean	7.93	11.87	9.40	12.60	5.63	9.10	6.40	5.33	7.53	9.43
		SD	0.25	0.35	0.86	0.56	0.67	1.79	1.07	0.99	1.04	2.93
	F - value		*3.76	*6.89	1.271	*20.80	*4.20	*42.83	*59.04	*7.39	*8.93	*40.40
40 - 60	Monolingual	Mean	7.70	8.67	8.67	10.23	4.90	6.23	4.93	5.17	5.37	2.37
		SD	0.53	4.64	0.92	0.73	0.76	3.90	1.23	0.83	2.95	2.43
	Bilingual	Mean	7.83	9.97	9.40	11.17	6.13	6.67	6.80	4.97	6.57	4.60
		SD	0.75	3.76	0.86	1.56	0.94	2.79	1.09	0.89	2.11	3.01
	F - value		0.63	1.42	*10.20	*8.86	*31.38	0.24	*38.53	0.81	*3.27	*9.99
60 - 80	Monolingual	Mean	2.77	9.70	8.13	10.30	5.00	4.63	4.53	4.23	4.70	4.53
		SD	1.83	3.73	1.04	1.60	0.79	2.26	0.82	0.68	1.93	2.14
	Bilingual	Mean	7.67	10.27	9.17	12.23	6.00	7.20	6.03	5.37	6.90	5.10
		SD	0.60	2.56	0.79	0.89	0.91	1.65	1.03	0.92	1.32	3.49
	F - value		*193.35	0.47	*18.71	*33.29	*20.71	*25.16	*38.81	*29.15	*26.48	0.57

(*PF - Personal Facts, SC - Symbol Cancellation, CN - Confrontation Naming, CD - Clock Drawing, SR - Story Retelling, ST - Symbol trail, GN - Generative Naming, DM - Design Memory, MZ - Mazes, DG - Design Generation*)

In the age group of 20 to 40 years, results revealed that except for the confrontation naming task (F (1, 58) =1.271, $p \leq 0.05$) performance on all other tasks were significantly different between monolinguals and bilinguals (Table 7). The performance of bilinguals was better than monolinguals in all the other tasks in the age group of 20 to 40 years. The findings disagree with the results of the study by Bialystok et al, (2005) who studied four age groups comprising of children (5 years), young adults (20-30 years), middle aged (30-60 years), and older adults (over 60 years) and found out that there was no bilingual advantage for younger group in nonlinguistic tasks namely the Simon task. The results of MANOVA indicated that except for personal facts (F (1,58) =0.632, $p \leq 0.05$), symbol cancellation (F (1,58) =1.420, $p \leq 0.05$), symbol trails (F (1, 58) =0.245, $p \leq 0.05$) and design memory (F (1, 58) =0.807, $p \leq 0.05$) performance on all other tasks were significantly different between monolingual and bilingual participants in the age group of 40 to 60 years. Significant difference is evident for linguistically loaded tasks like confrontation naming, story retelling and generative naming. Story retelling mainly requires intact working memory which acts as central for both comprehension of written and spoken text, whereas attentional control is essential for non linguistic tasks. Generative naming was patterned after the word fluency measure which mainly requires the memory and language. Results of MANOVA for participants in the age range of 60 to 80 years indicated that except for the symbol cancellation task (F (1,58) =0.470, $p \leq 0.05$) and design generation task (F (1,58) =0.575, $p \leq 0.05$) all other tasks were significantly different between monolingual and bilingual participants. The performance of bilinguals was better than monolinguals in all the other tasks in the age group of 60 to 80 years. In general, elderly participants performed significantly poorer than younger monolinguals and younger bilinguals in both linguistic and nonlinguistic tasks. Graph1 to Graph10 represents

the comparison of monolingual and bilingual participants across three age groups for the ten cognitive linguistic tasks.

To discuss in detail, in the age group of 20 to 40 years, bilingual participants show better performance than monolingual participants on non linguistic tasks. The findings are in accordance with the study of Bialystok et al, (2005) which states that bilinguals are more proficient than monolinguals in tasks requiring inhibitory control which is required for nonlinguistic tasks. In the present study, the domains mainly involved in the non linguistic tasks are attention, executive functions and visuospatial skills. The linguistic tasks are personal facts, story retelling and generative naming and non linguistic tasks are symbol cancellation, clock drawing, symbol trails, design memory, mazes and design generation. An interesting factor may be that all the professionals (Speech Language Pathologists) are familiarized with similar type of test material during their training compared to monolingual participants. In the age group of 40 to 60 years bilingual participants show better response for linguistic as well as non linguistic tasks compared to monolingual participants. The domains mainly involved in linguistic and non linguistic tasks are attention, executive function and language skills. The linguistic tasks are confrontation naming, story retelling and generative naming and non linguistic tasks are clock drawing, mazes and design generation.

In the age group of 60 to 80 years, monolingual participants show better response for linguistic than non linguistic tasks. The linguistic tasks are personal facts, confrontation naming, story retelling and generative naming. The domains mainly involved in linguistic tasks are attention, memory and visuospatial skills. Studies have shown that bilingualism is associated with decrements in some verbal abilities relative to monolingual controls. The findings are supported by Roberts, Garcia, Desrochers, and Hernandez (2002) & Gollan, Montoya, and Werner (2002) in which bilinguals have more

errors in picture naming and reduced scores on letter and category fluency tests. The reason for bilingual disadvantage in lexical retrieval could be because of the parallel activation of both the languages when bilinguals are using one of them (Beauvillain & Grainger, 1987; Hermans, Bongaerts, De Bot, & Schreuder, 1998; Green, 1998; Brysbaert, Van Dyck, & Van de Poel, 1999; Dijkstra, Grainger, & van Heuven, 1999; De Groot, Delmaar, & Lupker, 2000; Colome´, 2001; Jared & Kroll, 2001; Van Hell & Dijkstra, 2002; Costa, 2005). Bilinguals typically show lower levels of performance than monolinguals in highly constrained verbal tasks and also generating words in the category condition which is similar to accessing a lexical item in interconnecting networks (Levelt, 1999). From this, we may infer that confrontation naming and generative naming tasks will be difficult for bilinguals, in general. Working memory plays a major role in story retelling task. The demands on working memory will be greater for bilinguals who need to mange two language systems which requires inhibition of one system while the other is being used (Michael & Gollan, 2005). Working memory is central to tasks such as comprehension of written and spoken text (Gernsbacher & Faust, 1991; Just & Carpenter, 1992) and fluency in language production (Rosen & Engle, 1997).

In the present study, when the performance of participants in the age group of 60 to 80 years and 40 to 60 years is compared, there is no difference in performances of tasks across age groups. These findings are supported by Kamath and Prema (2001) who examined young old (60-70) and middle aged adults (40-60) on linguistic tasks like letter cancellation, generative naming etc. The results revealed that small differences in performances of tasks across age group and with respect to gender have been noted.

On comparison of the cognitive linguistic performance of monolingual and bilingual participants across the three groups (20 to 40years, 40 to 60years and 60 to 80years),

bilingual participants showed better performance than monolingual participants in non linguistic tasks compared to linguistic tasks. Bilingual advantages have been reported in a variety of non verbal cognitive tasks of cognitive functioning. These tasks mainly involve the need to resolve conflict (Bialystok et al., 2004; Carlson & Meltzoff, 2008; Costa, Hernandez, & Sebastián-Gallés, 2008), to suppress distracting information (Bialystok, Craik, & Ruocco, 2006; Colzato et al., 2008), or to switch between multiple rules (Bialystok & Martin, 2004; Bialystok & Viswanathan, 2004). Such effects are especially strong in children and older adults (Bialystok & Martin, 2004; Bialystok et al., 2004), and are smaller but still reliable in younger adults (Costa et al., 2008). Studies have reported that bilingualism is associated with advantages in executive control, disadvantages in verbal fluency, and no clear effects on working memory (Bialystok, Craik, & Luk, 2008; Costa-Hernandez & Sebastian-Galles, 2008; Bialystok & Feng, 2009). Similar findings are also evident from the results of the present study.

As both the language systems for fluent bilinguals remain active, the fluent use of one of the languages requires an attentional mechanism that will keep language production focused on the relevant language, ignoring interference from the unwanted language. Therefore, bilinguals constantly face a conflict in lexical choice that monolinguals do not, making linguistically loaded tasks more effortful for bilinguals and performance less efficient. This is manifested as a disadvantage in rapid lexical retrieval for bilinguals. At the same time, the resolution of that ongoing conflict boosts the central control system that monitors attention, making that processing more robust in bilinguals. So the bilingual advantage in executive control (nonlinguistic tasks) could be the constant experience in using attention to resolve conflict in online processing. Lexical conflict leads to disadvantages in lexical retrieval but to advantages in nonlinguistic

cognitive processing. Similar findings are also evident from the results of the present study where bilingual participants showed poorer performance compared to monolingual participants in linguistic tasks compared to nonlinguistic tasks. This effect was also evident across different age groups 20 to 40 years, 40 to 60 years and 60 to 80 years. Monolingual participants showed poorer performance than bilingual participants in nonlinguistic tasks, whereas they showed better performance than bilinguals in linguistically loaded tasks. This effect was evident in the performance of participants in the age group of 20 to 40 years, 40 to 60 years and 60 to 80 years.

Bilinguals disadvantage in linguistic tasks is more evident with aging. In comparison to the performance of bilingual participants in the age group 40 to 60 years, the bilingual participants in the 60 to 80 age group show better performance in non linguistic task compared to linguistic tasks. This may be attributed to the fact that bilingual participants in the 60 to 80 age group are more susceptible to aging effects, compared to monolinguals. As is evident from the results of performance on cognitive linguistic tasks of participants in 20 to 40 years, 40 to 60 years and 60 to 80 age groups, bilinguals performed better than monolinguals consistently across the three age groups for non linguistic tasks. However, their performance with aging for linguistic tasks revealed varied results across the three age groups. This may be indicative of the fact that linguistic tasks are more susceptible to aging effects in bilinguals. Similarly we can see the monolingual advantage in lexical access across the age groups. As is evident from the results of 20 to 40 years, 40 to 60 years and 60 to 80 years age groups, monolingual performed better than bilinguals consistently across the three age groups for linguistic tasks. However, their performance with aging for nonlinguistic tasks revealed varied results across the three age groups. This may be indicative of the fact that nonlinguistic tasks are more susceptible to aging effects

in monolinguals. That is, lexical representation may be intact in bilinguals, but response production may suffer from the need to suppress interference from the unwanted language. However the conflict resolution explains both the disadvantages in lexical retrieval and the advantages in executive control, because both the effects are attributed to the same mechanism. Moreover, these complementary processes interact with aging: The need to resolve lexical conflict is an ongoing problem for bilinguals and does not appear to change with age, but the benefit of that process boosts the general executive control system, protecting it from decline and providing an additional age-related advantage for older bilinguals. Bilinguals will have an advantage in attentional control which would increase in older adults but that the disadvantage in lexical retrieval would remain constant. In another aspect we can say that bilingual disadvantages in verbal tasks depends on language proficiency, notably the vocabulary size, and level of executive control involved in the task.

Reliability and Validity

Testing was repeated on 15 % of participants in all three age groups for monolinguals and bilinguals. Test-retest reliability was employed and alpha coefficient was obtained. An alpha coefficient of >0.98 was obtained for all three age groups for monolinguals and bilinguals which indicated high test-retest reliability. Discriminant validity was checked using a stratified sample of clinical population. The clinical population included three participants with aphasia and two participants with dementia. The scores obtained for the clinical population on the CLQT-K were compared with the confidence intervals for all CLQT tasks and it was found that they were falling outside the confidence intervals. Hence the test was found to be useful in distinguishing both clinical

and non clinical population. However, this needs to be validated with more number of stratified samples of clinical population.

CHAPTER - V

SUMMARY AND CONCLUSION

Cognition, language and communication are interrelated. There are several tests available to assess cognitive-linguistic aspects in English language. India being a multilingual country, there is a need to develop tests or adapt tests available in English to suit the Indian context. It is often reported in the literature that cognitive linguistic functions are interrelated with aspects like age, socioeconomic status, and education and is also influenced by the effects of monolingualism and bi / multilingualism.

Few studies have been done in the Indian context to explore the cognitive linguistic abilities in adults across different age groups and also to explore the cognitive linguistic performance of monolinguals and bi/multilingual population. Moreover, there is less information about the performance of monolinguals and bi/ multilinguals on linguistic as well as nonlinguistic tasks across different age ranges. Hence this study was taken up with the objective of adapting the Cognitive Linguistic Quick test (CLQT) by Estabrooks (2001) to Kannada (CLQT-K) and to standardize it on monolingual (Kannada) and bilingual (Kannada-English) participants in the age range of 20 to 40 years, 40 to 60 years and 60 to 80 years. It also aimed to examine the age related changes in the performance of cognitive linguistic tasks in Kannada speaking monolingual (Kannada) and bilingual (Kannada-English) participants in the age range of 20-40, 40-60 and 60-80 years.

The present study included 180 normal monolingual and bilingual participants who were divided into three age groups namely 20-40, 40-60, and 60-80 years. All the participants had Kannada as their native language, and were screened using Mini Mental

State Examination [MMSE] by Folstein & Mc Hugh (1975)] with a criteria to obtain a score of 25 or above. Another criteria was to have a minimum of tenth grade education and a score of 2 or above for education and a score of 1 or above for occupation in NIMH Socio Economic Status Scale [N.I.M.H. (1999)]. Bilingual participants were to have a score of 1 or above in Kannada in the International Second Language Proficiency Rating Scales [ISLPR] by Wylie (2006). The responses were audio recorded using digital recorder-Ikon ik855. The test battery consisted of ten cognitive linguistic tasks mainly personal facts, symbol cancellation, confrontation naming, clock drawing, story retelling, symbol trails, generative naming, design memory, mazes and design generation. These tasks mainly involved cognitive domains like attention, memory, language, visuospatial skills and executive functions.

The raw scores for each participant were tabulated and appropriate statistical analyses were performed using SPSS (Version 17.00) statistical package. Following this, the mean and standard deviation were computed across each test item distributed in ten tasks and across three age groups. The Cognitive Linguistic Quick Test by Estabrroks (2001) was adapted into Cognitive Linguistic Quick Test in Kannada (CLQT-K) and confidence intervals were obtained for monolingual and bilingual participants in the age group of 20 to 40 years, 40 to 60 years and 60 to 80 years as a part of standardisation of the adapted CLQT-K. The confidence intervals give the estimated upper and lower limit for the population mean. MANOVA and post hoc Duncan's test were carried out to find out the significant difference across age group and various cognitive tasks. Test-retest reliability was employed and alpha coefficient was obtained. An alpha coefficient of >0.98 was obtained for all three age groups for both monolinguals and bilinguals which indicated

high test-retest reliability. Discriminant validity was checked using a stratified sample of clinical population. The clinical population included three participants with aphasia and two participants with dementia. The scores obtained for the clinical population on the CLQT-K were compared with the confidence intervals for all CLQT tasks and the test was found to be useful in distinguishing both clinical and non clinical population. However, this needs to be validated using a large sample of clinical population.

The results of the study are summarized as follows:

- ✓ As age increases there was a degradation in cognitive linguistic performance with age in case of both monolinguals and bilinguals.
- ✓ The monolingual participants in the age groups of 20 to 40 years, 40 to 60 years and 60-80 years showed statistically significant difference in the tasks of personal facts, confrontation naming, design memory and design generation when compared to other tasks. The participants in the age group 60 to 80 years were significantly different from participants in age groups 20 to 40 years and 40 to 60 years in tasks like personal facts and confrontation naming. The participants in the age group 60 to 80 years performed better than the other two groups in tasks like personal facts and confrontation naming on CLQT-K.
- ✓ The bilingual participants in the age groups 20 to 40 years, 40 to 60 years and 60 to 80 years showed statistically significant difference in the tasks of symbol cancellation, clock drawing, symbol trail, generative naming and design generation when compared to other tasks. The participants in the age group 20 to 40 years were significantly different from the age groups 40 to 60 years and 60 to 80 years in tasks like symbol

cancellation, symbol trail and design generation and the age group 40-60 was significantly different from the age groups 20-40 and 60-80 only for clock drawing task. The participants in the age group 20 to 40 years performed better than the other two groups in tasks like symbol cancellation, symbol trail and design generation and the participants in the age group 40 to 60 years performed better than the other two groups in clock drawing task on CLQT-K.

- ✓ On comparing the cognitive linguistic performance of monolingual and bilingual participants in the age group of 20-40, bilinguals showed better performance than monolinguals on non linguistic tasks namely symbol cancellation, clock drawing, symbol trail, design memory, mazes and design generation.
- ✓ On comparing the cognitive linguistic performance of monolingual and bilingual participants in the age group of 40-60, bilinguals show better response for linguistic and non linguistic tasks compared to monolinguals. The linguistic tasks are personal facts, confrontation naming, story retelling and generative naming and the non linguistic tasks are symbol cancellation, clock drawing, symbol trail, design memory, mazes and design generation.
- ✓ On comparing the cognitive linguistic performance of monolingual and bilingual participants in the age group of 60-80, monolinguals showed better response for linguistic than non linguistic tasks. The linguistic tasks are personal facts, confrontation naming, story retelling and generative naming and the non linguistic tasks are symbol cancellation, clock drawing, symbol trail, design memory, mazes and design generation.

In general, age effects on several vocabulary measures (decreasing performance with increasing age) have been noted. The age related cognitive decline may be because of the variables like educational level and the socioeconomic status in monolinguals and bilinguals. The trend noted is that bilinguals show better performance in non-linguistic tasks and monolinguals show better performance in linguistic tasks. Bilingual disadvantages are found in verbal tasks based on lexical access and advantages in non verbal tasks requiring executive control. Therefore the linguistically loaded tasks are more effortful for bilinguals than monolinguals.

Limitations of the study

- ✓ Factors like educational level and socio-economic status were not controlled in the present study. Though subject selection was based on a score of 2 or above for education and a score of 1 or above for occupation in NIMH scale, these were not considered as variables in this study.
- ✓ Data was not obtained separately for male and female separately.
- ✓ This is a cross sectional study and only pilot norms were obtained and only preliminary validation was done.
- ✓ Vocabulary measures were not taken into account between monolingual and bilingual participants.

Implications of the present study:

1. This assessment tool will help the professionals to find out cognitive linguistic performance of Kannada speaking monolingual and bilingual population across three

different age groups, mainly 20 to 40 years, 40 to 60 years, and 60 to 80 years and ten cognitive linguistic tasks.

2. The present study further corroborates the evidence to research in cognitive linguistic performance and the factors contributing to it and opines to carry out extensive research in this area.

3. Profiling of various cognitive skills in different age groups of normal population which in turn be useful in therapeutic intervention.

Future Directions

- This is only a preliminary prestandardisation effort and norm adjustment needs to be done and the present finding is only pilot norms and not standard norms.

- Standardization and norm adjustment/ normalization needs to be done for calculation of scores in for all the cognitive linguistic tasks of CLQT-K.

- Randomized clinical subjects were taken and only discriminant validity was calculated. Future research should focus on more specified and stratified sample of clinical population for obtaining validity.

- Studies addressing issues such as education and socioeconomic status as contributing factors in performance on cognitive linguistic tasks needs to be taken into consideration.

- To study the performance of very old individuals (above 80 years) on cognitive linguistic tasks.

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APPENDIX I A

International Second Language Proficiency Rating Scales [(ISLPR) Wylie, 2006)]

Name: Date:

Circle the number beside the paragraph which you believe most closely describes your level of proficiency in Indonesian in Speaking, Listening, Reading and Writing

SPEAKING

0	Zero Proficiency	I can't communicate anything at all in spoken Indonesian.
0+	Formulaic proficiency	I can communicate by using a limited range of simple stock Indonesian phrases I have learned.
1-	Minimum 'creative' proficiency	I communicate mainly with simple stock Indonesian phrases. I can be 'creative' (ie. Say new things I have **not** learned as stock phrases) but any creative language consists of no more than, for example, a subject and verb with perhaps also an object or adverb, and I make many mistakes that most people have great trouble understanding unless the context makes it very predictable.
1	Basic transactional proficiency	I can communicate my basic needs and basic factual information in situations or on topics that are very familiar (eg I can conduct basic shopping transactions and outline such things as how long and where I have learned Indonesian). I can maintain a very simple conversation (satisfying minimum courtesy requirements) with a simple series of exchanges, using complete, though very simple sentences (generally consisting of a single clause). I make a lot of mistakes and I may have to repeat myself often to be understood.
1+	Transactional Proficiency	I speak Indonesian well enough to take part in simple social conversations in face-to face situations with a background speaker. My language is 'creative' enough (see above) to allow me to interact as an individual, and complex enough to convey my simple opinions about familiar matters. I make a lot of mistakes and I often have great trouble coming up with the vocabulary and structures I need. I make mistakes in grammar, particularly when I am trying to express more complex ideas (e.g. with an 'if' clause).

2	Basic social proficiency	I speak Indonesian well enough to take part in face-to-face conversations with a number of background speakers and in telephone conversations describing familiar things and relating familiar events, and conveying my opinions fairly precisely 'off the cuff'. I use a range of complex sentences (eg with an 'if and 'because'). I often have trouble coming up with the vocabulary I need. I get frustrated in conversations about complex or abstract issues, because I can't express the things I want to, and I worry that other people may think I am ignorant. I use a variety of constructions with clauses but I make mistakes in grammar, particularly when I am trying to express more complex ideas (e.g. with an 'unless' clause). Beyond basic courtesy forms I have limited ability to tailor my language as outlined below.
2+	Social proficiency	I am midway between the description above and the one below.
3	Basic vocational proficiency	I can speak Indonesian well enough to substantiate my own and discuss other people's opinions effectively in conversations or unprepared monologues, although I can't pursue my 'argument' to great depths. I make mistakes, though these rarely confuse or amuse the listener. In familiar situations I can generally tailor what I say and how I say it to considerations such as the formality of the occasion and whether the person I am talking to is older or younger than me, though I cant always come up with the appropriate vocabulary or structure.
3+	Basic vocational proficiency plus	I am midway between the description above and the one below.
4	Vocational proficiency	I can operate effectively in complex in-depth discussions or monologues in social and academic or work situations. My language is mostly accurate, fluent and appropriate to the situation. Someone might think I was a background speaker for a few moments, but they wouldn't be fooled for long.
4+	Advanced vocational proficiency	I am midway between the description above and the one below.
5	Native-like proficiency	I speak the language just as well as similarly educated background speakers do. There is nothing about the way I speak that suggests that I am not a background speaker.

LISTENING

0	I can't understand anything at all when I hear Indonesian spoken, however familiar the topic may be, and however slowly and carefully the other person may speak.
0+	I understand a limited range of short, simple things that I have often heard in Indonesian (e.g. basic personal questions, my own language teacher's basic classroom or tutorial instructions).
1-	I understand a range of short, simple things that I have often heard in Indonesian. I can also understand some 'novel' (i.e. new to me) things in face-to-face situations, provided they are very short and simple (generally consisting of a single clause) and very predictable (e.g. answers to my own questions where the range of possible answers is very limited) and provided the other person uses gestures, and slow, careful speech, and is willing to re-word things in Indonesian to help me.
1	I understand very simple conversations in face-to-face situations with a background speaker of Indonesian, provided the topics are very familiar or have direct relevance to me (e.g. how long and where I have studied the language) and provided the other person uses simple sentences, speaks slowly and repeats or re-words things in Indonesian to help me.
1+	I understand simple conversations in face-to-face situations with a background speaker of Indonesian provided the topics are familiar or of particular interest to me. I can follow some complex sentences (e.g. with an 'if' or 'because' clause) provided the other person is willing to speak slowly and carefully. I understand just isolated bits of very simple news stories on Indonesian TV or radio.
2	I understand when I am participating in conversations with background speakers of Indonesian (face-to-face or on the telephone) about topics that are familiar or of interest to me. If I am not a participant in a conversation (e.g. when I overhear people talking on a bus), I generally understand very little. I can get the main ideas of very simple news stories on Indonesian TV and radio on general (e.g. human-interest) topics, provided the newsreader is speaking relatively slowly
2+	I am midway between the description above and the one below.
3	I understand almost everything when I am participating in social conversations with background speakers of Indonesian on fairly complex and abstract topics (e.g. the extent to which a government should subsidize sporting activities). I can generally follow a conversation I overhear between background speakers (e.g. on a bus) even though I can't understand some things that they say. I can use the telephone for most purposes and I understand most TV and radio news stories.
3+	I am midway between the description above and the one below.

4	I understand most things in the language, even things as difficult as complex radio documentaries with fast speech. However I tend to miss subtle plays on words or references to 'deep' aspects of the culture. I have difficulty with some accents.
4+	I am midway between the description above and the one below.
5	I understand the spoken Indonesian language just as well as similarly educated background speakers do. I understand subtleties and cultural references just as well as they do, and cope just as well when people speak very fast, mumble or have a heavy, unfamiliar accent, or when there is severe interference from background noises.

READING

0	I cant understand anything at all when I read the language, however familiar the topic, and however simple the text
0+	I recognise and understand a limited range of short, simple texts that I have often seen (eg the names of major cities, titles of familiar textbook, common street signs).
1-	I recognise and understand a range of short, simple texts that I have often seen. I can get the essential information in some very simple 'novel' (ie. new to me) texts on very familiar topics provided they are very short (generally consisting of a single clause).
1	I get the essential information in short, very simple 'novel' texts (eg. notices and or advertisements for familiar events or products). I can follow short, very simple instructions (eg consisting of a set of several single-clause sentences) about things I am familiar with. I am lost with longer, more complicated text on less familiar topics.
1+	I get the essential information in simple texts on familiar topics where the meaning is clearly spelled out or where they are fairly predictable (eg circulars about routine events or simple personal notes addressed to me). If the notes are handwritten, the style of handwriting must be one I am familiar with, and the writing neat. I can understand some complex sentences (eg with an 'if' or 'because' clause.). I can follow short, very simple instructions (eg consisting of a set of several single-clause sentences) about things I am familiar with. I am lost with longer, more complicated texts on less familiar topics.
2	I get the essential information in simple texts on familiar topics (eg short, simple human interest stories from a daily paper and personal letters to me about everyday events). Handwriting must be in a standard style and neat. I may need to use a dictionary to help with unfamiliar key items.
2+	I am midway between the description above and the one below.
3	I get the essential information from straightforward texts such as general news stories in the daily paper and semi-technical texts in familiar fields (eg middle school text books in a subject I am interested in). I don't need a dictionary unless I want a full understanding of these (eg to do a translation). I can read short popular novels for enjoyment, although I need a lot more time than a similarly educated background speaker.
3+	I am midway between the description above and the one below.

4	I generally understand quite complex texts (eg editorials in an 'intellectual' newspaper and very detailed articles in my own field of interest) although I miss subtle plays on word or references to 'deep' aspects of culture. I read these texts nearly as fast as a similarly educated background speaker does. I cope with most forms of print and handwriting
4+	I am midway between the description above and the one below.
5	I understand the written language just as well as similarly educated background speakers do. I understand subtleties and cultural references and cope with non-standard or untidy handwriting just as well as they do.

WRITING

0	I can't communicate anything at all in written Indonesian.
0+	I can communicate by using a limited range of simple stock Indonesian phrases I have learned.
1-	I communicate mainly with simple, stock Indonesian phrases I have memorised. I can be 'creative' (see SPEAKING) but any creative language consists of just, for example, a subject and verb with perhaps also an object or adverb. Even using a dictionary I make so many mistakes that most readers have great trouble working out what I want to convey unless the context makes it very predictable. I'm usually concentrating so much on the basic vocabulary that I can't worry about grammatical accuracy.
1	I can communicate my basic needs and basic factual information about very familiar things to a background speaker who is sympathetic and/or experienced in communicating with beginning learners of Indonesian. I can use complete, though very simple, sentences (generally consisting of a single clause). When I need to use more than one sentence to convey a message, I can't make links between the ideas in these sentences through language (with words such as 'however' or 'therefore') so I rely on the reader's knowledge of the context and ability to 'read between the lines'. Even using a dictionary I make a lot of mistakes, but I generally get my meaning across if the reader has good will and patience.
1+	I can write Indonesian well enough to conduct simple social correspondence with background speaking friends and to describe myself to a stranger such as a member of the community who has volunteered to be a language partner. My language is 'creative' enough (see SPEAKING) to allow me to interact as an individual, and complex enough to convey my simple opinions about familiar matters. Even if I use a dictionary, however, I make a lot of mistakes, particularly when I try to express more complex things (e.g. with an 'if' clause) but I generally get my ideas across.
2	I can write Indonesian well enough to describe familiar things, relate familiar matters and to convey my opinions about them fairly precisely 'off the cuff'. I use a range of complex sentences (eg, with 'if' and 'because'). Even using a dictionary I make a lot of mistakes but I generally get my ideas across. I have limited ability to tailor my language as outlined below.
2+	I am midway between the description above and the one below.
3	I can write Indonesian well enough to substantiate my own opinion and to discuss other peoples' opinions, though I can't pursue my 'argument' in great depth. Readers generally follow the development of my reasoning, though it may seem quite 'second-language' in its organisation. Even when I use a dictionary I make mistakes, but these rarely confuse or amuse the reader. In familiar situations I can tailor what I write and how I write it to considerations such as the intended

	audience, my purpose in writing, and the type of text.
3+	I am midway between the description above and the one below.
4	I can write texts as complex as a major project report or a senior school history assignment. My language is mostly accurate and appropriate. Someone might think I was a background speaker after reading a few sentences but they wouldn't be fooled for long.
4+	I am midway between the description above and the one below.
5	I write the language just as well as similarly educated background speakers do. If I make any mistakes, they are the sorts of mistakes that such background speakers make.

APPENDIX I B

NIMH SOCIO-ECONOMIC STATUS SCALE

National Institute for the Mentally Handicapped (1999)

Grade	Occupation	Score	Descriptions/Illustrations
I	Professional	5	Doctors, Engineers, Chartered or Cost Accountants, IT Professionals, Architects, Audiologists, Group A Jobs, Large Scale business with turnover above INR 50 lakh per annum, etc
II	Semi-Professional	4	Technicians, Skilled Workers, Business with turnover between INR 10-20 lakh per annum, Group B Jobs, etc
III	Technical	3	Technicians, Skilled Workers, Business with turnover between INR 5-10 lakh per annum, Group C Jobs, etc
IV	Semi-skilled	2	Assistants to Techies, Farmers, Field Workers, Group D Staff, auto/taxi drivers, small time painters, carpenters, bartenders, etc
V	Unskilled	1	Part time Jobbers, Manual Workers, House Maids, porters, etc

Grade	Highest Education	Score	Descriptions/Illustrations
I	P G & Above	5	Post Graduate Diplomas, Doctorates, Professional Qualifications, etc
II	Graduates	4	Graduates with Diploma, etc
III	Under-Graduates	3	Pre-University Courses, Intermediate, Plus Two Level Courses, etc
IV	Middle & High School	2	Passed or Failed Tenth Class, SSC, SSLC, etc
V	Illiterate	1	Unread or cannot read or write

APPENDIX I C

Mini-Mental State Examination [(MMSE) Folstein & Mc Hugh, 1975]

Patient's Name: _____ Date:

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

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

Interpretation of the MMSE:

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

Interpretation of MMSE Scores:

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

APPENDIX II

Cognitive –Linguistic Quick Test in Kannada (CLQT - K)

[A] PERSONAL FACTS

"I want you to answer the questions mentioned below".

1."When were you born?"

¤ÃªÀÅ ºÀÄnÖzÀ ¢£ÁAPÀ vÁjÃRÄ AiÀiÁªÀÅzÀÄ ? (¤ÃªÀÅ AiÀiÁªÁUÀ ºÀÄnÖzÀÄÝ ?)

2."Where were you born?"

¤ÃªÀÅ J°è ºÀÄnÖzÀÄÝ?

3.What is your age now?"

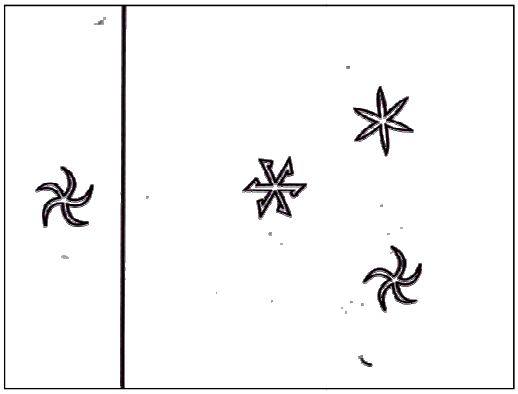
¤ªÀÄä ªÀAiÀÄ¸ÀÄì JµÀÄÖ?

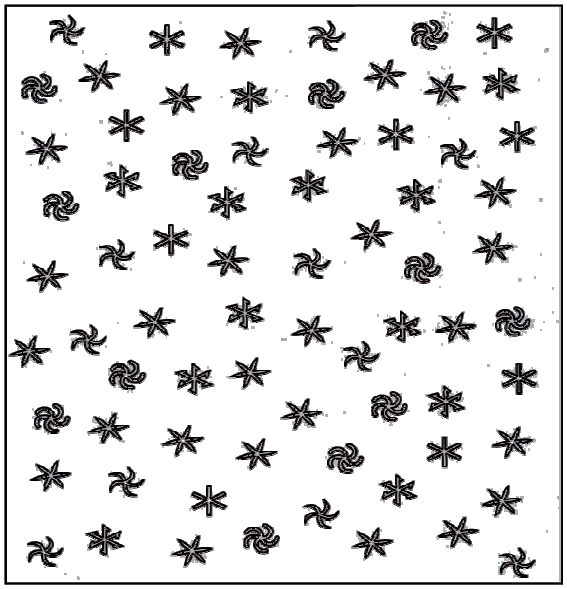
4.What is your complete current address?"

¤ªÀÄä ¥ÀÆtð/ ¥ÀÆwð «¼Á¸À K£ÀÄ?

[B] SYMBOL CANCELLATION

"Look at this symbol  .. This symbol appears several times on the page. I'm going to cross out the symbol."[TRIAL]. "Now, I want you to cross out every example of this symbol on the page. Do you have any questions? You have 2 minutes. Start now."





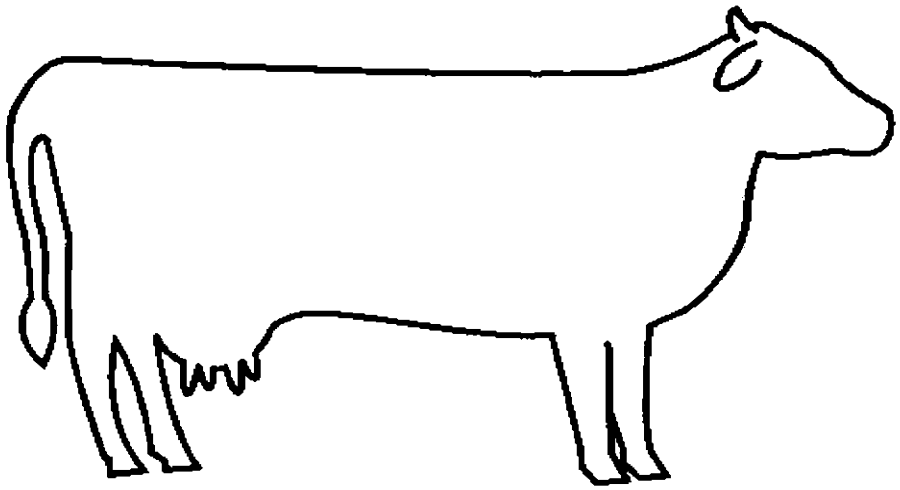
F aºÉß (¹A§¯ï) AiÀÄ£ÀÄß £ÉÆÃr CxÀªÁ EzÀ£ÀÄß £ÉÆÃr. EzÀÄ §ºÀ¼À ¸Áj F PÁUÀzÀzÀ°è PÁtÂ¸ÀÄvÀÛzÉ. £Á£ÀÄ F aºÉßAiÀÄ ªÉÄÃ¯É VÃlÄ ºÁPÀÄvÉÛÃ£É CxÀªÁ UÉgÉ ºÁPÀÄvÉÛÃ£É. ¤ÃªÀÅ ¸ÀºÀ FUÀ EzÉÃ vÀgÀºÀ aºÉßUÀ¼À£ÀÄß UÀÄgÀÄw¹, UÉgÉ J¼É¬Äj. ¤ªÀÄUÉ K£ÁzÀgÀÆ ¥Àæ±ÉßUÀ½ªÉAiÉÄÃ?

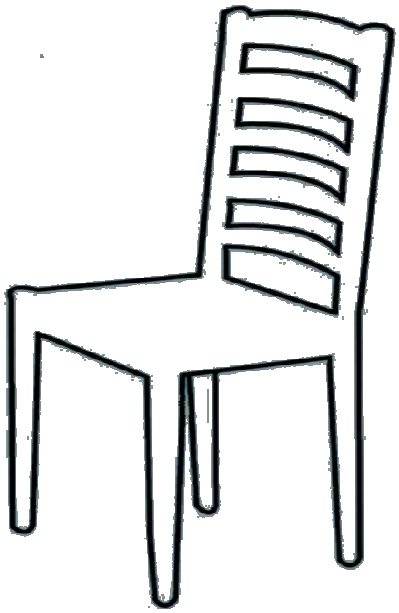
¤ªÀÄUÉ JgÀqÀÄ ¤«ÄµÀUÀ¼À ¸ÀªÀÄAiÀÄªÀ£ÀÄß PÉÆqÀ¯ÁUÀÄvÀÛzÉ, FUÀ ±ÀÄgÀÄªÀiÁr

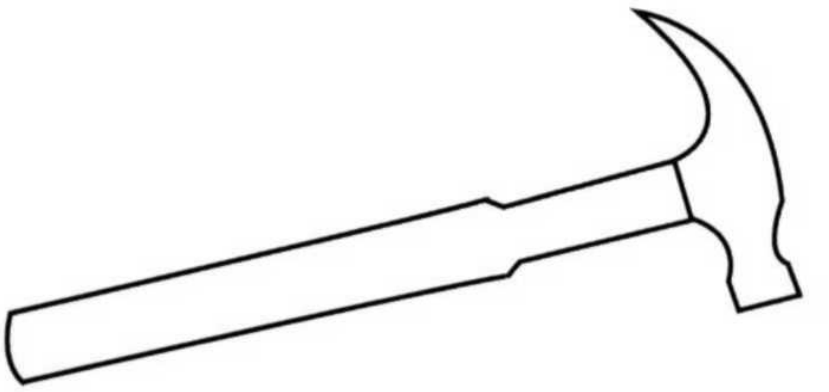
[C] CONFRONTATION NAMING

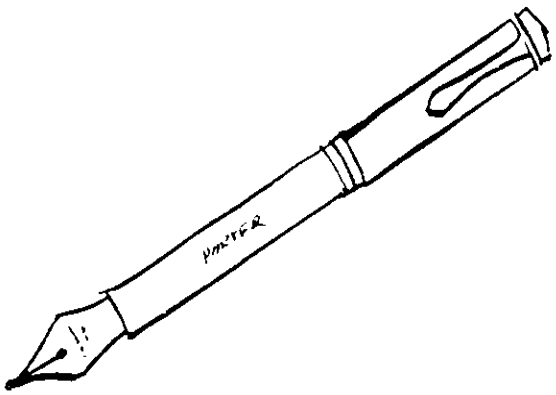
"Now, I want to name some pictures." You have 30 seconds time for each picture.

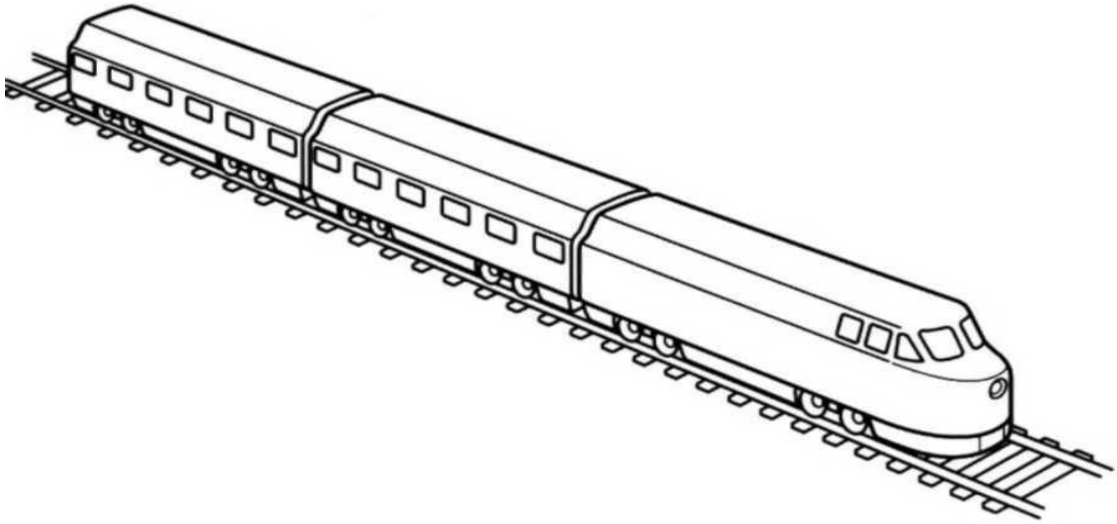
FUÀ ¤ÃªÀÅ F avÀæUÀ¼À£ÀÄß ºÉ¸Àj¹. ¤ªÀÄUÉ ¥ÀæwAiÉÆAzÀÄ avÀæPÀÆÌ 30 ¸ÉPÉAqÀÄ ¸ÀªÀÄAiÀÄªÀ£ÀÄß PÉÆqÀ¯ÁUÀÄvÀÛzÉ.

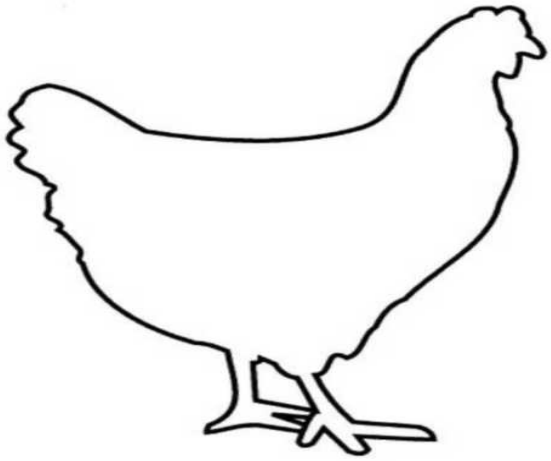


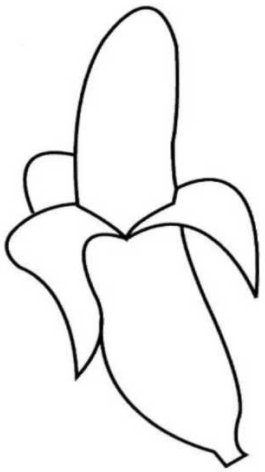


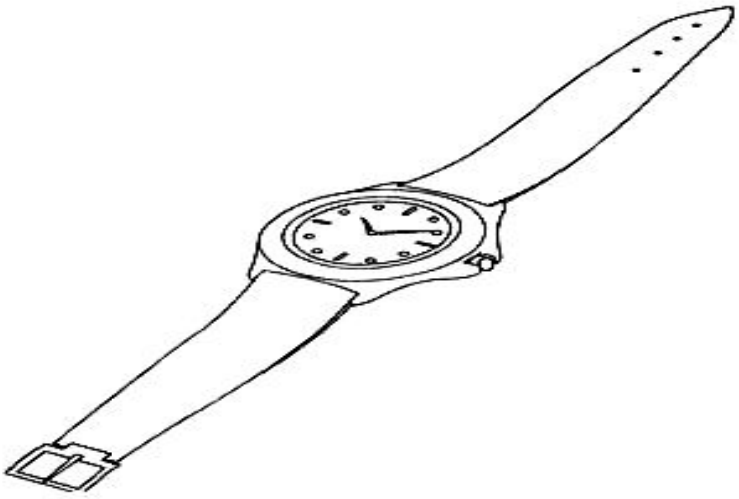



PILOT







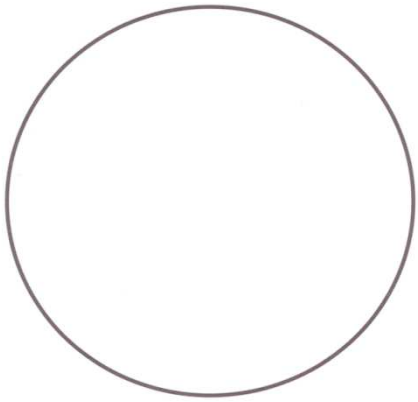


Confrontation naming

Item	Acceptable variations	Response
1.cow ºÀ¸ÀÄ	/eṯṯu/, /ḏəna/ JvÀÄÛ/zÀ£À	
2.chair PÀÄað		
3.hammer ¸ÀÄwÛUÉ		
4.pen ¯ÉÃR¤	¥É£ÀÄß	
5.train gÉÊ®Ä		
6.chicken,hen,rooster PÉÆÃ½	ºÀÄAd	
7.banana ¨Á¼ÉÃºÀtÄÚ	¨Á¼ÉPÀzÀ½	
8.shirt ±ÀlÄð	/əŋ⍰/ CAV	
9.watch ªÁZÀÄ		
10.(eye) glasses PÀ£ÀßqÀPÀ		

[D] CLOCK DRAWING

“I want you to draw a clock on the page. First, put all the numbers inside the circle. Then, set the hands to ’10 minutes after 11.’ Be careful. Be neat. You have 3 minutes.”



¤ÃªÀÅ FUÀ PÁUÀzÀzÀ°è MAzÀÄ UÀrAiÀiÁgÀzÀ avÀæªÀ£ÀÄß ©r¸À¨ÉÃPÀÄ. ªÉÆzÀ®Ä J®è ¸ÀASÉåUÀ¼À£ÀÄß ªÀÈvÀÛzÀ M¼ÀUÉ §gÉAiÀÄ¨ÉÃPÀÄ. ªÀÄvÉÛ UÀrAiÀiÁgÀzÀ PÉÊUÀ¼À£ÀÄß ºÀ£ÉÆßAzÀÄ UÀAmÉ ºÀvÀÄÛ ¤«ÄµÀPÉÌ ¤°è¹. ºÀÄµÁgÁV ±ÀÄgÀÄªÀiÁr. ZÉÆPÀÌªÁV ªÀiÁr. £Á£ÀÄ ¤ªÀÄUÉ ªÀÄÆgÀÄ ¤«ÄµÀ ¸ÀªÀÄAiÀÄ PÉÆqÀÄvÉÛÃ£É..

[E] STORY RETELLING

“I’m going to tell you a short story. Listen carefully. I want you to repeat the whole story back to me exactly as I tell it to you . I can only read it one time”. “Now, tell me the same story. You have 2 minutes”.

£Á£ÀÄ FUÀ ¤ªÀÄUÉÆAzÀÄ ¸ÀtÚ PÀxÉAiÀÄ£ÀÄß ºÉÃ¼ÀÄvÉÛÃ£É, ¤ÃªÀÅ D PÀxÉAiÀÄ£ÀÄß CzÉÃ vÀgÀºÀ ªÁ¥À¸ï ºÉÃ¼À¨ÉÃPÀÄ. ¸ÀjAiÀiÁV PÉÃ½¹PÉÆ½î. £Á£ÀÄ ºÉÃ½zÀ jÃwAiÀÄ°è ¤ÃªÀÅ £À£ÀUÉ ¥ÀÆwð PÀxÉAiÀÄ£ÀÄß ªÁ¥À¸ÀÄ (wgÀÄV) ºÉÃ¼À¨ÉÃPÀÄ. £Á£ÀÄ CzÀ£ÀÄß MAzÉÃ ¸Áj ºÉÃ¼ÀÄvÉÛÃ£É ¸Àj£Á? FUÀ ±ÀÄgÀÄ ªÀiÁr.

ªÀÄAdÄ¼Á¼À ºÀÄlÄÖºÀ§âzÀAzÀÄ CªÀ¼À UÀAqÀ CªÀ½UÉ ¸ÀÄAzÀgÀªÁzÀ ªÀdæzÀ GAUÀÄgÀªÀ£ÀÄß ¤ÃrzÀ£ÀÄ. D gÁwæ CªÀ¼ÀÄ D GAUÀÄgÀªÀ£ÀÄß ºÁQPÉÆ¼Àî®Ä wÃªÀiÁð¤¹zÀ¼ÀÄ.DzÀgÉ CzÀÄ PÁtÂ¸À°®è. CªÀ¼ÀÄ CzÀ£ÀÄß J¯Áè PÀqÉ ºÀÄqÀÄQzÀ¼ÀÄ, £ÀAvÀgÀ C¼À®Ä ¥ÁægÀA©ü¹zÀ¼ÀÄ. PÀtÄÚ MgÉ¸À®Ä aÃ®PÉÌ PÉÊ ºÁQ ZËPÀªÀ£ÀÄß vÉUÉzÀ¼ÀÄ, ºÁUÉ vÀ£Àß GAUÀÄgÀªÀÅ ¹QÌvÀÄ. CªÀ½UÉ §ºÀ¼À ¸ÀAvÉÆÃµÀªÁ¬ÄvÀÄ.

/məd□u□ana □ə□a □v□□a huʈʈuhəbbaḍə̈ḍu məʤuɬanɪge onḍu suḍarava□ḍa v□d□raḍa uɲur□v□nnu ni□d□ḍ□nu a□ ra□ṯri □v□□u a□ uɲur□v□nnu ha□k□ho□□uvuḍə̃ḍu ṭi□rma□n□s□ḍ□□u a□ḍ□re □du ka□□ejat□□□ṯṯu a□ke □d□nnu ella□ k□□e hu□uk□ḍa□u m□ṯṯe □□□ḍu pra□r□mb□□s□□ḍ□□u □v□□u

k□□ t□□ukav□nnu ṯe□ejəlu d□e□b□□e kə□ ha□k□də□u əll□ a□ uɲurəvu s□kk□ṯu/

Story elements	Response
1.mə̃d□u□ana ªÀÄAdÄ¼À£À	
2.□ə̃□a UÀAqÀ	
3.huṯṯuhəbbaḍə̃ḍu ºÀÄlÄÖ ºÀ§âzÀAzÀÄ	
4.v□d□raḍa ªÀdæzÀ	
5.uɲur□v□nnu GAUÀÄgÀªÀ£ÀÄß	
6.ra□ṯri gÁwæ	
7.ha□k□ho□□uvuḍẽḍu ºÁQPÉÆ¼Àî®Ä	
8.ka□□ejat□□□ṯṯu PÁuÉAiÀiÁVvÀÄÛ	
9.hu□uk□ḍa□u ºÀÄqÀÄQzÀÝ¼ÀÄ	

10.□□□d̪u pra□r□mb□□s□□d̪□□u C¼À®Ä- ¥ÁægÀA©ü¹zÀ¼ÀÄ	
11.k□□ t□□ukav□nnu PÉÊ ZËPÀªÀ£ÀÄß	
12.d□e□b□□e eÉÃ©UÉ	
13.k□□ ha□k□d□□u PÉÊ ºÁQzÀ¼ÀÄ	
14. s□kk□t̪u ¹QÌvÀÄÛ	

AUDITORY COMPREHENSION

“Now I’m going to ask some questions about the story. Just answer ‘yes’ or ‘no.’

Questions

1. PÀxÉAiÀÄ°ègÀÄªÀ ºÉAUÀ¹£À ºÉ¸ÀgÀÄ ¸Àà¥Àß£Á?

   kət̪ejəlliruvə heŋəsinə həsəru swəpnənə:

2. DPÉUÉ UÀAqÀ£ÀÄ CªÀ¼À ºÀÄlÄÖºÀ§âPÉÌ ªÀdæzÀ GAUÀÄgÀªÀ£ÀÄß PÉÆnÖzÀÝ£Á?

   ə:kəgə gənd̪ənu əvəɬə huʈʈuhəbbakke vədʒrad̪a uŋurəvənnu kottid̪a:nə:

3. vÀ¦à J¯ÁèzÀgÀÆ DPÉ D GAUÀÄgÀªÀ£ÀÄß J¸É¢zÀÝ¼ÉÃ

   t̪əppi ɛllə:d̪əru ə:ke ə:uŋurəvənnu ɛsid̪id̪d̪ə:lə

4. D ºÉtÂÚ£À ºÉ¸ÀgÀÄ ªÀÄAdÄ¼À JA¢vÁÛ?

ə: ʒuɬa ɛndithə:

5. CªÀ¼À UÀAqÀ CªÀ¼À ºÀÄlÄÖ ºÀ§âPÉÌ ºÀªÀ¼ÀzÀ GAUÀÄgÀªÀ£ÀÄß ¤ÃrzÀ£ÉÃ?

əvəɬə gəndʐə əvəɬə huʈʈuhəbbakke həvaɬədə uɲurəvənnu ni:didəne

6. CªÀ½UÉ CªÀ¼À aÃ®zÀ°è GqÀÄUÉÆgÉ ¸ÁªÀiÁ£ÀÄ ¹QÌvÉÃ?

əvəɬigə əvəɬə tʃi:l ədəlli udugore sə:mə:nu sikkitɛ:

[F] SYMBOL TRIALS

Trial 1: Circles by Size

"Look at these circles. They are different sizes. I will connect them by drawing lines between them. I will start with the smallest circle and draw a line to the next biggest circle. Now I will draw a line to the biggest circle in figure: 1"

"Now I want you to start from the smallest circle and draw a line from that circle to the next biggest circle, and then keep going.in figure: 2". You have 1 minute.

Figure:1

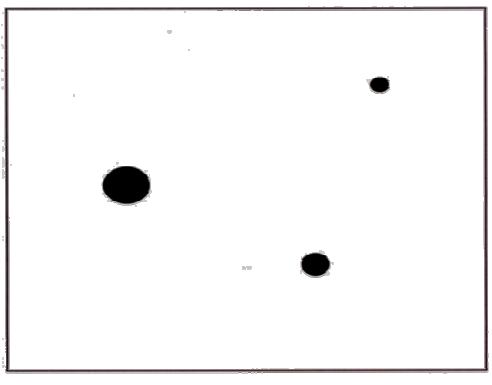
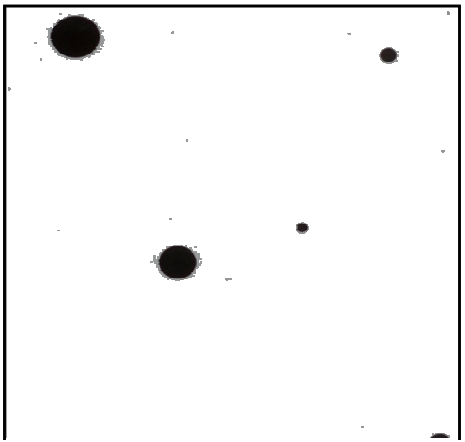


Figure:2



F ªÀÈvÀÛUÀ¼À£ÀÄß UÀªÀÄ¤¹. CªÀÅUÀ¼ÀÄ ¨ÉÃgÉ ¨ÉÃgÉ C¼ÀvÉUÀ¼À°è EzÉ. £Á£ÀÄ CªÀÅUÀ¼À£ÀÄß UÉgÉ J¼ÉzÀÄ ¸ÉÃj¸ÀÄvÉÛÃ£É. £Á£ÀÄ Cw aPÀÌzÁzÀ ªÀÈvÀÛ¢AzÀ UÉgÉ ±ÀÄgÀÄ ªÀiÁqÀÄvÉÛÃ£É ªÀÄvÀÄÛ CzÀgÀ ªÀÄÄA¢£À C¼ÀvÉAiÀÄ CzÀQÌAvÀ ¸Àé®à zÉÆqÀØ ªÀÈvÀÛPÉÌ ¸ÉÃj¸ÀÄwÛÃ¤. FUÀ £Á£ÀÄ Cw zÉÆqÀØ C¼ÀvÉAiÀÄ ªÀÈvÀÛPÉÌ ¸ÉÃj¸ÀÄvÉÛÃ£É. F PÁUÀzÀzÀ°è CzÀ£ÉßÃ ¤ÃªÀÅ ªÀiÁqÀ¨ÉÃPÀÄ. Cw aPÀÌzÁzÀ ªÀÈvÀÛ AiÀiÁªÀÅzÀÄ? ¸Àj, FUÀ CzÀQÌAvÀ zÉÆqÀØ ªÀÈvÀÛPÉÌ UÉgÉ J¼É¬Äj ºÁUÀÆ ºÁUÉÃ ªÀÄÄAzÀÄªÀj¹. £Á£ÀÄ ¤ªÀÄUÉ ¸ÀºÁAiÀÄ ªÀiÁqÀ®Ä ¸ÁzsÀå«®è.¤ªÀÄUÉ ¸ÁzsÀåªÁzÀµÀÄÖ ªÀiÁr, ¤ªÀÄUÉ £Á£ÀÄ MAzÀÄ ¤«ÄµÀ ¸ÀªÀÄAiÀÄ PÉÆqÀÄvÉÛÃ£É. ¸Àj.

Trial 2: Alternating Shapes

“Now look at these circles and triangles. I will connect them by drawing lines between them. I will start with this circle and draw a line to the triangle. Now I will draw a line from the triangle to the other circle .Now I will draw a line to the last triangle in figure: 1”

“Now I want you to start with the circle and draw a line from the circle to a triangle, and then keep going, circle to triangle to circle, and so on in figure: 2”. You have 2 minutes .

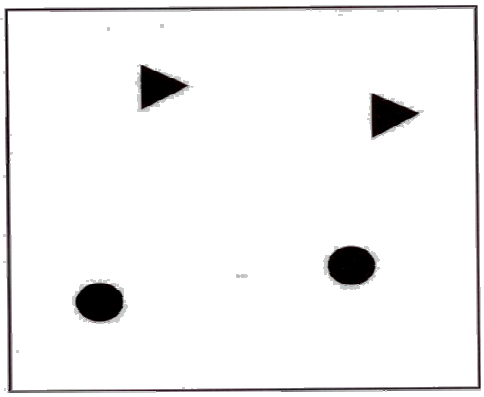


Figure:1

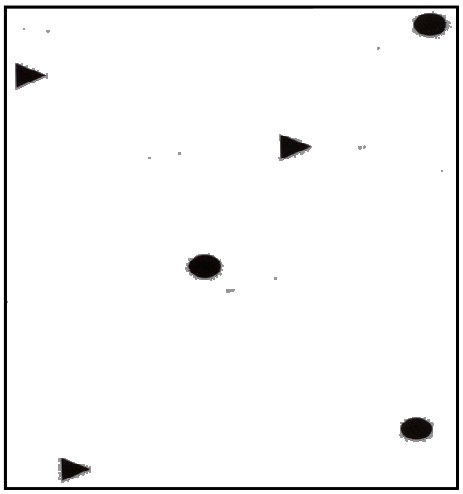


Figure:2

FUÀ F ªÀÈvÀÛUÀ¼ÀÄ ºÁUÀÄ wæ¨sÀÄdUÀ¼À£ÀÄß £ÉÆÃrj. £Á£ÀÄ CªÀÅUÀ¼À£ÀÄß UÉgÉ J¼ÉzÀÄ ¸ÉÃj¸ÀÄvÉÛÃ£É. £Á£ÀÄ F ªÀÈvÀÛUÀ½AzÀ ¥ÁægÀA¨sÀªÀiÁr wæ¨sÀÄdPÉÌ ¸ÉÃj¸ÀÄvÉÛÃ¤ FUÀ wæ¨sÀÄd¢AzÀ ¨ÉÃgÉ ªÀÈvÀÛPÉÌ UÉgÉ J¼ÉAiÀÄÄvÉÛÃ£É. £Á£ÀÄ FUÀ PÉÆ£É wæ¨sÀÄdPÉÌ UÉgÉAiÀÄ£ÀÄß J¼ÉAiÀÄÄvÉÛÃ£É. F PÁUÀzÀ°è CzÀ£ÉßÃ ¤ÃªÀÅ ªÀiÁqÀ¨ÉÃPÀÄ. F ªÀÈvÀÛ¢AzÀ ±ÀÄgÀÄªÀiÁrj.F ªÀÈvÀÛ¢AzÀ wæ¨sÀÄdPÉÌ MAzÀÄ UÉgÉ J¼ÉAiÀÄj ºÁUÀÄ ºÁUÉAiÉÄÃ ªÀÄÄAzÀÄªÀj¹, ªÀÈævÀÛ¢AzÀ wæ¨sÀÄdPÉÌ, wæ¨sÀÄd¢AzÀ ªÀÈvÀÛPÉÌ, ºÁUÉ ªÀiÁqÀÄwÛj. £Á£ÀÄ ¤ªÀÄUÉ ªÀÄÆgÀÄ ¤«ÄµÀ ¸ÀªÀÄAiÀÄ PÉÆqÀÄvÉÛÃ£É. ¤ªÀÄUÉ ¸ÁzsÀåªÁzÀµÀÄÖ ZÉ£ÁßV ªÀiÁr.

Scored Item : Alternating Sizes and Shapes

“Look at these circles and triangles. They are different sizes. I will connect them by drawing lines between them. I will start with the smallest triangle and draw a line to the smallest triangle. Now I will draw a line to the next biggest circle, and then to the next biggest triangle in figure: 1)

Now I want you to connect by drawing lines starting from the smallest circle and then keep going….circle, triangle, circle and so on in figure: 2”. You have 3 minutes .

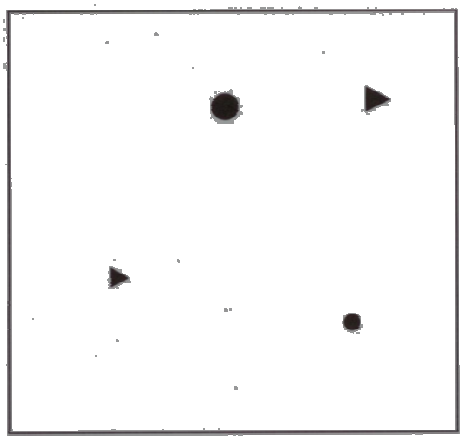


Figure: 1

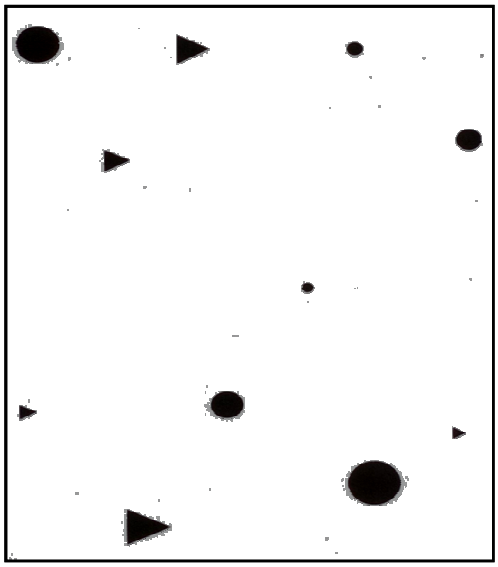


Figure: 2

F ªÀÈvÀÛUÀ¼À£ÀÄß ªÀÄvÀÄÛ wæ¨sÀÄdUÀ¼À£ÀÄß £ÉÆÃrj. EªÀÅ ¨ÉÃgÉ ¨ÉÃgÉ C¼ÀvÉUÀ¼À°èzÉ £Á£ÀÄ CªÀÅUÀ¼À£ÀÄß UÉgÉ J¼ÉzÀÄ ¸ÉÃj¸ÀÄvÉÛÃ£É. £Á£ÀÄ Cw aPÀÌ ªÀÈvÀÛ¢AzÀ UÉgÉ ±ÀÄgÀÄ ªÀiÁqÀÄvÉÛÃ£É ªÀÄvÀÄÛ Cw aPÀÌ wæ¨sÀÄdPÉÌ UÉgÉ ¸ÉÃj¸ÀÄvÉÛÃ£É. FUÀ £Á£ÀÄ ªÀÄÄA¢£À Cw zÉÆqÀØ ªÀÈvÀÛPÉÌ UÉgÉ

J¼ÉAiÀÄÄvÉÛÃ£É.F PÁUÀzÀzÀ°è CzÀ£ÀÄß ¤ÃªÀÅ ªÀiÁqÀ¨ÉÃPÀÄ. FUÀ Cw aPÀÌ ªÀÈvÀÛªÀ£ÀÄß vÉÆÃj¹.Àj FUÀ D ªÀÈvÀÛ¢AzÀ Cw aPÀÌ wæ¨sÀÄdPÉÌ UÉgÉ J¼É¬Äj ºÁUÉ ªÀÄÄAzÀÄªÀj¹ ªÀÈvÀÛ, wæ¨sÀÄd, ªÀÈvÀÛ ºÁUÉ ºÉÆÃUÀÄvÁÛ Ej. £Á£ÀÄ ¤ªÀÄUÉ ªÀÄÆgÀÄ ¤«ÄµÀ ¸ÀªÀÄAiÀÄªÀ£ÀÄß PÉÆqÀÄ vÉÛÃ£É. ¤ªÀÄUÉ ¸ÁzsÀåªÁzÀµÀÄÖ ZÉ£ÁßV ªÀiÁr.

[G] GENERATIVE NAMING

Subtask 1- Animals

“I want you to name as many different animals as you can in 1 minute. What animals can you think of?”

FUÀ ¤ªÀÄUÉ JµÀÄÖ ¸ÁzsÀåªÉÇÃ CµÀÄÖ ¨ÉÃgÉ ¨ÉÃgÉ ¥ÁætÂUÀ¼À ºÉ¸ÀgÀÄUÀ¼À£ÀÄß MAzÀÄ ¤«ÄµÀzÀ°è ºÉÃ¼À¨ÉÃPÀÄ. £Á£ÀÄ ¤ªÉÆäqÀ£É ¸À°ÀPÀj¸À®Ä ¸ÁzsÀå«®è. ¤ªÀÄUÉ JµÀÄÖ ¸ÁzsÀåªÉÇÃ CµÀÄÖ ªÀiÁr.

Subtask 2 - m words

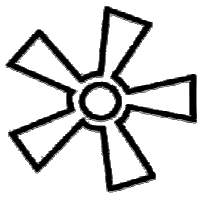
“Now I want you to name as many words as you can in 1 minute that start with the letter m. Proper nouns are not allowed. Do not say the same word again with a different ending, like mop, then mopped or mopping.”

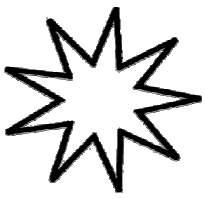
FUÀ ¤ÃªÀÅ ‘ªÀÄ' CPÀëgÀ¢AzÀ ±ÀÄgÀÄªÁUÀÄªÀ JµÀÄÖ ¥ÀzÀUÀ¼ÀÄ ¸ÁzsÀåªÉÇÃ CµÀÄÖ ¥ÀzÀUÀ¼À£ÀÄß MAzÀÄ ¤«ÄµÀzÀ°è ºÉÃ¼À¨ÉÃPÀÄ DzÀgÉ £ÁªÀÄ ¥ÀzÀUÀ¼À£ÀÄß ºÉÃ¼À¨ÁgÀzÀÄ. £Á£ÀÄ ¤ªÉÆäqÀ£É ¸ÀºÀPÀj¸À®Ä ¸ÁzsÀå«®è.ºÉÃ½zÀ ¥ÀzÀªÀ£ÉßÃ ¥ÀÄ£À: ºÉÃ¼À¨ÉÃr.GzÁ: MgÉ¸ÀÄ... JAzÀÄ ºÉÃ½zÀ ªÉÄÃ¯É... MgÉ¸ÀÄªÀÅzÀÄ, MgÉ¸ÀÄvÁÛ£É »ÃUÉ CzÉÃ ¥ÀzÀªÀ£ÀÄß ºÉÃ¼À¨ÁgÀzÀÄ.

[H] DESIGN MEMORY

“Look at these designs carefully. There are 3 sets of designs. I want you to remember what they look like. Try to remember them because I can only show them once.”

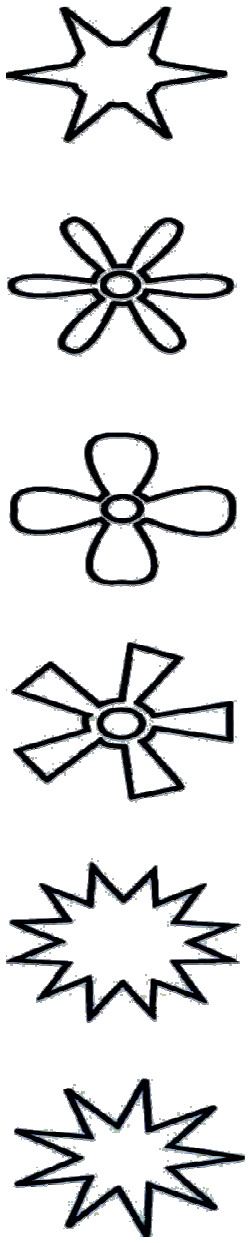
Picture no:1





F DPÀÈwUÀ¼À£ÀÄß £ÉÆÃr E°è ªÀÄÆgÀÄ ¸Émï£À°è ««zsÀ DPÀÈwUÀ½ªÉ. ¤ÃªÀÅ F DPÀÈwUÀ¼À£ÀÄß eÁÕ¥ÀPÀzÀ°èlÄÖPÉÆ¼Àî¨ÉÃPÀÄ £Á£ÀÄ ¤ªÀÄUÉ PÉÃªÀ® MAzÉÃ ¸À® EªÀÅUÀ¼À£ÀÄß vÉÆÃj¸ÀÄvÉÛÃ£É.

“Point to the designs I just showed you.” You have 10 seconds time for each response to each task.



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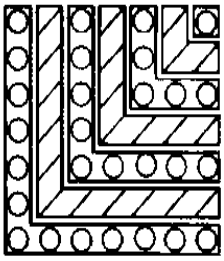
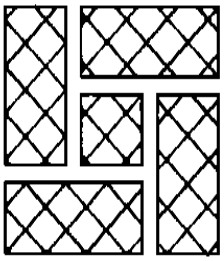
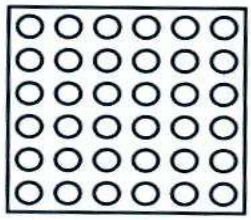
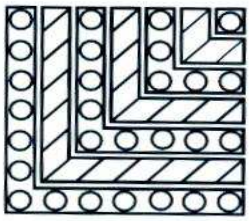
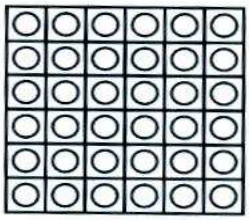
Picture no:2

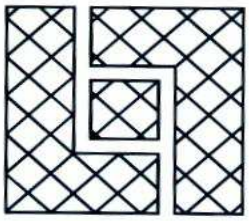


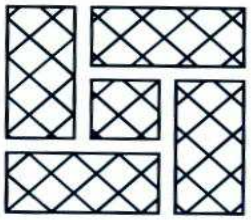


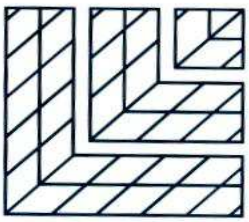












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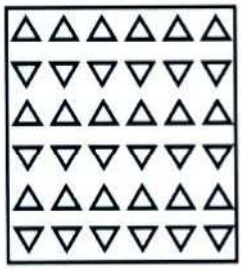
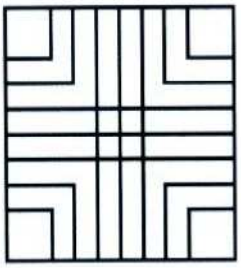
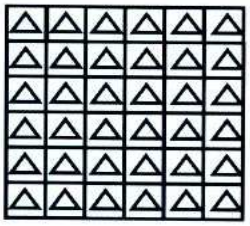
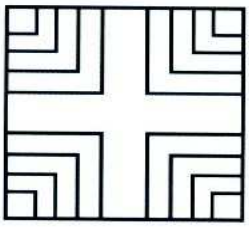
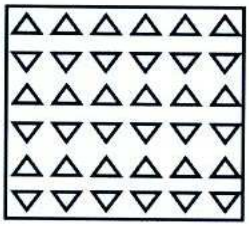
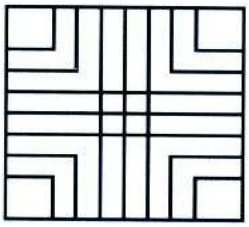


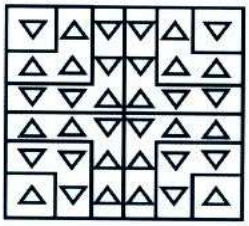


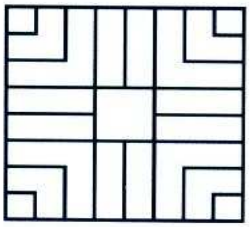








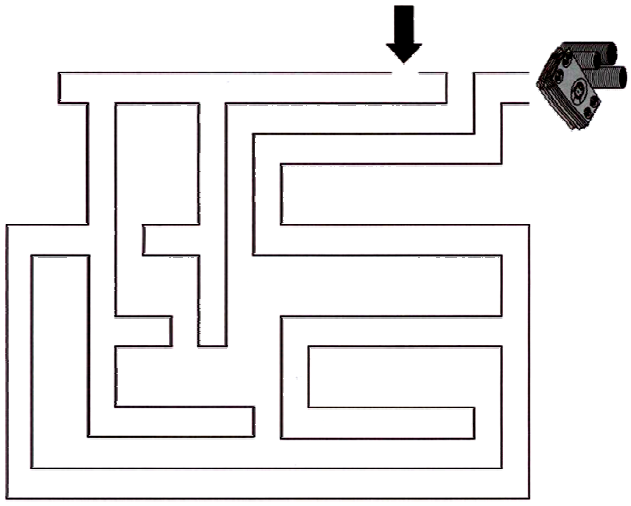




[I] MAZES

Maze 1

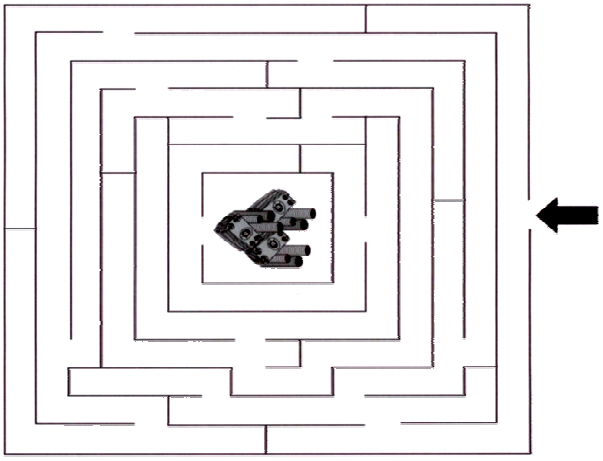
“ Use the pen to trace a path through the maze to get to the money. Stay in the alleys and don’t go through any walls. You have 60 seconds to complete the maze. Do you have any questions? Begin at the arrow. Start now.”



ºÀtªÀ£ÀÄß ¹UÀ®Ä F ZÀPÀæªÀÇåºÀzÀ zÁjAiÀÄ°è ¥É£ÀÄß G¥ÀAiÉÆÃV¹ UÉgÉAiÀÄ£ÀÄß ºÁQ. ZÀPÀæªÀÇåºÀzÀ UÉÆÃqÉUÀ¼À£ÀÄß ªÀÄÄnÖ¸À¨ÁgÀzÀÄ. F ZÀPÀæªÀÇåºÀzÀ DlªÀ£ÀÄß ªÀÄÄj¸À®Ä ¤ªÀÄUÉ 60 ¸ÉPÉAqÀÄUÀ½zÉ. K£ÁzÀgÀÆ ¥Àæ±ÉßUÀ½ªÉAiÀiÁ? FUÀ ±ÀÄgÀÄ ªÀiÁr. (¨ÁtzÀ UÀÄgÀÄw£À PÀqÉ¬ÄAzÀ ±ÀÄgÀÄªÀiÁr)

Maze 2

“you have 2 minutes to trace a path through this maze. Do you have any questions? Begin at the arrow. Start now.”



F ZÀPÀæªÀÇåºÀ ¸ÀjAiÀiÁzÀ zÁj ºÀÄqÀÄPÀ®Ä/ PÀAqÀÄ »rAiÀÄ®Ä ¤ªÀÄUÉ 2 ¤«ÄµÀUÀ¼À CªÀPÁ±À«zÉ. ¨ÁtzÀ UÀÄgÀÄw¤AzÀ ±ÀÄgÀÄ ªÀiÁr. FUÀ ±ÀÄgÀÄ ªÀiÁr. ¥ÀæAiÀÄvÀß ªÀiÁqÀÄvÁÛ Ej. ¤ªÀÄUÉ ¸ÁzsÀåªÁUÀÄªÀµÀÄÖ ¥ÀæAiÀÄvÀß ªÀiÁr (¸ÀjAiÀiÁzÀ zÁj ºÀÄqÀÄPÀ®Ä ¥ÀæAiÀÄwß[1]).

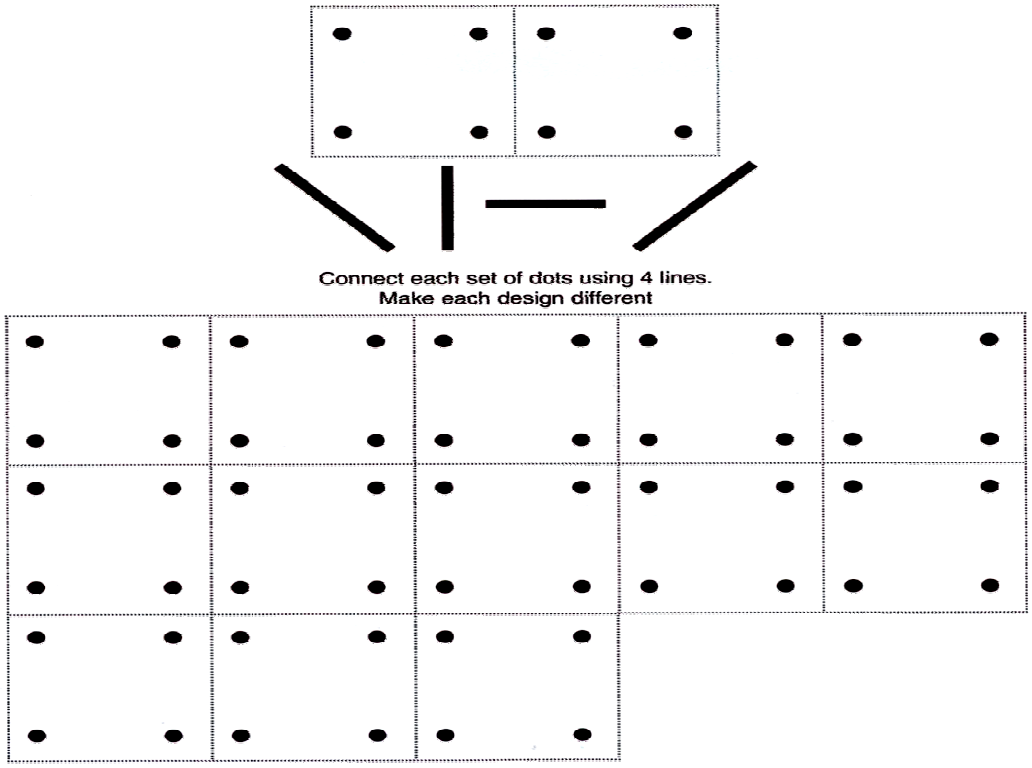
[J] DESIGN GENERATION

“Here are four dots. I’m going to connect the dots, using four lines to make a design.”. “I used four lines to connect the four dots. I will make another design.” [DEMONSTRATION INSTRUCTION]

“I made a different design using four lines. I want you to make as many designs as possible, but don’t copy my designs. Use four straight lines. Make sure each line begins

at a dot and ends at a dot. You have 3 minutes. Remember to use four lines for each design. Start now."

"Use four lines and only four lines."



E°è £Á®ÄÌ ZÀÄQÌUÀ¼ÀÄ EªÉ. £Á£ÀÄ £Á®ÄÌ UÉgÉUÀ¼À£ÀÄß G¥ÀAiÉÆÃV¹ ZÀÄQÌUÀ¼À£ÀÄß ¸ÉÃj¹ DPÀÈwUÀ¼À£ÀÄß ªÀiÁqÀÄvÉÛÃ£É. £Á£ÀÄ £Á®ÄÌ UÉgÉUÀ½AzÀ £Á®ÄÌ ZÀÄQÌUÀ¼À£ÀÄß ¸ÉÃj¹zÉ £Á£ÀÄ ¨ÉÃgÉ DPÀÈwUÀ¼À£ÀÄß ªÀiÁqÀÄvÉÛÃ£É. £Á£ÀÄ £Á®ÄÌ UÉgÉUÀ½AzÀ ¨ÉÃgÉ DPÀÈwUÀ¼À£ÀÄß ªÀiÁrzÉ. ¤ªÀÄUÉ JµÀÄÖ ¨ÉÃgÉ ¨ÉÃgÉ ¥ÀæPÁgÀzÀ DPÀÈwUÀ¼À£ÀÄß

ªÀiÁqÀ®Ä ¸ÁzsÀåªÉÇÃ, CµÀÄÖ ªÀiÁr DzÀgÉ £Á£ÀÄ ªÀiÁrgÀÄªÀAvÉ CzÉÃ DPÀÈwUÀ¼À£ÀÄß ªÀiÁqÀ¨ÁgÀzÀÄ. £Á®ÄÌ UÉgÉUÀ¼À£ÀÄß G¥ÀAiÉÆÃV¹, ¥ÀæwAiÉÆAzÀÄ UÉgÉAiÀÄÄ; MAzÀÄ ZÀÄQÌ¬ÄAzÀ ±ÀÄgÀÄªÁV E£ÉÆßAzÀÄ ZÀÄQÌAiÀÄ°è ªÀÄÄPÁÛAiÀÄªÁUÀ¨ÉÃPÀÄ. ¤ªÀÄUÉ ªÀÄÆgÀÄ ¤«ÄµÀUÀ¼À ¸ÀªÀÄAiÀÄ ¹UÀÄvÉÛzÉ. £É£É¦gÀ° ¤ÃªÀÅ £Á®ÄÌ UÉgÉUÀ¼À£ÀÄß G¥ÀAiÉÆÃV¸À¨ÉÃPÀÄ. FUÀ ±ÀÄgÀÄªÀiÁr. £É£À¦gÀ° ¤ÃªÀÅ £Á¯ÉÌÃ £Á®ÄÌ UÉgÉUÀ¼À£ÀÄß G¥ÀAiÉÆÃV¹ DPÀÈwUÀ¼À£ÀÄß §gÉAiÀÄ¨ÉÃPÀÄ.

* Refer Appendix III for score sheet

A) PERSONAL FACTS

1. ni:vu huttıɖa ḏina:ka, ṯari kʰu javuḏu (ni:vu javaga huttldu)

2. ni:vu jelli huttıɖḏu

3. nimma vajəsu eʃtu

4. nimma pu:rnə/ pu:rṯı vilasa e:nu

B) SYMBOL CANCELLATION

i: tʃı nʰe (sĩbəl) jannu no:ṛı ə ṯʰəva ıɖənnu no:ṛı. ıɖu bəhəla sarı i: kagaɖaɖallı ka:ɳısuṯəḏe. na:nu i: tʃı nʰeja me:le gi:tu ha:kuṯṯe:ne aṯava gere ha:kuṯṯe:ne. ni:vu sahaiga ıde: ṯərəha tʃınəgaləannu guruṯısı, gere eləjırı.

nıməge e:naḏəru prəʃnegəlıveje:, nıməge erədu nımıʃhagəla səməjəvənnu koṛəla:guṯəḏe, i:ga ʃuruma:ṛi.

C) CONFRONTATION NAMING

ni:vu i:ga tʃiṯrəgələnnu hesərisi niməgə prəṯijonḏu tʃitrakku muvəṯṯu sekẽdu səməjəvənnu kodala:ṯəḏe.

D) CLOCK DRAWING

ni:vu i:ga kagaɖaɖallı onḏu gʰəṛijarəḏə tʃiṯrəvənnu bidisəbe:ku, moḏəllu ella sãkʰjəgələnnu vruṯəḏə oləge bərijebekku, məṯṯe gəṛija:rədə kəigələnnu hənnoḏuu gãte haṯṯu nimiʃəkke nillisi, huʃa:ra:gi maṛi. tʃokkəva:gi mari. na:nu niməgə mu:ru nimiʃa səməja koṛuṯe:ne.

E) STORY RETELLING

nanu i:ga niməgõɖ̲u sənnə kət̪ejənnu he:ɭuṯ̲e:ne, ni:vu a: kaṯ̲ejannu əɖ̲e:t̪ərəha va:pəs he:ɭabe:ku. sərijagi keɭisikoɭ̰i. nanu heɭiɖ̲a rıtijəlli ni:vu nənge purṯ̲ikəth̲ejannu vapəsu tirugi he:ɭabe:ku.

/mãdʒuɭanna gãɖa əvəɭa huʈ̲uhəbbəɖ̲ãɖ̲u mãdʒuɭənıge onɖ̲u sũɖ̲ərəva:ɖ̲ə vədʒraɖ̲a uŋurəvənnu ni:dıɖ̲ənnu a: ra:t̪̲ri əvəɭu a: uŋurəvənnu ha:kıkoɬɬəvəɖ̲əɖ̲u t̪̲i:rma:nısıɖ̲əɭu a:ɖ̲əre əɖ̲u ka:ɳejat:gıʈ̲ʈ̲u a:ke əɖ̲ənnu ella: kəɖe huɖukıɖ̲əɭu məʈ̲ʈ̲e əɭəɖ̲u pra:rəmbhısıɪɖ̲əɭu əvəɭu kəı tʃəukəvənnu t̪̲egejəlu dʒe:bıge kəı ha:kıdaga uŋurəvu sıkkıt̪̲u/

F) SYMBOL TRAILS

Trial 1

i: vruʈ̲ʈ̲əgəɭənnu gəmənisi, əvugəɭa be:re be:re əɭət̪̲egəɭəlliɖ̲e, nanu əvugəɭannu gere eɭəɖ̲u se:risuṯ̲ene. nanu əṯ̲i tʃikkəɖ̲a:ɖ̲a vruʈ̲ʈ̲əɖ̲ĩɖ̲a gere ʃuru maṛuʈ̲ʈ̲ene. məʈ̲ʈ̲u əɖ̲əra mũɖ̲ina əɭət̪̲eja əɖ̲əkĩɖ̲a svalpa ɖ̲odda vruʈ̲ʈ̲əke se:risuṯ̲ene, i: kagaɖ̲aɖ̲allı əɖ̲ənne: ni:vu maṛabe:ku, əṯ̲i tʃikkəɖ̲a:ɖ̲a vruʈ̲ʈ̲ə ja:vudu, səri i:ga əɖ̲əkĩɖ̲ ɖ̲o:dda vruʈ̲ʈ̲əke gere eɭejiri ha:gu ha:ge mũɖ̲uvarisi, nanu nimage səhajə madəlu saɖ̲h̲əjvilla. niməge saɖ̲h̲əvaɖ̲əʃtu maṛi . niməge nanu onɖ̲u nimiʃa səməja koṛuṯ̲ene səri.

Trial 2

i:ga i: vruʈʈəgəɭu ha:gu tribudzəgəɭənnu no:diri. nanu əvugəɭannu gere eɭəɖu se:risuʈene. nanu i: vruʈʈəɖiɖa prərəmbʰə maṛi tribudzəkke se:risuʈene. i:ga tribudzəɖiɖa be:re vruʈʈəkke gere eɭejuʈe:ne. nanu i:ga konæ tribudzəkke gerejənnu eɭejuʈe:ne. i: kagaɖaɖallı əɖənne ni:vu maṛabeku. i: vruʈʈəɖiɖa ʃurumaṛiri. i: vruʈʈəɖiɖa tribudzəkke onɖu gere eɭejiri ha:gu ha:ge mũɖuvarisi. vruʈʈəɖiɖa tribudzəkke tribudzəɖiɖa vruʈʈəkke ha:ge maṛuta:iri. nanu niməge mu:ru nimiʃa səməjəvə koṛuʈʈe:ne.niməge saɖʰjəvaɖəʃtu tʃenna:gi maṛi.

Trial 3

i: vruʈʈəgəɭənnu məʈʈu tribudzəgəɭənnu no:diri, ivu be:re be:re əɭəʈegəɭəlliɖe, nanu əvugəɭannu gere eɭəɖu se:risuʈene.nanu əʈi tʃikkə vruʈʈəɖiɖa gere ʃuru madut:ene. məʈʈu əʈi tʃikkə tribudzəkke gere se:risuʈene, i:ga nanu muɖina əʈi ɖodda vruʈʈəke gere eɭejuʈe:ne, i: ka:gəɖəɖəlli ədənnu ni:vu maɖəbekku, i:ga əʈi tʃikkə vruʈʈəvənnu ʈo:risi. i:ga a: vruʈʈəɖiɖa əʈi tʃikkə tribudzəkke gere eɭejiri ha:ge muɖuvərisi vruʈʈə, tribudzə, vruʈʈə ha:ge ho:guʈʈa iri, nanu niməge mu:ru nimiʃa səməjəvənnu koṛuʈʈe:ne. niməge saɖʰjəvaɖəʃtu maṛi.

G) GENERATIVE NAMING

Subtask 1-Animals

i:ga niməge eʃtu sa:ɖjəvo: əʃtu be:re be:re pra:ɳigələ hesərugələnnu/onɖu nimiʃədəlli he:labeku. nanu nimmoṛəne səhəkərisəlu saɖʰəvilla. niməge eʃtu səɖʰjəvo: əʃtu maṛi.

Subtask 2-‘m’ words

i:ga ni:vu 'ma' əkʃərəɖiɖa ʃuruvaguva eʃtu pədəgəlu sa:ɖjəvo: əʃtu pədəgələnnu onɖu nimiʃədəlli he:labeku, aɖəre na:məpədəgələnnu he:laba:rəɖu . nanu nimmorəne səhəkərisəlu saɖʰəvilla. heliɖə pədəvənne punahə he:ləbedi. uɖa:hərənige oresu he:liɖə me:le oresuvudu, oresuṭe:ne ha:ge əɖe pədəvənnu he:laba:rəɖu.

H) DESIGN MEMORY

i: a:kruṭikələnnu no:ri illi mu:ru setnəlli vividə a:kruṭigəlive. ni:vu i: a:kruṭikələnnu njəpəkəɖ əllittu kolləbeku. nanu niməge kevəla onɖe: səla ivugələnnu ṭorisuṭṭe:ne. i:ga nanu ṭorisiɖa a:kruṭijənnu napəkəɖəllıttukõdu ni:vu ade: a:kruṭijənnu ke:vəla həṭṭu sekẽdugələlli ṭorisiəbeku.

I) MAZES

MAZE 1

həɳəvənnu sigəlu i: tʃəkrəvjuhəɖə ɖa:rijəlli pennu upəjo:gisi, gerejannu ha:ki. tʃəkrəvjuhəɖə go:degələnnu muttisəbarəɖu. i: tʃəkrəvjuhəɖə ətəvənnu murisəlu niməge ərəvəʈʈu sekeduli̯ve. e:naɖəru prəʃnəgali̯veja: . i:ga ʃurumaṛi (baɳəɖə guruʈina kədejida ʃurumaṛi).

MAZE 2

i: tʃəkrəvjuhə sərijaɖa ɖa:ri hudukəlu kəɳdu hidijəlu nimage erədu nimiʃəgələ əvəka:ʃəviɖe. baɳəɖə guruʈiniɖa ʃurumaṛi. i:ga ʃurumaṛi. prəjəʈnamaruʈtaa: nimage sadjəvaɖʰəʃtu prəjəʈna mari. (sərijaɖa ɖa:ṛi hudukəlu prəjəʈnisi)

J) DESIGN GENERATION

illi nalku tʃukkigəli̯ve. nanu nalku geregələnnu upəjo:gisi tʃukkigələnnu se:risi a:kruʈigələnnu maduʈʈe:ne. nanu nalku geregəliɖə nalku tʃukkigələnnu se:risiɖe. nanu be:re a:kruʈigələnnu maduʈʈe:ne. nanu nalku geregəliɖə be:re a:kruʈigələnnu maṛide. niməge eʃtu be:re be:re prəka:rəɖə a:kruʈigələnnu madəlu saɖʰjəvo: əʃtu maṛi. aɖəre nanu maṛiruvəɖə̃ʈe əɖe a:kruʈigələnnu madəbarəɖu. nalku geregələnnu upəjo:gisi, prəʈijoɖu gereju: onɖu tʃukkij iɖa ʃuruvagi innõdutʃukkijəlli mukʈa:jəvagəbe:ku. niməge mu:ru nimiʃəgəl səməja siguʈəɖe. nenepirəli ni:vu nalku geregələnnu upəjo:gisəbeku. i:ga ʃuru maṛi. nenepirəli ni:vu nalke: nalku geregələnnu upəjo:gisi a:kruʈigələnnu bərijabeku.

APPENDIX III

Score Sheet

(Refer Appendix II for instructions)

A. Personal facts

Score two point for each correct answer & zero point for incorrect answer

Item	Response	Score	
		Correct	Incorrect
1.When were you born?			
2.Where were you born?			
3.What is your age now?			
4.What is your complete address?			

Maximum score = 8

B. Symbol cancellation

No. of Symbols correctly cancelled =

No. of Symbols Incorrectly cancelled =

Total correct – Total Incorrect = Symbol cancellation score

Maximum score = 12

C. Confrontation Naming

Score 1 point for each correct response and 0 point for incorrect response.

Maximum score = 10

D. Clock Drawing

Score

1. **How many numbers are present? Are they legible in context?** 3 2 1 0

3 = Numbers 1-12 are present with no perseverated or extra numbers.

2 = At least one of the following is present

- Only six to 11 correct numbers are present.
- One or more numbers higher than the number 12 is present in addition to six to 12 correct numbers.
- Six to 12 correct numbers are present, with one or more numbers perseverated.

0 = Only one to five correct numbers are present.

0 = No correct numbers are present.

2. Does the clock show 12 and only 12 of something? 1 0

1 = The clock is divided by 12 of something (e.g., numbers, hands, dots).

0 = One of the following is present

- The clock is divided by less than 12 of something.
- The clock is divided by more than 12 of something (e.g., perseveration, extra numbers).

3. Are the numbers oriented correctly for reading vs. rotated? 1 0

1 = Zero to two numbers are rotated.

0 = Three or more numbers are rotated.

4. Are the numbers spaced correctly? 1 0

1 = The numbers 12, 3, 6 and 9 are in the correct places, and the other numbers are reasonably well spaced.

0 = Numbers are poorly spaced/ spaced.

5. Are the numbers inside the circle arranged in a circular pattern? 1 0

1 = Numbers are arranged in a circular pattern inside the circle. One or two numbers may stray from a circular pattern, but no number or less than half of any number is placed outside the circle.

0 = At least one of the following is present

- No circular arrangement of numbers is evident.
- Three or more numbers stray from a circular pattern.
- At least half of one or more numbers is placed outside the circle.
- One or more numbers is placed outside the circle.

6. Are the numbers presented clockwise? 1 0

1 = All numbers written are clockwise around the clock.

0 = At least one of the following is present

- Numbers are counter clockwise.
- Numbers are in a random arrangement.
- Numbers are in columns.

7. How many hands are there? 1 0

1 = Two hands are present.

0 = At least one of the following is present.

- No hands are present.
- Only one hand is present.
- More than two hands are present. (No penalty for a " seconds" hand.)

8. What lengths are the hands? 1 0

1 = A distinguishable long hand and short hand are present.

0 = At least one of the following is present.

- Equal size hands are present.
- Only one hand is present.
- More than two hands are present.(No penalty for a " seconds" hand.)

9. Where do the hands originate? 1 0

1 = Hands (or a single hand if only one hand is present) emanate from the center of the circle, or within ½ inch from the center of the circle. Hands (if more than a single hand) touch, or come within ½ inch of touching at the point of origin.

0 = At least one of the following is present.

- Hands originate more than ½ inch from the center.
- Hands are separated by more than ½ inch at the point of origin.
- No hands are present.

10. Where do the hands point? 1 0

1 = One hand is pointing to 11 and the hand is pointing to 2, or one two- directional hand is pointing to 11 and 2.

0 = At least one of the following is present.

- One or more hands is not pointing to 11 and 2.
- No hands are present.
- More than two hands are present.(No penalty for a " seconds" hand.)

11. Do the hands tell the correct time? 1 0

1 = The short hand points to 11 and the long hand points to 2.

0 = At least one of the following is present.

- One or more hands does not point to the correct number.
- Equal size hands are present.
- No hands are present.
- Only one hand is present.
- More than two hands are present.(No penalty for a " seconds" hand.)

Maximum score = 13

E. Story Retelling

Score one point for each correct story element and zero point for each incorrect story element.(Refer Appendix III D for story).

Maximum score = 14

Auditory Comprehension

Score ½ point for each correct answer and 0 point for incorrect answer.

Maximum score = 3

Use the table below to determine the Story Retelling Score

Subscore Total	Story Retelling Score
0	0
1-2	1
3-4	2
5-6	3
7-8	4
9-10	5
11-12	6
13-14	7

Maximum Score = 7

F. Symbol Trails

Score one point for each correct trail and zero point for incorrect trail. (Total of ten trails)

Maximum Score = 10

G. Generative Naming

To determine the generative naming score:

Step 1: Add the Correct Animals and Correct 'm' words

Step 2: Use the table below to determine the Generative Naming Score

Correct Animals + 'm' words	Generative Naming Score
0	0
1-5	1
6-10	2
11-15	3
16-20	4
21-25	5
26-30	6
31-35	7
36-40	8
41+	9

Maximum score = 9

H. Design Memory

Score one point for each correct design and 0 point for incorrect design. (Total of six designs).

Maximum score = 6

I. Mazes

Maze 1

Step 1 – Correct solution = 4

Incorrect solution = 0

If the score is 4 points: Move to step 2

Subtract 1 point each time the examinee's line travels at least ½ inch up an incorrect path but is self corrected. If the difference is a negative number, score as 0 points.

Maze 2

Step 1 – Correct solution = 4

Line stops or crosses the wall directly above the money = 3

Incorrect solution = 0

If the score is 3 or 4 points: Step 2

Subtract 1 point each time the examinee's line travels at least ½ inch up an incorrect path but is self corrected. If the difference is a negative number, score as 0 points.

Maze 1 + Maze 2 = Maximum score = 8.

J. Design Generation

Scoring	Score
Total number of designs (13 designs, one point for each correct design)	

Maximum score = 13

Additional Information

Number of demonstration designs that were copied (maximum of two designs)	
Number of Perseverated designs (any time an examinee's design is repeated, count it as a perseverated design)	
Number of designs with designs with greater or less than four lines	
Other types of Incorrect designs	

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