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Cognitive Linguistic Performance in Bilingual Persons with Dementia

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ABSTRACT

Cognitive linguistics (CL) refers to the school of linguistics that understands language creation, learning, and usage as best explained by reference to human cognition *in general. With increase in age human cognition improves, which can be measured through tasks based on cognitive-linguistics. The tasks include attention and concentration, orientation, memory, organization etc. But these skills reduce their efficiency with advanced age. That is, younger population perform better as compared to older. And a disorder of elderly called dementia is a debilitating condition causing progressive deterioration in cognition, personality and communication skills. If healthy elderly perform less efficient in cognitive linguistic skills, then disordered population will perform with still lesser efficiency. Hence there is an immediate need to study the cognitive-linguistic performance in healthy elderly as compared to dementia. The aim of the present study is to qualify the cognitive-linguistic performance in persons with dementia as compared to healthy elderly. Considered for the study were 20 (10 monolingual and 10 bilingual) healthy elderly and age matched persons with dementia. Monolingual persons had Kannada as their mother tongue/ first language and bilinguals had Kannada as their mother tongue/ first language with English as their second language. Addenbrookes Cognitive Examination Revised for Kannada speakers (ACE-R/K) (Deepa & Chengappa 2009) and Cognitive linguistic Assessment Protocol (CLAP) (Kamath 2001, Rajasudhakar & Chengappa 2008) were administered for both the groups. The performance of healthy elderly as against persons with dementia is discussed along with the comparison of performance of monolinguals versus bilinguals.*

Keywords: Cognitive Linguistics, Dementia, Bilingualism

INTRODUCTION

Cognition is a general term that refers to both stored knowledge and the process for making and manipulating knowledge. The human brain is a pattern recognition system, and memories are stored patterns. The ability to access memory stores enables us to interpret our ever changing environment and modify our behaviour to ensure survival and achieve our objectives (Bayles & Tomoeda 2007).

Cognition is the ability of our brain to think, to process and store information, to solve problems. It is a high level of behavior unique to humans. This behavior is disrupted by an illness such as Alzheimer's disease (Bayles & Tomoeda 2007).

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. Thus, the simple act of object naming requires perception, access to long term memory, association, recognition, lexical retrieval, decision-making, motor planning, and self-monitoring.

Closed head injury and cerebrovascular accidents as well as other cerebral neuropathologies may result in deficits of cognitive- linguistic skills. These deficits emerge as dynamic and pervasive, ranging from subtle to severe. Treatment of cognitive-linguistic deficits is a dynamic process that begins with assessment of patient’s information processing skills ability for quanifying specific deficits and observation and recording of response behaviours (Ross-Swain 1992)

Neurogenic communication disorders in adults encompass a variety of specific abnormalities all caused by nervous system pathology. These disorders include aphasia, right hemisphere damage, traumatic brain injury, dementia, dysarthria etc. Neurogenic communication disorders are an important consequence of nervous system abnormality. Their features, severity and outcome reflect the location, magnitude and nature of the abnormality. Present study is primarily based on dementia.
Dementia is the progressive decline in cognitive function due to damage or disease in the body beyond what might be expected from normal aging. Dementia is a non-specific illness syndrome (set of symptoms) in which affected areas of cognition may be memory, attention, language, and problem solving. According to American Psychiatric Association (2000), the clinical feature necessary for diagnosis of dementia are multiple deficits manifested by memory impairment and one or more of the cognitive disturbances such as aphasia, apraxia, agnosia or disturbance in executive functioning. Higher mental functions are

affected first in the process. Especially in the later stages of the condition, affected persons may be disoriented in time (not knowing what day of the week, day of the month, month, or even what year it is), in place (not knowing where they are), and in person (not knowing who they are or others around them).

The early stage of dementia lasts from two to four years. The symptoms found during this stage include difficulty in handling finances, memory problems, concentration problems, difficulty with complex tasks, forgetting the location of objects and decreased awareness of recent events (Bayles 1991). The first obvious symptom of dementia is a problem with episodic memory. Working memory is also affected early in the progression of the disease, and is manifested by decreased efficiency of encoding and retrieval of information. Individuals have difficulty sustaining attention (Perry, Watson & Hodges 2000; Backman, Small & Fratiglioni 2001) and span memory is modestly attenuated in some individuals though not all.

In the middle stage of dementia, motor function remains good but restlessness is common. There is worsening of episodic memory, attenuation of span memory, encoding and retrieval deficits and degradation of semantic memory. They have difficulty focusing attention, they are easily distracted, and can be difficult to engage in activities. Visual-perceptual and visual constructive deficits are apparent and, in fact, dementia patients perform inferior to healthy peers on virtually all executive function and cognitive-communicative tests. The form of language remains generally intact but content is prominently affected (Bayles, Tomoeda & Trosset 1992).

During the later stage, patients often become disoriented for person as well as place and time. Their scores on the MMSE (described later in this section) range from 0 to 9. Speech is typically fluent but generally slower and more halting. But the form of language remains intact though meaningful output is greatly reduced (Appell, Kertesz & Fisman 1982).

Communication abilities in bilingual demented patients and the pattern of language decline for L1 and L2 in dementia are issues rarely mentioned in the dementia literature. It is well known, however, the ability to maintain fluency in more than one language decreases with aging (Hyltenstam & Obler 1989). With advancing age, people may tend to retreat to a single language, regardless of a life-long history of bilingualism. Moreover, older bilinguals may experience increased difficulties handling two languages due to the effects of cross-language interference. These effects in aging bilingual persons can be further exacerbated in those who develop dementia.

Cognitive impairment is the hallmark of dementia, and is detected subjectively from historical information reported by patients and other informants, and from the clinician's observations of general mental status. Objective assessment requires the clinician to measure the individual's performance on one or more cognitive (neuropsychological) tests on one or more occasions. Interpretation of the measurements of within or outside the normal range requires prior knowledge of these measures and the normal range for the population which are been tested (Ganguli et al. 1996).

Assessment of cognitive function is critical to the diagnosis of dementia because by definition, dementia comprises multiple cognitive deficits. Early evaluation of individuals suspected of having dementia is important because 10 – 15% of cases are due to treatable causes (Larson, Reifler, Sumi, Canfield & Chin 1986; Clarfielf 1988). There are many assessment protocols available for dementia. They include both screening and comprehensive tests/ protocols.

Screening test include Mini-mental state examination (MMSE) (Folstein, Folstein & McHugh 1975), Alzheimer Disease Assessment Scale (ADAS), and Short Portable Mental Status Questionnaire (SPMQ) (Plfiffer 1975). The MMSE evaluates orientation to person, place and time, general knowledge, memory, communication, and copying. The MMSE requires 5-10 minutes to administer. The total possible score is 30. Most clinicians consider a score of less than 24 as indicative of dementia (Desmond 2002). Short Portable Mental Status Questionnaire (SPMQ) (Plfiffer 1975) is another screening test consisting of 10 items which assess a patient's knowledge of personal and general information including orientation to time and place, age, date of birth, mother's maiden name, telephone number, address, current and previous presidents and serial subtraction ability. Alzheimer Disease Assessment Scale (ADAS) (Rosen, Moh & Davis 1986) is a 21-item scale that combines a mental status or cognitive portion with a behavioural rating or non-cognitive section. Cognitive section consists of word recall, spoken language, language comprehension, test instruction recall, word finding, following commands, naming, figure construction, ideational praxis, orientation and word recognition.

There are few comprehensive test protocols to assess dementia. For the present study we included Addenbrooke's Cognitive Examination Revised (ACE-R). Addenbrooke's Cognitive Examination Revised (ACE-R) Mioshi et al. (2006) consists of Orientation, Repetition, Attention & Concentration, Memory, Verbal fluency, Language (comprehension, writing, repetition, naming, reading) and Visuaspatial abilities.

There are a very few Indian tests which assess cognitive and linguistic skills in elderly. Cognitive linguistic assessment protocol (CLAP) is given by Kamath & Prema (2001) and Rajasudhakar & Chengappa (2008). CLAP has its basis from Cognitive Linguistic Improvement Program (CLIP) by Ross-Swain (1992) which contains cognitive-linguistic tasks and activities that are designed to accompany or be used.

The behavioral and cognitive slowing that characterizes normal aging is exaggerated in dementia. Birren & Botwinick (1951) reported an early attempt to document slowing in dementia, in which they showed patients with senile psychosis to be slower in writing than age-matched healthy older persons. Miller (1974) investigated the nature of response slowing in dementia. Miller showed that patient group to be much slower on simple task requiring subjects to move small objects.

The studies which have employed standardized “intelligence tests” agree that dementia patients show lower mean IQ scores than groups of age matched control subjects (review by Miller 1977).

Selective attention within the visual modality has been studied with digit (Lewis & Kupke 1977) or letter (Talland & Schwad 1964) cancellation tasks. Using digit cancellation task, Allender & Kasniak (1985) found moderately demented patients to be impaired relative to age and education matched healthy elderly subjects.

Eslinger & Benton (1983) investigated spatial and nonspatial visual perceptual abilities in a group of 40 older dementia patients (mixed etiology) and age-matched group of healthy elderly subjects. The dementia patients as a group were significantly impaired on both of these tasks.

Stoarandt, Botwinick, Danziger, Berg & Hughes (1984) found mild Alzheimer’s dementia patients to make significantly more errors than age-matched healthy elderly subjects on a geometric design copy task. Further it was found that as the disease progressed there were greater number of errors in copying the geometric design.

Beattty et al. in the year 1994 administered standard neuropsychological tests and individualized measures of patients’ skilled behaviors. For patients who remained skilled at games, performance was compared with that of normal controls. Findings indicate that a broad range of complex cognitive abilities may be preserved in patients with dementia of the Alzheimer type (DAT) including who could not perform simpler actions.

Ballard, Patel, Oyebode & Wilcock (1996) assessed 124 patients with different types of dementia with a standardized battery which included the Geriatric Mental State Schedule, the history and etiology

Schedule, the Secondary Dementia Schedule and the CAMCOG. There were no significant differences in the cognitive abilities between the groups.

Laurin et al. (2001) explored the association between physical activity and the risk of cognitive impairment and dementia. Compared with no exercise, physical activity was associated with lower risks of cognitive impairment, Alzheimer disease, and dementia of any type. Significant trends for increased protection with greater physical activity were observed. High levels of physical activity were associated with reduced risks of cognitive impairment.

AIM

Present study aimed at assessing cognitive skills in monolingual and bilingual persons with dementia using two test protocols. The study was also interested in the comparison of performance across bilinguals versus monolinguals.

METHOD

Materials

Included in the study are two test protocols for assessing cognitive linguistic skills in elderly population. These tests include Addenbrooke's Cognitive Examination Revised for Kannada speakers (ACE-R/K) (Deepa & Shyamala 2009) and Cognitive linguistic assessment protocol (Kamth & Prema 2001; Rajasudhakar & Chengappa 2008). Clinical Dementia Rating scale (Hughes et al. 1985) was used to measure the cognitive status of the participants.

Description of CLAP

CLAP is a test, which assesses the cognitive and linguistic abilities in young and elderly. It was developed by Kamath & Prema in 2001 which was further modified by Rajasudhakar & Chengappa in 2008. This test consists of domains such as attention, perception & discrimination, memory, problem solving and organization.

The first domain comprises Attention, Discrimination and Perception. It consists of visual subset and auditory subsets separately. Under visual subset there are three tasks, letter cancellation, contingent letter cancellation and word cancellation. In letter cancellation task, individuals should cancel the letter /la/ how many ever times its present. In contingent letter cancellation, the individual has to cancel the letter

/ka/ which is adjacent to letter /i/ in a group of letters. In the word cancellation one has to cancel the word /*kittaLe*/ (meaning orange fruit) in a group of words. Under auditory subset there are four tasks, sound count, letter pair discrimination, word pair discrimination and backward month naming. In sound count task, individuals are expected to listen to a series of sounds and count the number of times the sound /ba/ appears. In letter and word pair discrimination, individuals are expected to listen to paired items and say whether they sound same or different. The fourth task is to say the names of months in a year in the reverse order (Eg: December, November, etc).

The Second domain is Memory. This domain is further divided into three subtypes of memory, which include episodic memory, working memory and semantic memory. Under episodic memory, individuals will be tested by asking ten questions regarding orientation and recent memory. Under working memory there are two tasks, digit forward and digit backward. The person is expected to repeat the numbers after the examiner in the same order and in the reverse order consequently. Semantic memory consists of five tasks, Co-ordinate naming, Superordinate naming, Word naming fluency, generative naming, Sentence repetition and Carry out commands. In coordinate naming individuals should name “any five items used for writing.” During superordinate naming task, individuals will be read out a series of items, and they are expected to name the group to which these items belong. Word naming fluency is where the individuals will be given a letter and they are supposed to name five items beginning with that letter. Generative naming is where individuals will be asked questions and are supposed to answer them in single word. Sentence repetition is where the examiner will read out simple to complex level sentences and the individuals have to repeat after them. Carry out commands is the task where the examiner gives simple to complex commands for the individuals to perform in the sitting place.

Third domain in the test is Problem solving. This consists of seven tasks, Sentence disambiguation, Sentence formulation, Predicting outcome, Predicting cause, Compare and contrast, Why/wh questions and sequential analysis. In Sentence disambiguation task, individuals will be given a sentence which contains two meanings hidden in it. They are supposed to tell both the meanings to the experimenter. During Sentence formulation task participants will be given a sentence with wrong word order. Participants are expected to correct the order of the words and frame the right sentence. Predicting cause is the task where in the individuals will be read out with an incident and they are supposed to provide two causes for the same (Eg: Your plants dried up).

During compare and contrast task, the individuals will be given two items and they are supposed to say the similarities and the differences between them (Eg: Airplane vs. bird). In predicting outcome the participants have to state two outcomes as a consequence of the given incidence (Eg: what would you do if your key is not matching with the lock?). In "why question" participants will be asked "wh" questions. In Sequential analysis task, individuals are expected to elaborate at least four steps in each event analysis (Eg: Planting a sapling).

Final domain in the test is Organization. This domain consists of three tasks namely Categorization, Analogies and Sequential events. In Categorization task participants will be presented a word auditorily following which they will be provided a series of five words. Participants are supposed to choose two words among the series of five which belong to the group of the word provided in the begining (Eg: "Dog" is the word and series of five words are flower, cap, rat, pencil, and lion. Here lion and rat belong to dog's group i.e. animals). Analogies is where the experimenter will read out three words with a relationship between first two. The participants have to come out with fourth word with the similar relation to the first two words (Eg: car: road:: aeroplane: sky). Finally during sequential analysis task the participants will be given paragraphs with wrongly ordered sentences starting from simple to complex. The participants have to place sentences in right order and make meaningful paragraph.

All the correct answers are scored 1 and the wrong ones as 0. Maximum score in the test is 240. The test takes approximately one to one and a half hour for administration.

Description of ACE-R

Addenbrooke's Cognitive Examination Revised is a test of comprehensive cognitive assessment developed in French by Mioshi et al. (2006). It contains 5 sub-tests, each one representing one cognitive domain: attention/orientation (18 points), memory (26 points), fluency (14 points), language (26 points) and visuospatial (16 points). Maximum score for ACE-R is 100 totally. Examination is through auditory based questioning interview type. Each task contained a score of 1 for correct and 0 for the incorrect response. Under attention and orientation section participants are asked questions regarding orientation of the place, date, day etc. Under memory section Anterograde and retrograde memory is checked using simple memory tasks. Fluency is the section which checks for verbal fluency for letter and lexical category. In the language domain one checked for naming, reading, writing, comprehension, repetition and three stage commands.

Finally in the visuospatial domain, participants are asked to copy the diagrams, count the dots and recognize the alphabets. This test adapted into Kannada (a Dravidian language) and was used for the study.

Participants

20 Kannada speaking healthy elderly (10 monolinguals and 10 bilinguals) in the age range of 65-85years were used as comparison group for 11 persons with dementia (6 monolinguals and 5 bilinguals). All monolingual speakers had Kannada as their mother tongue and bilingual speakers had Kannada as their first language (L1) and English as their second language (L2). Language proficiency was measured using International Second Language Proficiency Rating Scales (ISLPR) by Wylie & Ingram (2006). The scale checks four parameters i.e., speaking, listening, reading, and writing. Scoring in the scale ranges from 0 to 5 (0 stands for zero proficiency and 5 stands for native like proficiency). The outcome of the ISLPR is a profile, rather than a result, as each major skill is separately specified.

Data was gathered from National Institute of Mental Health & neurosciences, Bangalore and Nightingales Medical Trust, RT Nagar, Bangalore, Karnataka. Details of the patient participants are depicted in Table 1. All the patient participants were coded based on their language status as either monolingual or bilingual i.e M1, M2, M3, M4, M5, & M6 and B1, B2, B3, B4 & B5.

Table 1. *Demographic and neurological details of patient participants*

S. No.	Age/Sex	M/B	Code	Years of education	CDR score	Diagnosis	Neuroimaging result
1	67/f	M	M1	15	1	Mild AD	Bilateral medial temporal atrophy
2	65/m	M	M2	12	1	Mild vascular	Diffuse brain atrophy
3	72/f	M	M3	13	2	Moderate AD	Diffuse central atrophy
4	69/f	M	M4	17	2	Moderate Frontotemporal	Left fronto-temporal atrophy
5	68/m	M	M5	13	2	Moderate Frontotemporal	Bilateral fronto-temporal lobe atrophy
6	86/f	M	M6	12	3	Severe AD	Bilateral medial temporal atrophy
7	68/f	B	B1	15	1	Mild vascular	Diffuse brain atrophy
8	66/m	B	B2	15	1	Mild AD	Bilateral sub-cortical infarcts
9	71/m	B	B3	16	2	Moderate	Multiple cerebral

						vascular	infarcts
10	69/f	B	B4	12	2	Moderate frontotemporal	Left fronto-temporal atrophy
11	75/f	B	B5	17	3	Severe AD	Bilateral medial temporal atrophy

(M = Monolingual, B= Bilingual, CDR= Clinical dementia rating, M1= monolingual 1, B1= bilingual 1, m= male, f = female).

PROCEDURE

Two groups were considered for the study. A clinical group of 11 patients with dementia who were recruited from National Institute of Mental Health and Neuroscience, Bangalore, India and Nightingales Medical trust, Bangalore, India. This clinical group was compared with 20 healthy elderly matched for gender, age and education. All patients were subjected to a clinical and radiological (CT or MRI or SPECT). Patients were classified into dementia and non-dementia groups, according to DSM-IV criteria (APA 1994). All the participants were interviewed by the first investigator and the general history was taken. Interview was basically question and answers type. General history included the demographic details of the participants, education history, language history, medical history, present health status and any other associated problems. Participants were expected to answer to the extent possible. Because the testing would take nearly two hours, all the participants were provided breaks in between the data collection considering their age. For the patient population frequent breaks were provided as they were unable to co-operate for long duration. Followed by the general history, a written consent was taken from all the participants regarding the willingness for the participation in the study. Language proficiency was measured using International Second Language Proficiency Rating Scales (ISLPR) by Wylie & Ingram (2006) based on the interview with the family members. The clinical group and healthy elderly groups were studied with the ACE-R and CLAP

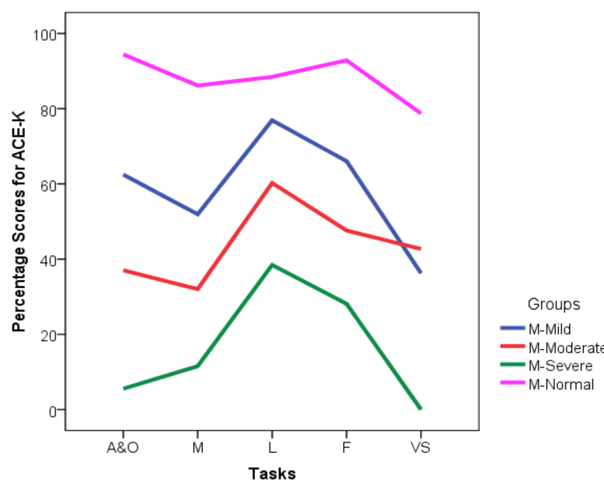
RESULTS

Following the administration of the two tests (ACE-R/K and CLAP), the scores obtained for the normal monolingual and bilingual participants were averaged separately and compared with the group matched patient participants. Details of scores obtained for monolingual and bilingual participants for ACE-R/K is as shown in Table 2 and Table 3.

Table 2. *ACE-R/K scores for monolingual participants*

S. No.	Participants	Attention & Orientation (18)	Memory (26)	Language (26)	Fluency (14)	Visuaspatial skills (16)	Total (100)
1.	M1	10	14	21	9	10	64
2	M2	12.5	13	19	9.5	10	64
3	M3	7	8	15	6	6.5	42.5
4	M4	7	8	15	8	6.5	44.5
5	M5	6	9	17	6	7.5	45.5
6	M6	1	3	10	4.5	0	18.5
7	NM	17	22.4	13	23.7	12.6	88.7

(M1= monolingual 1, M2= monolingual 2, M3= monolingual 3, M4= monolingual 4, M5= monolingual 5, M6= monolingual 6, NM = normal monolingual).



Graph 1. *Percentage scores of monolingual participants for ACE-R/K (A & O = Attention and Orientation, M= Memory, L= Language, F = Fluency, VS= Visuaspatial skills)*

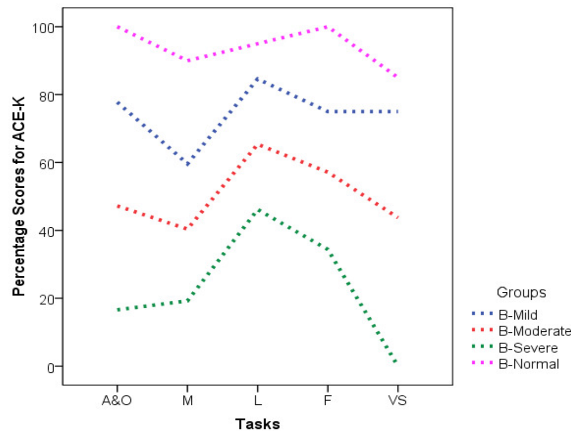
Table 2 and Graph 1 represent the mean and percentage scores of monolingual participants for ACE-R/K respectively. As it is seen from Table 2 and Graph 1, typical participants scored higher in all the subtests of ACE-R/K. There was a reduction in scores for all the subtests of ACE-R/K as dementia progressed from mild to severe stage. The scores showed a falling trend for memory as the disease progressed. That is, as the disease progressed, the scores are reduced for memory subtest in equal proportion. Though language (content) is affected in patient participants, at all the stages of dementia, the degree

is less as compared to other domains of the test. Visuaspatial skills are greatly affected at all the stages. Fluency is much preserved as compared to other subtests in the patient population.

Table 3. *ACE-R/K scores for bilingual participants*

S. No.	Participants	Attention & Orientation (18)	Memory (26)	Language (26)	Fluency (14)	Visuaspatial skills (16)	Total (100)
1.	B1	14	16	22	10	12	74
2	B2	14	15	22	11	12	74
3	B3	9	10	17	8	6.5	50.5
4	B4	8	11	17	8	7.5	51.5
5	B5	3	5	14	5.5	0	27.5
6	NB	18	23.4	14	24.7	13.6	93.7

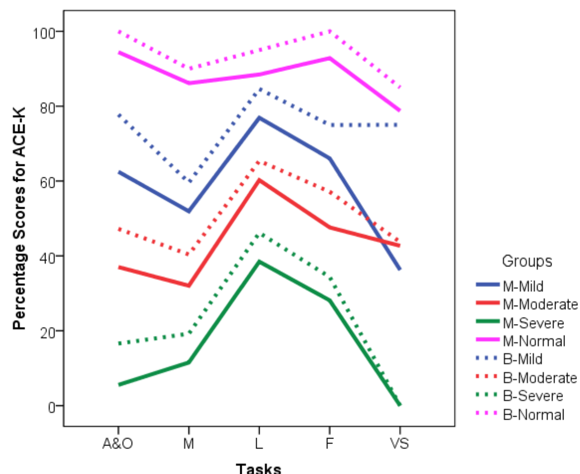
(B1= bilingual 1, B2= bilingual 2, B3= bilingual 3, B4= bilingual 4, B5= bilingual 5, NB = normal bilingual).



Graph 2. *Percentage scores of bilingual participants for ACE-R/K (A & O = Attention and Orientation, M= Memory, L= Language, F = Fluency, VS= Visuaspatial skills)*

Table 3 and Graph 2 represents the mean and percentage scores of bilingual participants for ACE-R/K respectively. As seen in the Table 3 and Graph 2, the scores on different subtest of ACE-R/K is inversely proportional to the stages of dementia. That is, as the disease progressed, the scores are reduced in all the domains of the test. Drastic changes in the scores are prominent for domains of memory and visuaspatial skills. Language is affected at all the stages of dementia but at the lesser degree as compared to that of other domains. Attention and

orientation is reduced in equal proportion across various stages of the disease. Apart from language domain, fluency is also much preserved in the patient group.



Graph 3. *Combined percentage scores for monolingual and bilingual participants for ACE-R/K. (A & O = Attention and Orientation, M= Memory, L= Language, F = Fluency, VS= Visuaspatial skills)*

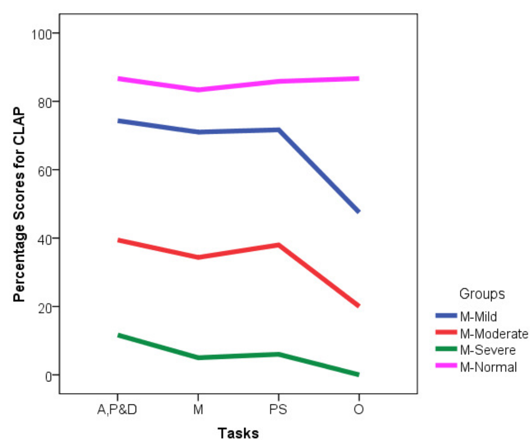
Combined representation of percentage scores for monolingual and bilingual participants for ACE-R/K is depicted in the Graph 3. As it is seen from the graph, the bilingual participants performed better as compared to that of monolinguals. Potential differences from monolinguals in task solving strategies and patterns of cognitive decline during normal and abnormal aging is clear from the Graph 3. This was true for both normal and the patient population. Overlapping of scores were seen for the domain of visuaspatial skills. That is, both monolingual as well as bilinguals performed on par with eachother for the visuaspatial tasks during the moderate and severe stage of dementia. For the same task, monolingual mild dementia participants performed similar to that of monolingual and bilingual moderate dementia participants. Domains such as attention & orientation, memory, language and fluency did not show any overlapping in the scores between the various stages of dementia.

Details of scores obtained for Cognitive Linguistic Assessment Protocol (CLAP) by the monolingual and bilingual participants is shown in Table 4 and 5 and Graphs 4, 5 and 6. Table 4 shows CLAP for monolingual participants in each domain. And Graph 4 shows the percentage scores of these subjects for the CLAP.

Table 4. *Scores of monolingual participants for CLAP*

S. No.	Participants	Attention, perception & Discrimination (60)	Memory (60)	Problem Solving (60)	Organization (60)	Total (240)
1	M2	44	50	42	29	165
2	M2	45	46	44	28	163
3	M3	25	26	22	12	85
4	M4	24	25	24	13	86
5	M5	22	25	22	12	80
6	M6	7	3	4	0	14
8	NM	52	55	51.5	44	202.4

(M1= monolingual 1, M2= monolingual 2, M3= monolingual 3, M4= monolingual 4, M5= monolingual 5, M6= monolingual 6, NM = normal monolingual).



Graph 4. *Percentage scores of monolingual participants for CLAP (A, P & D= Attention, Perception and Discrimination, M= Memory, PS= Problem Solving, O= Organization)*

As it is seen from Graph 4 and Table 4, there is a gradual reduction in scores in all the domains of the test from mild to severe stages. Attention, perception & discrimination and memory showed decreased trend in scores from normal to severe stage of the disorder. Organization is most affected among all the other domains in all the

stages of the disorder. Attention, perception & discrimination and problem solving go almost on par with each other in mild and moderate stages of dementia. At the later stage of dementia, problem solving is also equally affected compared to other domains in the test.

Table 5. *Scores of bilingual participants for CLAP*

S. No.	Participants	Attention, perception & Discrimination (60)	Memory (60)	Problem Solving (60)	Organization (60)	Total (240)
1	B1	45	52	47	36	180
2	B2	52	50	50	32	184
3	B3	27	26	28	13	94
4	B4	26	27	24	11	88
5	B5	10	5	5	0	20
8	NB	60	55.7	54.4	56.2	226.3

(B1= bilingual 1, B2= bilingual 2, B3= bilingual 3, B4= bilingual 4, B5= bilingual 5, NB = normal bilingual).

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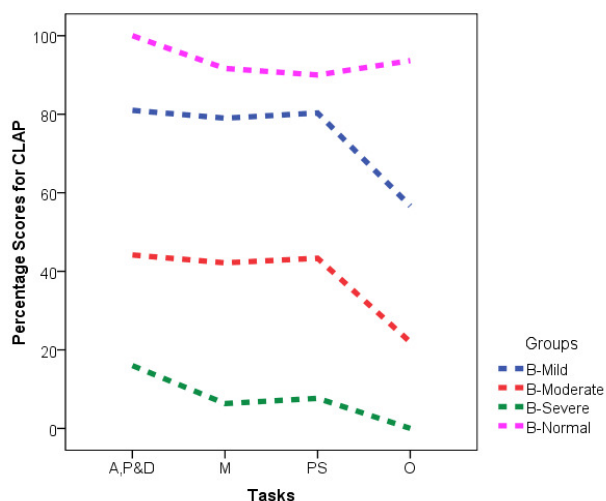
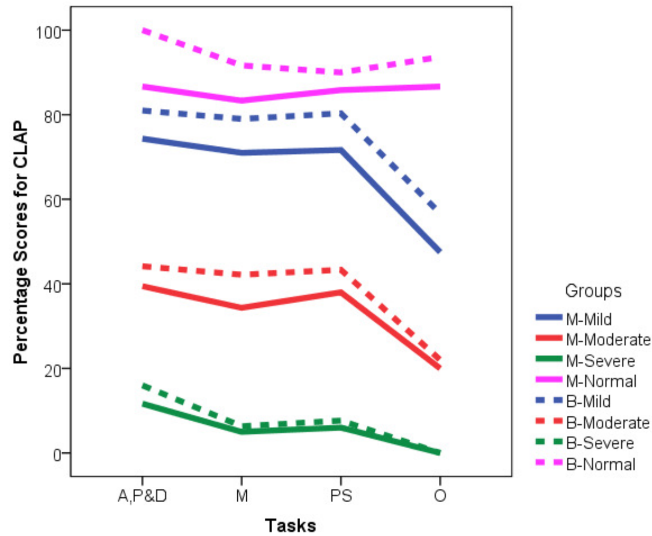


Graph 5. *Percentage scores of bilingual participants for CLAP (A, P & D= Attention, Perception and Discrimination, M= Memory, PS= Problem Solving, O= Organization)*

Table 5 shows the scores and and Graph 5 shows percentage scores for bilingual participants obtained from CLAP respectively. There was a gradual fall in scores in all the domains of the test across the stages of dementia. Scores for attention, perception & discrimination, memory and problem solving were almost equal within each stage of the

disorder. This was true for mild and moderate stages of the disease. Whereas, in the severe stage of the disorder it was not the same. There was a falling trend in the scores from attention, perception & discrimination till organization. Organization skills declined from the mild stage of the disease.



Graph 6. *Combined percentage scores for monolingual and bilingual participants for CLAP. (A, P & D= Attention, Perception and Dsicrimination, M= Memory, PS= Problem Solving, O= Organization)*

Graph 6 represents the combined percentage scores of monolingual and bilingual participants for cognitive linguistic assessment protocol. As it is evident from the graph, bilinguals performed better as compared to monolinguals in each of the domains of the test. This was true for both normal and patient population. This difference was almost nil in the later stages of dementia. Organization skills were almost on par for both monolinguals and bilinguals at the moderate and severe stages. Hence, as the disease progressed, the difference between monolingual and bilingual group decreased.

DISCUSSION

Diverse cognitive changes, including changes in language abilities are observed during aging (Craik & Bialystok 2006). It has been proposed by these authors that aging and general cognitive decline may have a detrimental effect on the ability to use two languages. Bilingualism is a heterogeneous phenomenon and patterns of language use throughout life span are diverse. Research has supported that assumption using two or more languages can frequently provide not only some social but also cognitive advantages. This was also supported by the present study which aimed at measuring the cognitive-linguistic performance in bilingual persons with dementia across the stages of the disease. Two tests, Addenbrooke's Cognitive Examination Revised for Kannada speakers (ACE-R/K) (Deepa & Shyamala 2009) and Cognitive linguistic assessment protocol (Rajasudhakar & Chengappa 2008) were used to assess the cognitive linguistic abilities in bilingual persons with dementia. Age matched normal individuals were used as the comparison group. Monolinguals as well as bilinguals were grouped separately and discussed. The results from ACE-R/K and CLAP indicate that persons with dementia showed decline in the cognitive functioning proportionate to the stages of the disease. As the disease progressed their cognitive abilities declined simultaneously. Another interesting fact is that bilinguals performed better as compared to that of monolinguals in both patient as well as normal group. The dementia patients presented a particularly interesting population for the study of the relation of linguistic function to the integrity of the mind and the dependencies between the different types of linguistic knowledge. Also the performance of the advanced dementia patients provided the evidence that knowing the sounds of language, rules for combination into words and their word order is not sufficient to enable exchange of information. According to our study the dementia patients had knowledge regarding the sound system of the language. But they lacked the pragmatic skills wherein usage of their knowledge to the communication environment was failed. But they could retain these skills till the moderate stage but failed during the advanced stage.

In ACE-R/K, at all the stages of dementia and in normal aging group memory is found to be reduced. This is been supported by Backman, Small & Fratiglioni (2001) who state that working memory is affected in the progression of the disease, and is manifested by decreased efficiency of encoding and retrieval of information throughout. Also individuals with difficulty sustaining attention,

naming objects and word finding problems difficulty adds on to the difficulty with memory related tasks.

Results from ACE-R/K indicate that language (content) is affected at later stage of the disease. This finding is in support of Bayles, Tomoeda & Trosset (1992) who stated that form of language remains generally intact but content is prominently affected. In the later stage, discourse is less cohesive and can be described as "empty." They could repeat the sentences but no longer understand them. Phonologic knowledge can be applied by dementia patients who are incapable of communicating meaningfully.

Fluency of speech is least affected due to dementia in initial stages. Speech is typically fluent but generally slower and more halting. This is in agreement with Appell, Kertesz & Fisman (1982), who found that the form of language remains intact though meaningful output is greatly reduced during the course of the disease.

Apart from memory, visuaspatial skills are also affected to a greater degree according to the test (ACE-R/K). This is seen markedly in the milder stage of the disease. The findings regarding visuaspatial skills are rarely elaborated in the literature. It is evident that visual perception and visual-constructive deficits are significant and dementia patients perform inferior to healthy peers (Bayles, Tomoeda & Trosset 1992). Patients with dementia demonstrate slower response in motor tasks. Motor tasks were major for visuaspatial skills assessment. Though the participants performed poor in these tasks it was not very clear whether it was most attributed to motor or cognitive slowing. Also the patient population exhibited disorganization of the normal motoric movements which can be termed as bradykinesia.

Results from CLAP indicate that patient participants were slower and inaccurate in performing attention, perception and discrimination tasks. It is very clear that they exhibit visual-perceptual deficits which can be referred to as visual agnosia in the clinical literature after the observation of clinical patients with dementia (Ernst, Dalby & Dalby 1970). The inaccurate performance in the visual subset of this domain would attribute to the visual recognition problems. Even though the patient population was provided bigger letters and longer duration, their performance was inaccurate and incorrect. Thus the disease related changes can place these elderly at a perceptual disadvantage.

The results from CLAP reveal that overall, bilingual's performance was better compared to that of monolinguals. Linguistic memory is affected from the milder stage of dementia and it worsens as the disease progresses. The findings are in agreement with Morris (1996) and Perry, Watson & Hodges (2000) who found difficulty in focused

attention, forgetting the location of objects and the memory problems like decrease in the working memory capacity.

Organization skills decline from the early stage of the disease. Since individuals face difficulty in working memory, they perform very poorly on organization tasks. The decreased sustained attention, leads to the poor performance in them. Organization skills require solving of complex tasks, hence concentration problems found in these individuals hinder their performance. This is in agreement with Bayles (1991). Also, the behavioral slowing and the fatigue are also common features which can be contributing to the poor performance.

Problem solving skills were found to be better than other tasks in CLAP. This could be due to the fact that tasks involved in this domain were easier compared to other domains of the test. Problem solving domain involved fluency of language as the responses for the task. Since fluency of language is preserved till moderate stage of the disease, the scores were better in this domain. However in the later stage even problem solving is equally affected like other domains of the test. A less complete or elaborate mental representation would thus be available to higher cognitive process such as problem solving skills. Beyond a certain point, a mental representation may be so degraded and it may no longer activate the appropriate concept.

Results on attention, perception and discrimination did not differ much from ACE-R/K. Problem with sustaines attention starts from the early stage of dementia and it progresses with the disease.

Overall bilinguals performed better as compared to monolinguals in both the tests and across the test domains. Results from the present study show that bilinguals perform better in all the domains of cognitive linguistic tasks as compared to monolinguals. This might be because that bilingual have two choices to come out with any response. Aging has been associated with increased interference between two languages. Alteration or code switching between languages occurs commonly amongst bilinguals (Skiba 1997). Whereas monolinguals have single language in use and hence if they are unable to use a particular word for a context the answer would be nil with no other choice. But bilinguals can code-switch and complete that particular task. In the present study, researchers were not interested in studying the performance in particular languages, but performance as a whole in cognitive linguistic task. So the response either from native language (L1) or the second language (L2) was taken as appropriate. Thus, bilinguals performed better as compared to monolinguals. This was true for the normal group as well because normal aging also shows up decline in the language abilities (Craik & Bialystok 2006).

CONCLUSION

The primary aim of the study was to assess the performance of monolingual and bilingual persons with dementia in two test protocols that is CLAP and ACE-R/K. Because persons with dementia have multiple cognitive deficits, including memory impairment, associated functions are always affected. The results of the two tests correlated well and cognitive decline was seen both in healthy control group as well as the clinical group with the latter performing worst than the former group.

Bilinguals performed better as compared to monolinguals in both the tests and across the cognitive domains of the tests. Bilinguals had an advantage of two choices to come out with the response unlike monolinguals with single language choice alone. The study enriches the knowledge of the clinicians working with elderly in various clinical set-ups. Age associated changes in sensory processes necessitate that modifications in illumination, size of the visual stimuli, and complexity of visual presentation be considered when working with the older adults. Reduction in attention capacity with aging implies that task complexity shouldbe carefully considered in clinical interactions with older individuals. Deficits in perception and attention in persons with dementia must be taken into account in any attempt to assess other aspects of cognition and communication. Further research has to be supported by longitudinal studies in these individuals. Since the study considered very few persons with dementia, studies with lager group of individuals will strengthen the generalization of the findings. To conclude, this research has supported the suggestion that bilingualism can have a protective effect during age-associated cognitive decline, and may even delay the onset of the dementia process.

REFERENCES

Abutalebi, J., Annoni, J. M., Zimine, I. et al. 2008. Language control and lexical competition in bilinguals: An event-related FRMI study. *Cerebral Cortex*, 12, 1496-1505.

Allender, J. & Kasniak, A. W. 1985. Processing of emotional cues and personality change in dementia of the Alzheimer's type. Paper presented at the *31th Annual Meeting of the International Neuropsychological Society*, San Diego, CA.

American Psychiatric Association. 1994. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, DC.

Appell, J., Kertesz, A. & Fisman, M. 1982. A study of language functioning in Alzheimer's patients. *Brain and Language*, 17, 73-91.

Backman, L., Small, B. J. & Fratiglioni, L. 2001. Stability of the preclinical episodic memory deficit in alzheimer's disease. *Brain*, 124, 96-102.

Ballard, C., Patel A., Oyebode F. & Wilcock G. 1996. Cognitive devline in patients with alzheimer's disease, vascular dementia, and senile dementia of Lewy body type. *Age and aging*, 25, 209-213.

Bayles, K. A. 1991. Alzheimer's disease symptoms: Prevalence and order of appearance. *Journal of Applied Gerontology*, 10, 419-430.

——. & Tomoeda, C. K. 1993. *Arizona Battery for Communication Disorders of Dementia.* Austin, TX: Pro-Ed.

——. & Tomoeda, C. K. 1997. *Improving Function in Dementia and other Cognitive-linguistic Disorders.* Austin, TX: Pro-Ed.

Beatty, W. W., Winn, P., Adams, R. L., Allen, W., Wilson, D. A., Prince, J. R., Olson, K. A., Dean, K. & Littleford, D. 1994. Preserved cognitive skills in dementia of the alzheimer type. *Archives of Neurology*, 51/10, 1040-1046.

Birren, J. E. & Botwinick, J. 1951. The relation of writing speed to age and to the senile psychoses. *Journal of Consulting Psychology*, 15, 243-249.

Clarfield, A. M. 1988. The reversible dementias: DO they reverse? *Annals of Internal Medicine*, 109, 476-486.

Coppens, P. & Frisinger, D. 2005. Category-specific naming effect in non-brain-damaged individuals. *Brain and Language*, 94, 61-71.

Craik, F. I. & Bialystok, E. 2006. Cognition through the lifespan: Mechanisms of change. *Trends in Cognitive Sciences*, 10, 131-138.

Deepa, M. S. & Chengappa, S. 2009. Discourse in Bilingual Persons with Dementia. Ongoing Doctoral thesis, University of Mysore, Mysore.

Eichenbaum, H. & Cohen, N. J. 2001. *From Conditioning to Conscious Recollection: Memory Systems of the Brain.* New York: Oxford University Press.

Eslinger, P .J. & Benton, A. L. 1983. Visuo-perceptual performances in aging and dementia: Clinical and theoretical implications. *Journal of Clinical Neuropsychology*, 5, 213-220.

Fabbro, F. 2001. The bilingual brain: Bilingual aphasia. *Brain and Language*, 79, 201-210.

Fisher, N., Rourker, B., Bieliauskas, L. & Giordani, B. 1996. Neuropsychological subgroups of patients with alzheimer's disease. *Journal of Clinical and Experimental Neuropsychology*, 18, 349-370.

Folstein, M. F., Folstein, S. E. & McHugh, P. R. 1975. Mini-mental state: A practical method for grading the mental state of patients for the clinician. *Journal of Psychiatric Research*, 12, 189-198.

Fuster, J. M. 1989. *The Prefrontal Cortex.* 2nd ed. New York: Raven Press.

Galton, C., Patterson, K., Xuereb, J. & Hodges, J. 2000. Atypical and typical presentations of alzheimer's disease: A clinical neuropsychological, neuroimaging and pathological study of 13 cases. *Brain: A Journal of Neurology*, 123, 484-498.

Good, C. D., Johnsrude, I. S., Ashburner, J., Henson, R. N. A., Friston, K. J. & Frackowiak, R. S. J. 2001. A voxel-based morphometric study of ageing in 465 normal adult brains. *NeuroImage*, 14, 1-16.

Goodglass, H. 1980. Naming disorders in aphasia and aging. In L.Obler & M. Albert (Eds), *Language and Communication in the Elderly* (pp. 37-45). Lexington, MA: DC Heath.

Halsband, U. 2006. Bilingual and multilingual language processing. *Journal of Physiology*, 99, 335-375.

Hyltenstam, K. & Obler, L. K. 1989. *Bilinguals Across the Lifespan: Aspects of Acquisition, Maturity and Loss*. New York: Cambridge University Press.

Kamath, A. 2001. Cognitive-linguistic assessment protocol for adults. Unpublished Master's dissertation, University of Mysore, Mysore.

Kemper, S. Kynett, D. Rash, S., O'Brien, K. & Sportt, R. 1989. Life-span changes to adults language: Effects of memory and genre. *Applied Psycholinguistics*, 10, 49-66.

Larson, E. B., Reifler, B. V., Sumi, S. M., Canfield, C. G. & Chinn, N. M. 1986. Diagnostic tests in the evaluation of dementia: A prospective study of 200 elderly outpatients. *Archives of Internal Medicine*, 146, 1917-1922.

Laurin, D., Verreault, R., Lindsay, J., MacPherson, K. & Rockwood, K. 2001. Physical activity and risk of cognitive impairment and dementia in elderly persons. *Archives of Neurology*, 58, 498-504.

Lewis, R. & Kupke, T. 1977. The lafayette clinic repeatable neuropsychological test battery: Its development and research applications. Paper presented at the *Annual Meeting of the Soutwestern Psychological Association*, Hollywood, Floria.

Lorenzen, B. & Murray, L. L. 2008. Bilingual aphasia: A theoretical and clinical review. *American Journal of Speech Language Pathology*, 17, 299-317.

Luria, A. 1966. *Human Brain and Psychological Processes*. New York: Harper & Row.

Meinzer, M., Obleser, J., Flaisch, T., Eulitz, C. & Rockstroh, B. 2007. Recovery from aphasia as a function of language therapy in an early bilingual patient demonstrated by FMRI. *Neuropsychologia*, 45, 1247-1256.

Miller, E. 1974. Psychomotor performance in presenile dementia. *Psychological Medicine*, 4, 65-68.

Mioshi, E. Dawson, K. Mitchell, J., Arnold, R. & Hodges, J. R. 2006. A cognitive bedside assessment beyond the MMSE: The addenbrooke's cognitive examination. *International Journal of Geriatric Psychiatry*, 21/11, 1078-85.

Morris, R. G., Gick, M. L. & Craik, E. I. M. 1988. Processing resources and age differences in working memory. *Memory and Cognition*, 16, 362-366.

Nicholas, L.G., Barth, C., Obler, L. K., Au, R. & Albert, M. L. 1997. Naming in normal aging and dementia of the Alzheimer's type. In H. Goodglass & A. Wingfield (Eds), *Anomia: Neuroanatomical and Cognitive Correlates* (pp. 166-188). San Diego, CA: Academic Press.

Nilsson et, L. G., Backman, L., Nyberg, L., Erngrund, K., Adolfsson, R., Bucht, G., et al. 1997. The Betula prospective cohort study: Memory, health, and aging. *Aging, Neuropsychology and Cognition*, 4, 1-32.

Nyberg , L., Maitland, S. B., Ronnlund, M., Backman, L., Dixon, R.A., Wahlin, A. et al. 2003. Selective adult age differences in an age-invariant multi-factor model of declarative memory. *Psychology and Aging*, 18, 149-160.

O'Brien, J., Morris, C. M., Barber, R., Swann, A., Neill, D. & McKeith, I. 2001. The progression of cognitive impairment in dementia with lewy bodies, vascular dementia and alzheimer's disease. *International Journal of Geriatric Psychiatry*, 16, 499-503.

Perry, R., Watson, P. & Hodges, J. 2000. The nature and staging of attention dysfunction in early (minimal and mild) alzheimer's disease: Relationship to episodic and semantic memory impairment. *Neuropsychologia*, 38, 252-271.

Plfiffer, E. 1975. A short portable mental state questionnaire for the assessment of organic brain deficit in the elderly patients. *Journal of the American Geriatrics Society*, 23, 433-441.

Rajasudhakar, S. & Shyamala, K.C. 2008. A study of the effect of age, gender and lingualism on cognitive-linguistic performance. Student Research Report, All India Institute of Speech and Hearing, Vol, III.

Rosen, W. G., Mohs, R. C. & Davis, K. L. 1986. A new rating scale for alzheimer's disease. *American Journal of Psychiatry*, 141, 1356-1364.

Ross-Swain, D. 1992. *Cognitive Linguistic Improvement Progam*. San Diego, CA: Singular Publishing Group.

Schacter, D. L., Wagner, A. D. & Buckner, R. L. 2000. Memory systems of 1999. In E. Tulving & F. I. M. Craik (Eds.), *The Oxford Handbook of Memory* (pp. 627-643). New York: Oxford University Press.

Squire, L. R. 2004. Memory systems of the brain: A brief history and current perspectives. *Neurobiology of Learning and memory*, 82, 171-177.

——., Stark, C. E. L. & Clark, R. E. 2004. The medial temporal lobe. *Annual Review of Neuroscience*, 27, 279-306.

Skiba, R. 1997. Code switching as a countenance of language intereference. The internet. *TESL Journal*, III, 10. Available online: <http://iteslj.org>.

Stoarandt, M., Botwinick, J., Danziger, W. L., Berg, L. & Hughes, C. P. 1984. Psychometric differentiation of mild senile dementia of alzheimer's type. *Archives of Neurology*, 41, 497-499.

Talland, G. A. & Schwad, R. S. 1964. Performance with multiple sets in parkinson's disease. *Neuropsychologia*, 2, 45-53.

Tomoeda, C. K. & Trosset, M. W. 1992. Relation of linguistic communication abilities of alzheimer's patients to stage of disease. *Brain and Language*, 42, 454-472.

Tulving, E. 1984. Elements of episodic memory (précis). *Behavioral and Brain Sciences*, 7, 223-268.

Woodruff-Pak, D. S. 1997. *The Neuropsychology of Aging*. Cambridge, MA: Blackwell.

West, R. L. 1996. An application of prefrontal cortex function theory of cognitive aging. *Psychological Bulletin*, 120, 272-292.

Wylie, E & Ingram, D. E. 2006. *International Second Language Proficiency Ratings (ISLPR)* general proficiency version for English Nathan, Qld

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