VERBAL PERSEVERATION IN MALAYALAM - ENGLISH BILINGUALS

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"ഓം നമോ ഭഗവതേ വാസുദേവായ
ഓം ശ്രീകൃഷ്ണായ പരബ്രഹ്മണെ നമഃ"

"sarasvatI namastubhyam varadE kAmarUpiNI
vidyArambham karishyAmi siddhirbhavatu mE sadA"

Dedicated to

ACHAN, AMMA & CHETTAN

"Matru Devo Bhava

Pitru Devo Bhava

Acharya Devo Bhava

Athithi Devo Bhava."

[Regard the mother as God, the father as God, the preceptor as God and the guest as God]

Certificate

This is to certify that this dissertation entitled **"Verbal Perseveration in Malayalam - English Bilinguals"** is a bonafide work in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student (Registration No. 08SLP016). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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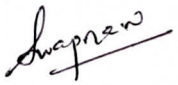
This is to certify that this dissertation entitled **"Verbal Perseveration in Malayalam - English Bilinguals"** has been prepared under my guidance and has not been submitted earlier to any other University for the award of any other Diploma or Degree.



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Declaration

This Dissertation entitled **"Verbal Perseveration in Malayalam - English Bilinguals"** is the result of my own study under the guidance of Dr. Swapna. N, Lecturer in Speech Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

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"By doubting we are led to question and by constant and frequent questioning we arrive at the truth. These are the Keys to Wisdom"

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CHAPTER I

INTRODUCTION

Research in cognitive aging and related behavioral symptoms is becoming an area of growing concern. Researchers from different disciplines such as Linguistics, Psychology, Cognitive Neurosciences and also Speech Language Pathology are now focusing their research to study speech and language acquisition, development and the associated changes with age. Speech Language Pathologists' (SLPs) in particular are concerned with the study of speech and language characteristic of geriatrics as it has direct implications on clinically aging population. Speech errors in specific, whether from normal or impaired speakers, have proven to be a rich source of data that reveals the nature of linguistic representations and the cognitive mechanisms underlying the production of words and sentences. Among the different types of speech errors, verbal perseveration is a common symptom that impedes the language fluency. Verbal perseverations are speech errors in which the flow of speech is disturbed by the intruding material that comes from the preceding speech. As defined by Sandson & Albert (1984) perseverations are the inappropriate recurrence or continuation of an earlier response.

Perseveratory errors provide important information about the temporal properties of language production. The presence of these errors in both normal and impaired speakers suggests that perseverative errors reflect the malfunction of fundamental mechanisms of the normal language processor that can be disturbed by brain damage, by circumstances that stress the unimpaired language system in some way (e.g., increasing rate of speech), or by aging. This malfunction can operate at different levels of neurocognition to produce distinctly different kinds of perseverative symptoms. The most

widespread taxonomy of perseveration classifies perseveration into continuous, stuck-in-set and recurrent types and implicates disturbances of adrenergic, dopaminergic and cholinergic neurotransmitter systems respectively. These neurochemical systems exert its effect on fundamental cognitive mechanisms that are thought to influence verbal perseveration, such as working memory, planning, shifting of cognitive sets and attentional processes. Thus perseveratory errors are expected in normal aging also, apart from brain damaged patients, as a result of decline in cognitive functions, specifically the executive functions. Changes in inhibitory control, component of executive function is the first to decline during cognitive aging (Bedard, Nichols, Barbosa, Schachar, Logan, & Tannock, 2002). There are two different accounts of perseveration namely the disinhibition account and reduced activation account.

It is very well established that during aging there will be many cognitive and associated language changes. There are two highly influential models proposed to explain these language changes during cognitive aging viz. 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. There are reports which suggest that the second language is learned through explicit memory while first language is acquired through implicit memory in late bilinguals (Paradis, 2004a). Under these circumstances, it can be assumed that, as different cognitive processes are involved in first and second language acquisition, there may be some differences in the underlying neural mechanisms of both languages of a late bilingual. Review of electrophysiological

studies which have focused on processing at the phonetic/phonological, semantic and even at syntactic levels support that the neural correlates of first language (L1) vs. second language (L2) processing differ from each other in bilinguals (Moreno, Rodriguez-Fornells, & Laine, 2008).

Research into bilingual language processing has provided growing evidence towards enhanced cognitive functions 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, & Viswanathan, 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. The extended experience of bilingualism thus builds up cognitive reserve and protects against the onset of dementia (Bialystok, Craik, & Freedman, 2007).

In recent years, there has been much work 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 with the studies related to bilingual language processing in normals as well as in individuals with communication disorders and are also considering issues related to bilingualism while developing assessment protocols and treatments for various communication disordered population.

It is presumed that perseveration may serve as a better behavioral tool to study second language changes during healthy aging as it has an implicated neurochemical substrata. The various neurochemical modulations have an effect on fundamental cognitive mechanisms particularly executive functions such as working memory, planning, shifting of cognitive sets and attentional processes which are thought to influence verbal perseverations. This offers the opportunity of considering perseveratory measures to assess bilingual cognitive advantages and to study whether these effects persists into old age. The current study also realizes the complete lack of any theoretical accounts or models proposed to study bilingual perseveratory behavior.

Need for the study

There is a lack of objective data concerning the nature and occurrence of perseverative behavior in the aging population as well as in selected categories of brain injury. The study of perseveratory characteristics in the normal aging population, apart from revealing age related changes, would help an SLP to screen/evaluate geriatric population for their speech and language deficits, if any. In treating the brain damaged population, clinicians are always left with the feeling that perseverative errors are just one of those intractable problems that may just improve over time as overall aphasia severity resolves. While to date there is no definitive 'cure' for perseverative errors, perhaps the key to developing more efficacious and successful therapy is gaining a better understanding of their underlying cause. Thus the increased knowledge of the underlying nature of perseverative errors will assist SLPs in the treatment of this problematic symptom. Also research in this direction may contribute evidences to the diverse results on age and gender related effects on perseveration.

Investigations to study perseveration have also raised diverse opinion on the potential of the tasks that are used to elicit perseveration. Research in this direction may reveal the various underlying language mechanisms during aging and this may provide evidences to bridge the gap between the seemingly diverse theoretical accounts of perseveration as well as the cognitive models on language and aging by substantiating or contradicting the existing literatures.

Moreover, all the studies done so far, with respect to perseveration were in monolingual population. There is a pressing need to conduct similar studies in bilingual population as it may reveal interesting findings regarding the bilingual language representation, processing and bilingual cognitive advantages. It still remains unclear whether bilingual cognitive advantages persist into old age. Perseveratory errors may be used as a tool to examine this. Perseverations may also reflect language specific changes during healthy aging in bilingual elderly and research in this direction may also pave way into the less explored frontiers of second language loss.

Objectives of the study

1. To investigate the differences in perseveration if any, between Malayalam-English bilingual and monolingual normal elderly individuals.
2. To examine whether perseverations differ with the first and second language in the bilingual elderly speakers.

In addition, the performance of the subjects with reference to age and gender will be analyzed.

CHAPTER II

REVIEW OF LITERATURE

Language is the major instrument of cognition. Language mediates not only the social relationship systems, but also the control of cognitive processes ('metacognition'). However, aging paves way for certain cognitive and linguistic changes in an individual. Research in cognitive aging and related behavioral symptoms of language attrition is becoming an area of growing concern. The study of speech and language characteristics of the normal elderly individuals is of particular concern as it has direct implications on clinically aging population. Speech errors particularly perseveration have proven to be a rich source of data that reveals the nature of linguistic representations and the cognitive mechanisms underlying the production of words and sentences. Perseverative errors thus reflect the malfunction of fundamental mechanisms of the normal language processor that can be disturbed by brain damage or by aging as a result of decline in cognitive function, or by circumstances which stress the language system in some way (e.g., increasing rate of speech).

Perseveration

Perseveration is described as any morbid tendency to maintain a normal set or to report an act not appropriate to the situation in which a response is required (Eisenson, 1973). Neisser (1895) first formulated the term "Perseveration" to indicate the persistent repetition or continuation of an activity once started. More recently, it has been described as the inappropriate recurrence or continuation of an earlier response (Sandson & Albert, 1984). This behavior when it occurs in speech is called 'Verbal perseveration'.

Perseveration has been observed in a wide variety of both physical and cognitive behaviors (Luria, 1965; Sandson & Albert, 1984; Albert & Sandson, 1986, Helm-Estabrooks, Ramage, Bayles, & Cruz, 1998) including writing, drawing, constructional tasks and speech (Helmick & Berg, 1976; Sandson & Albert, 1984). Perseveration, for example, can vary by level of communication processing (e.g., cognitive, linguistic, motor), by modality (e.g., verbal, graphic, manual), by task (e.g., spontaneous speech, verbal repetition, confrontation naming), task difficulty, item selection, and by combinations of these (Rosenberg, 1912; Christman, Boutsen, & Buckingham, 2004; Preethi & Goswami, 2010).

Verbal perseveration is one of the most common behavioral phenomena associated with aphasia (Albert & Sandson, 1986). Clinicians are concerned about the appearance of perseverative responses in brain injured adults due to its contaminating effects on test results, its influence on clinical examination and because it is an obstacle to therapy. Perseveration as reported by Morganstein and Certner-Smith (2001) is difficult to manage clinically. Perseveration is also reported in normal speakers (Ramage, Bayles, Helm-Estabrooks, & Cruz, 1999; Chandralekha & Prema, 2003; Mukunthan & Prema, 2003; Preethi & Goswami, 2010).

Types of perseveration

Perseveration is not generally understood to be a unitary phenomenon at either a behavioral or a neurophysiological level of analysis, although it has been postulated that a single mechanism of 'pathological inertia' can produce distinctly different kinds of perseverative symptoms by operating at different levels of neurocognition. Some neural localization is also possible for the various types of perseverative symptoms. The existing

literature on perseveration may be generally classified as those emphasizing on the type of perseveration with respect to anatomical lesion sites (Sandson & Albert, 1984) and the linguistic characteristics of perseveratory behavior speculating on language processing per se (Crossan, 1985). While the former attempts to relate lesion localization to the type of perseveration, the latter gives a linguistic description of perseveratory behavior. Three major types of perseveration that have been described in the literature are as follows:

1. **Continuous perseveration**: This type of perseveration involves abnormal prolongation or continuation without cessation of a current behavior. It is defined as the inappropriate or continuation of a response beyond the point of completion and without interruption by an intervening event (Sandson & Albert, 1984). This phenomenon can be observed across performance modalities. Other terms are 'Clonic' (Liepmann, 1905), 'Efferent motor' (Buckingham, 1985), 'Contiguous perseveration' (Buckingham, 1985) and 'Compulsive repetition' (Freeman & Gathercole, 1966). Sandson and Albert, (1984) have implicated a right hemisphere attentional disorder that might give rise to continuous perseveration. Citing evidence of a greater quantity of norepinephrine seen in the normal right versus left cerebral hemisphere, they suggested that some aspects of continuous perseverative behavior may arise from norepinephrine depletion secondary to right hemisphere damage.

2. **Recurrent perseveration**: This is defined as the inappropriate reproduction of a previous response following a subsequent stimulus (Sandson & Albert, 1984). This is the unintentional repetition of a response in the absence of a stimulus that was used initially to elicit a response. Recurrent perseveration is associated with damage to left temporal and parietal regions of the brain, although it is also seen in persons with aphasia

following sub-cortical damage (Moses, Nickels, & Sheard, 2004a). Other terms include 'intentional' (Liepmann, 1905), 'repetitious' (Buckingham, 1985) and 'ideational perseveration' (Bayles, Tomoeda, Kaszniak, Stern, & Eagens, 1985).

3. Stuck-in-set perseveration: This is an inappropriate maintenance of a category or framework of response after introduction of new tasks (Sandson & Albert, 1984). It involves higher order processing impairment of switching from one cognitive set to another, reflecting impaired executive functioning. There is an inflexible maintenance of an inappropriate cognitive behavioral response when a change in task is required. The individual may be aware of an alteration in the task demand but either does not recognize the intended response or is unable to formulate a new category of response. Sandson and Albert (1987) have suggested a dopaminergic hypothesis for such responses. This form of perseveration is typically seen in persons with frontal lobe damage (Sandson & Albert, 1984), where patients have difficulty in shifting attention from one form of response to another. Other terms are 'tonic perseveration' (Liepmann, 1905), 'cortical perseveration' (Luria, 1965), and 'impairments of switching' (Freeman & Gathercole, 1966).

The different types of perseveration along with their motoric description and the areas in brain implicated have been provided in table 1 below:

Table 1: *Types of Perseveration along with their Descriptions**

Type of perseveration	Motoric description	Areas of brain involved
Continuous	Abnormal repetition of a response token without cessation Stimulus: "Name this picture" (of a dog) Response: "Dog Dog Dog Dog"	Damage to thalamus, arcuate fasciculus and deep nuclei of subcortical structures Right hemisphere damage Norepinephrine depletion
Stuck-in-set	Inappropriate maintenance of a response type even though task demands have changed Stimulus: "Now point to the picture of the dog" Response: Continues to name, not point to, 'dog'	Left frontal lobe &/ mesolimbic frontal damage Dopamine depletion
Recurrent	Repetition of a previous response token to a subsequent stimulus within an established task set (Has pointed to dog and book) Stimulus: "Now point to the picture of the table" Response: Points to the 'dog'	Posterior left hemisphere damage, Left temporal/ parietal damage Acetylcholine depletion

*(Sandson & Albert, 1987)

The nature of perseverations has been studied extensively in the clinical population and in normal individuals (both young and elderly). The literature on perseveration was reviewed and the studies pertaining to these aspects have been broadly classified under the following sections:

I. Studies on brain damaged individuals

II. Studies on normal elderly individuals

III. Studies on adult unimpaired individuals

I. Perseveration in brain damaged individuals

Verbal perseveration is the most common behavioral phenomenon associated with aphasia (Helmick & Berg, 1976; Yamadori, 1981; Shindler, Caplan, & Hier, 1984; Albert

& Sandson, 1986; Pietro & Rigordsky, 1986; Lundgren, Helm- Estabrooks, Magnusdottir, & Emery 1994). Regardless of the type of aphasia, 50-90% of errors reported on verbal tasks made by aphasic patients have been reported as perseverative, typically of the recurrent type.

Yamadori (1981) studied thirty eight persons with aphasia (24 anterior lesions, 14 posterior and 4 mixed). The tasks used included repetition of meaningful and non-meaningful stimuli with varying length. Thirty three patients perseverated out of thirty eight. However, it was found that perseveration did not correlate with the severity, duration or type of aphasia.

Vilkki (1989) reported that recurrent and stuck-in-set perseveration was related to posterior and anterior left hemisphere lesions, respectively. They studied sixty two patients with focal brain lesions and eleven control subjects using alternating tasks of learning, generation and recall of words beginning with /k/. Patients with left posterior lesions failed to suppress the expression of the previously generated words in the subsequent generation task, whereas patients with left anterior lesions stated a great number of new words in the recall of previously learned words, presumed to indicate stuck-in-set perseveration of the previous generation performance.

Mukunthan and Prema (2003) investigated verbal perseveration in five individuals with Broca's aphasia and five normal individuals in the age range of 60-80 years. Five different tasks such as picture naming, function description, word definition, picture description and question-answer were selected and administered on all subjects.

The results indicated recurrent perseveration in Broca's aphasics and continuous perseveration in normal elderly individuals.

Perseverative errors are also common in the speech of schizophrenic patients (Barr, Bilder, Goldberg, Kaplan, & Mukherjee, 1989; DeLisi, 2001), parkinson's disease (Bayles, Trosset, Tomoeda, Montgomery, & Wilson, 1993) and huntington's disease (Butters, Goldstein, Allen, & Shemansky, 1998) and vocal tics of tourette's syndrome (Ridley, 1994) and in patients with traumatic brain injury (Hotz & Helm-Estabrooks, 1995; Lombardi, Andreason, & Sirocco, 1999). Patients with dementia also perseverated more frequently than normal subjects (Bayles et al., 1985; Bayles, Tomoeda, McKnight, Helm-Estabrooks & Hawley, 2004; Preethi & Goswami, 2010).

Pekkala, Albert, Spiro, and Erkinjunitti (2008) reported that perseveration is common in Alzheimer's disease (AD). They documented the type and quantitative burden of perseveration as cognitive decline progresses from normal aging through mild to moderate AD by administering a semantic verbal fluency task. They found perseveration to increase significantly with increasing severity of AD and different types of perseveration that distinguish the subject groups in a statistically significant manner. Recurrent and continuous perseverations appear early in AD. As the disease progresses in severity into moderate stage, the number of recurrent and continuous perseverations increases and stuck-in-set perseverations emerges. They concluded that the different types of perseveration are likely to reflect the progressive deterioration of different brain regions in AD.

In the Indian context, Preethi and Goswami (2010) made an attempt to investigate perseverative and anticipatory errors in Malayalam speaking normal aging individuals and persons with Alzheimer's disease (AD). The study incorporated nine persons with AD and ten normal geriatric persons as participants who were age, language, handedness and education matched. Four different tasks such as general conversation, confrontation naming, generative naming and picture naming were used to elicit anticipatory and perseverative errors. In this study the frequency of anticipative error was not extracted for both the groups, as none of them made this kind of error for any of the tasks administered. However, with respect to perseverative errors, the results showed that patients with AD had higher percentage of perseverative errors compared to normal geriatric patients. Generative task and general conversation were found to be potential tasks to elicit perseveration in both the groups. Recurrent type of perseverations obtained higher percentage frequency than continuous type and stuck-in-set type. Stuck-in-set had the least scores. In normal individuals, continuous types of perseverations were followed by recurrent type and there were no reports of stuck-in-set perseveration. This was in consonance with the study by Chandralekha and Prema (2003), but with respect to the percentage of perseveration it was in disagreement with this study. In this study only 2.23% of perseverative errors were reported for normal elderly subjects while a significantly higher percentage of perseveration (3.6%) was reported by Chandralekha and Prema (2003). They attributed the factors of education, socioeconomic status and multilingualism to their contrasting finding.

Only one study which discussed bilingual perseveratory behavior was found in the literature. This was a single case study on a transcortical sensory aphasic patient by

Mohan and Swapna (2010). A speeded picture naming task with semantic blocking was carried out in two language conditions in a Kannada-English bilingual patient with aphasia. The study revealed that frequency of perseverations was different for the two languages in their patient, less in L1 compared to L2. This was supported on the basis of Revised Hierarchical Model (Kroll & Stewart, 1994), proposed for bilingual language processing, where there are two different modules for L1 and L2 with bidirectional interactions. They also drew support from the Activation threshold hypothesis (Paradis, 1985, 1993) based on which low activation thresholds may yield faster and easier access than higher thresholds, especially under brain damage. Recurrent perseverations were found more than continuous perseveration. This was in agreement with the hypothesis that posterior aphasics have more recurrent perseverations (Vilkki, 1989). An interesting finding from the study was a new linguistic variant of perseveration, termed translation equivalent recurrent perseveration that was found. Here, an instance of recurrent perseveration was noted wherein the subject named the target picture with the translation equivalent of a previous word. The authors concluded that this could be because of the phenomenon of spontaneous translation reported in bilingual aphasics (Perceman, 1984).

II. Perseveration in normal elderly individuals

Verbal perseveration is noticed in normal aging, as normal aging is a dynamic series of biological, social and psychological changes. Knowledge regarding the frequency of perseveration in normals come from studies of brain damaged individuals in which normal control subjects also were studied.

Troster, Salmon, McCullough and Butters (1989), using the ratios of perseveration to responses reported that older normal individuals (M = 70.4 years) had

significantly more recurrent perseverations (M = 0.03, SD = 0.04) than younger (M = 50.8 years) normal individuals (M = 0.01, SD = 0.02). The task used was the verbal fluency section of Dementia Rating Scale (Mattis, 1988).

Using Wisconsin Card Sorting Test (Berg, 1948; Grant & Berg, 1948), Daigneault, Braun, and Whitaker (1992) studied prefrontal functions in normal aging. They reported significantly higher raw score rates of perseveration for older subjects (M= 56.6 years) than for younger subjects (M= 27.7 years). Both the above reported studies, provides evidence that perseveration may increase with normal aging.

Ramage, Bayles, Estabrooks, and Cruz (1999) determined the frequency of perseveration in normal individuals by type and in relation to task. Thirty young normal individuals (M=25.4 years) and thirty older normal individuals (67.9 years) were studied. They administered four tasks such as verbal definitions, generative naming, alternating graphomotor sequences and a version of Modified Wisconsin Card Sorting Task (Nelson, 1976). Their results revealed that 4% of all responses were perseverative. No significant difference was found between the age groups and gender. Stuck-in-set type of perseveration accounted for 73% of all perseverations and was reported only in Wisconsin card sorting test. Recurrent perseverations resulted in 24% of the total responses and were observed on all tasks. Continuous perseverations were uncommon. They concluded that in normal aging individuals the frequency of perseverations was less and thus they can be differentiated from individuals with brain damage, who exhibit greater frequencies.

A study was done on twenty four Tamil speaking older individuals by Chandralekha and Prema (2003). The subjects were categorized into four groups across the age range of 60-80 years. Five language tasks which included picture naming, picture description, defining words, defining function and question-answer were administered. The results revealed that perseveration is a phenomenon of geriatrics (M= 3.6% in 75-80 year old group) and that it increases with age in normal individuals. Continuous type of perseveration was found to be more frequent than other kinds of perseveration and this was equally present in phonological, semantic and syntactic aspects of language. The study was first of its kind in an Indian language and among the geriatric population. The study also revealed age and gender differences in the perseveratory characteristics. However, the number of samples were limited to establish the normative trend.

Foldi, Helm-Estabrooks, Redfield, and Nickel, (2003) studied perseveration in 73 healthy individuals in four age groups (18-39, 40-59, 60-74, 75-88) by administering three generative tasks (design generation, animal naming, words starting with /m/) from the Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001) and responses were scored for perseveration and productivity. The results indicated that design generation caused significantly higher perseveration rates which were found to be increasing linearly as a function of age, with highest prevalence in the oldest group. No age effects were found for perseveration on the verbal naming tasks. Perseverations elicited were independent of one another across tasks. But the study used design generation task that requires multiple simultaneous processing skills and places more demands on compromised executive processing in the elderly. Thus the studies on normal elderly population show a very minimal percentage of overall response as perseveration.

III. Perseveration in adult unimpaired individuals elicited through perseveration promoting manipulations

Perseverative errors may be elicited in adult speakers without language impairment when performing language tasks, but less frequently than patients with brain damage (Buckingham, 1980; Ramage et al., 1999). This challenges theories that perseverative errors result from damage to specific brain regions, as unimpaired speakers have no such damage. Instead studying the perseverative errors made by both populations may lead to converging evidence regarding theories of language processing (Buckingham & Rekart, 1979; Buckingham, 1980). Thus perseveratory errors made by unimpaired speakers elicited through perseveration promoting manipulations are considered to provide an understanding in terms of theories of normal language processing.

Vitkovitch and Humphreys (1991) used a speeded picture-naming task to induce naming errors in normal speakers. They found that (1) speeding up the pace of this task increased rates of semantic errors and that (2) many of these errors were perseverations from previous trials. This variable interacted with frequency, with more perseverations occurring on low frequency targets. Dell, Burger, and Svec (1997) studied the relation of speech rate with movement errors and reported that at faster rates perseveratory errors are favored.

Moses, Nickels, and Sheard (2004b), elicited different patterns of perseverative errors in reading aloud and picture naming under speeded response deadlines. The study was conducted in fourty four unimpaired participants in the age group of 18-30 years. They argued that the perseverative errors reflected both the level and degree to which language-processing efficiency was compromised by the response deadline in each task.

Gotts, Rochetta, and Cipolotti (2002) found increase in the overall error rate when speech rate was increased. However, they did not observe a simultaneous increase in perseverative errors, though many studies have indicated a direct relationship between higher speech rate and greater perseveratory error. Task variables were reported as a possible reason for this null result.

In summary, the studies on the effects of speech rate on accuracy of speech production concur that increased rates lead to more errors, including more movement errors. Not all studies show that rates of perseveration increase with speech rate, but further investigations of variables operating in different tasks that are used to elicit perseverations should shed light on this question.

Theories of perseveration

Various theories have discussed the origin of perseverations from different perspectives but the major focuses among them were directed to various cognitive processes.

Hudson (1968) stated that individuals with perseveration are absorbed by one idea to the exclusion of others. He explained the disorder as a memory problem and suggested analysis of factors which influence the storage and recall of ideas. According to him, intentional perseveration may be due to impairment of an inhibitory system which causes an increase in facilitatory activity and involuntary recall of recently established memory. Stated differently, perseveration occurs when the inhibitory system is unable to inhibit previously excited neural elements.

Yamadori (1981) proposed failure of post activation inhibition as an explanation for perseveratory errors. He proposed that the residual activation of perseverate is due to partial or complete failure of the mechanism that turns off activation immediately after production. The disturbance to activation levels of the current utterance is not included in this account. He also proposes a direct relationship between the type of perseveration and degree of inhibitory failure. Accordingly, continuous perseverations are seen when there is a complete failure of post activation inhibition mechanism, and recurrent would reflect partial failure of that mechanism.

An information processing model was proposed by Pietro and Rigordsky (1986) to account for perseverative responses. The model was developed based on the results obtained from an aphasic subject. According to the model, the items retrieved from the long term memory and uttered seemed to become a lexical unit in the working memory. However, once retrieved, the items appeared to be retained in the working memory (for the purposes of their explanation, concepts of working memory and short term memory were overlapped) as stimulus traces which entered into a "nonvolitional rehearsal process" interfering with the capacity of short term memory to add new items, or to search and retrieve from long term memory. This was particularly true as time demands of the task increased. The aphasic's repertoire thus becomes limited to a small pool of these nonvolitionally rehearsed items.

Shindler, Caplan, and Hier (1984) proposed that perseverative intrusions results in retrieval of an erroneous response from short term memory due to a disruption to the naming process that prevents retrieval of the target word from long term memory.

Based on Dell et al. (1997) model of serial order and interactive spreading activation theory of language production, for a perseveration to occur, the current target's vulnerability must co-occur with persisting activation of a past utterance. Others also place the source deficit within the language processor but postulate a failure of the turn off function rather than disrupted activation of the target word.

More recently, the literature points to two major theories of perseveration developed by incorporating ideas from earlier theories and evidences obtained from brain damaged and normal individuals. Most of these theories proposed are targeted towards explaining recurrent perseveration as it is likely to be the most prevalent form of perseveration in the realm of speech or verbal fluency as one can easily imagine inappropriate repetition of phonemes, morphological endings, or even whole words or phrases in patients with damage to language centers in the brain (McNamara & Albert, 2004).

1. Disinhibition theory or Competing activation account:

The residual activation from the prior response interferes with the person's ability to retrieve a new response from long-term memory because its representations have been recently activated. Based on semantically related primed experiments in unimpaired speakers, Vitkovitch and Humphreys (1991) hypothesized that perseverative errors are caused by increased levels of activation from primes in the links between semantics and phonology. This activation interferes with activation of the current target, resulting in the erroneous and perseverative selection of the prime. But Wheeldon and Monsell (1994) proposed that the locus of competition was more specifically at the level of lemma selection. These studies have also suggested that the perseveration of an immediately

preceding item is prevented either through transient facilitation of the target by the prime (Wheeldon & Monsell, 1994) or by automatic self-inhibition of the prime (Campbell & Clark, 1989; Arbuthnott, 1996). Priming thus introduces a further source of error predisposing the system to produce perseverative errors, as the resting level of activation for previously produced items will be increased (Dell, 1986; Schwartz, Saffran, Bloch, & Dell, 1994).

In short, the Competing activation account proposes that when naming a picture is disrupted by activation of semantically related primes at lags greater than '0', perseverations result. The supportive studies in this direction suggest the mapping of the semantic representation to the phonological form of the word as source of perseverative errors.

2. Underlying language processing breakdown or Reduced language-processing efficiency account

Recent research within a cognitive neuropsychological framework has begun to explore more specifically the linguistic influences on perseverative errors in individuals with differing levels of language processing breakdown. There is a small but emerging body of evidence that, as with other types of aphasic errors, the perseverative errors made by people with aphasia reflect (as opposed to actively interfere with) underlying language processing breakdown (Cohen & Dehaene, 1998; Hirsh, 1998; Martin, Roach, Brecher, & Lowery, 1998; Moses, Nickels, & Sheard, 2004b). Cohen and Dehaene (1998) also discussed how perseverative errors can occur in normal language production due to compromised language processing and normally existing amounts of persistent activation at any level of language processing. This theory assumes that the activation of the target

(word or phoneme) is abnormally weak and is subsequently overcome by (normally existing) persistent activation from prior responses. Thus this more recent research has proposed that two vital components lead to perseveration: 1) weakened activation of a target at any processing level (e.g., semantic, phonological) in addition to 2) normally existing persistent activation from previous responses. Some people also appear to utilize a restricted or stereotypical repertoire of words. These are produced whenever activation of a new target is insufficient. In this sense, the persistent activation from a previous response overcomes that of the target due to weakened activation of the target, rather than being due to interference from the previous response as earlier studies suggested.

Thus, in contrast to proposals from priming studies, perseverative errors are argued to occur at any stage in word production where language processing is compromised, enabling normally existing amounts of persisting activation to overcome that of a weakened target representation (Dell, 1986; Dell et al., 1997; Cohen & Dehaene, 1998).

While the implications of these errors for theories of language processing are not completely clear, their existence seems to reflect the persistence of recently processed information and the failure of current stimulus processing to override this persistence. To the extent that persistence and competition are intrinsic features of language processing, perseverations may provide important insights into the functioning of the normal language system and how it breaks down in aphasia.

Thus proponents of reduced language-processing efficiency account maintain that perseverations occur when language-processing efficiency is compromised at any processing level. This results in previously activated competitors reaching threshold before that of the target.

Aging and Cognition

Research in cognitive aging has advanced enormously in the past few decades, producing detailed studies and sophisticated models of age-related changes in cognitive functions. Cognitive aging is the cognitive changes related with aging which are central to theoretical explanation of observed language processing deficits, with production deficiency and reduced processing capacity as the prevailing explanations for such changes (Cohen & Faulkner, 1983; Bayles & Kaszniak, 1987). Aging is accompanied with a general slowdown in processing speed, inhibitory control, interference control, and task coordination (Cepeda, Kramer, & Gonzales, 2001; Bedard, Nichols, Barbosa, Schachar, Logan, & Tannock, 2002; Borella, Carretti, & De Beni, 2008). Furthermore, according to Bedard et al. (2002) there was much more variation in the aging population in all aspects of executive functions than at any other period across the life span. Executive functions is the set of abilities that allows an individual to select an action that is appropriate to a specific situation, inhibit inappropriate behavior and focus or maintain attention in spite of distractions. Although its components are not yet fully understood, executive function, also referred to as fluid intelligence, is assumed to include basic components like attention, inhibition, monitoring, switching, processing speed, response speed and working memory (Salthouse, 2005). These may vary between individuals, brain areas, and across the life span, and may be further subdivided. Hasher, Lustig, and

Zacks (2006) gave primary importance to inhibition, a component of executive function, as the crucial factor in optimal mental function: control rather than capacity. Generally, these executive functions improve in childhood, remain at a high level across adulthood and decline in old age. Bedard et al. (2002) suggested an inverted U shape for the developmental changes of inhibitory control as inhibitory control is the first to emerge, last to mature, remains stable over midlife, and the first to decline. As the inhibitory processes of the frontal lobes are implicated in control of ongoing cognitive operations, it seems reasonable to suppose that dysfunction of executive control processes of the frontal lobes will play an important role in emergence of perseverative phenomenon during aging.

Differences in mental function across all ages are linked to differences in frontal lobe architecture and several subcortical structures (Smith, Geva, Jonides, Miller, Reuter-Lorenz, & Koeppe, 2001; Colcombe, Kramer, Erikson, & Scalf, 2005; Crone, Donohue, Honomichl, Wendelken, & Bunge, 2006). According to Cepeda et al. (2001), neural pathway, the kind of information and the task determines the amount of activation for efficient processing. Tasks requiring inhibitory control activate the cortical and subcortical areas differentially and to various degrees, implying the possibility of different components that make up the executive processes (Hasher et al., 2006; Crone et al., 2006).

According to Hasher et al. (2006) inhibitory control allows an individual to attend only to what is relevant to, the exclusion of all else, to remove information no longer relevant due to changing goals, and to withhold a strong habitual response. When inhibitory processes are not operating efficiently, irrelevant or distracting information can

invade working memory, possibly resulting in lowered performance due to interference effects and response competition. Bowles and Salthouse (2003) examined the age-related effects of one component of inhibition, proactive interference, which occurs when information from a previous task interferes with new information and related it to a decline in working memory span. Unless task performance depends on strongly ingrained habits (Hay & Jacoby, 1996, 1999) or is well supported by the environmental context (Craik, 1986) older adults showed a decline in the effectiveness of executive control processes in many situations. In summary, aging leads to a decline in the effectiveness of attentional control but not in the ability to utilize habitual procedures and representational knowledge.

Another important component to high-level cognition is cognitive flexibility. According to Eslinger and Grattan (1993) cognitive flexibility refers to the ability to shift cognitive set, aptitude, thought or attention in order to perceive, process or respond to situations in different ways. This shifting occur when either external task conditions or self-initiated decisions require that an alternative to the current response be chosen and executed (Richards, Cote, & Stern, 1993). From the point of view of cognitive psychology, the different types of perseverations are regarded as error patterns due to cognitive inflexibility (Rende, 2000). Tests of verbal fluency along with design fluency, stroop color word tests (Stroop, 1935), standardized wisconsin card sorting test (Grant & Berg, 1948) etc are some of the measures of cognitive flexibility (Rende, 2000). Taconnat, Raz, Tocz, Bouazzaoui, Sauzon, Fay, and Isingrini (2009) reported that decrease in cognitive flexibility leads to age-related decrement in strategic organization in free recall tasks of memory. The study was conducted in 62 young (20-40 years) and

62 elderly (60-80 years) individuals. In the Indian context, a study was undertaken by Vijay Kumar and Prema (2010) to study the cognitive linguistic flexibility across aging. Their results indicated that cognitive aging is a natural phenomenon and that there is no significant deterioration in cognitive linguistic flexibility as age advances. This is because of the possibility of some extraneous variables such as linguistic exposure (bi/multilingualism), life style, culture, profession, physical and communicational activity, post retirement life activity, education, social/ familial roles, communication intent, physical and mental exercises, dietary habits etc which prevents cognitive rigidity during aging. They also identified that onset of cognitive aging can be sensed by 60 years onwards in the Indian population unlike 70 years reported in some Western literatures. The attributed reasons for this include communication demand, post retirement life style, physical and communication demands along with the anatomical, physiological, psychological, socio-cultural and educational differences between Indian and Western population.

Aging and Language

Given the inextricable link between cognition and language, it is not surprising that age – related cognitive changes are considered as a causative factor in reduced linguistic processing abilities. While the overwhelming majority of studies on language and aging take a monolingual perspective, there is now a growing awareness that more than half of the world's population is infact bilingual or multilingual. There is not much research conducted with respect to healthy aging and multilingualism in the Indian context and the number of studies on foreign/ second-language proficiency and its decline is also remarkably small.

Four types of language-attrition situations have been identified by Van Els in 1986: L1 (first language) loss in L1 environment (aging); L1 loss in L2 (second language) environment (loss of L1 by immigrants); L2 loss in L1 environment (loss of L2); L2 loss in L2 environment (loss of L2 by aging immigrants). Recent studies have provided converging evidence that certain language skills such as lexical retrieval during word production (Ardila & Rosselli, 1989; Goulet, Ska, & Kahn, 1994; Barresi, Nicholas, Connor, Obler, & Albert, 2000; MacKay, Connor, Albert, & Obler, 2002) and comprehension of complex material (Obler, Fein, Nicholas, & Albert, 1991; Kemtes & Kemper, 1997; Waters & Caplan, 2001) decline as individuals grow older. Such research, moreover, confirm the experience of older adults who often complain about difficulty remembering names of places, people, and objects, and about difficulty comprehending spoken language under certain conditions. Initial signs of decline have been reported as early as at age 50 (Au, Joung, Nicholas, Obler, Kass, & Albert, 1995) or even under 40 (Connor, Spiro, Obler, & Albert, 2004) but sharp drops in performance were mostly evident at age 70 or over. Moreover, the 70-year-old individuals experience greater decline over time (Au et al., 1995). But it is yet unclear whether the hypothesized changes in the strength of the connections in the network reflect a transient state (access failure) or actual changes in the lexical representations (degradation of knowledge). One study that addressed this issue directly and found evidence for age-related changes in both lexical retrieval and lexical representation was by Barresi, Nicholas, Connor, Obler and Albert (2000) who found evidences for both retrieval deficits as well as for semantic degradation. Furthermore, Barresi et al. (2000) found that older adults have significantly more instances of errors consistent with semantic degradation than did younger adults.

Models of Language and Aging

There are two models reported in the literature which tries to explain the age related changes in language. The transmission deficit hypothesis (MacKay & Burke, 1990) explains aging effects on language processes within the framework of node structure theory (NST) (MacKay, 1987). Under NST language production begins with the activation of semantic representations that send priming throughout the network, preparing semantically appropriate lexical representations for activation. Frequent activation of nodes strengthens connections increasing priming transmission, whereas aging weakens connections, reducing priming. Thus weakened connection strength caused by disuse or aging produces transmission deficits that can impair activation, resulting in retrieval failure (Burke, MacKay, Worthley, & Wade, 1991).

Age related differences in language may also be consistent with the hypothesis that inhibitory processes are deficient in old age, the inhibitory deficit hypothesis (Hasher & Zacks, 1988; Hasher, Zacks, & May, 1999). This hypothesis states that older adults are less able to inhibit irrelevant information than young adults. Hasher, Zacks, and May (1999) argued that inhibition is an essential attentional control process that allows activated goals to determine the content of consciousness by suppressing information that is irrelevant to these goals. Inhibitory functioning is assumed to be subserved by the frontal lobes (Kramer, Humphrey, Larish, Logan, & Strayer, 1994). Previous research has demonstrated that patients with frontal lobe dysfunction often show deficits in inhibition (e.g., perseveration and inability to maintain set, Shimamura, 1995) leading researchers to theorize that the frontal lobes are important for efficient inhibitory processing.

Bilingualism

According to Grosjean (1994) the term bilingual refers to an individual who uses two or more languages or dialects in his or her everyday life, regardless of the context of use. People who speak and understand two languages or two dialects and who are able to avoid mixing the two linguistic systems when writing and reading can be referred to as "bilinguals" (Aglioti, Beltramello, Girardi, & Fabbro, 1996).

If age of acquisition of either language is considered, two separate groups of bilinguals emerge: simultaneous or early bilinguals, and successive or late bilinguals (Kotik-Friedgut, 2001; Paradis, 2001, 2004a). Another typology, proposed by Weinreich (1953) defines bilingualism according to the way words in the different languages relate to underlying concepts. He distinguishes three different groups of bilinguals: compound, coordinate and subordinate bilinguals. Coordinate bilinguals learn L1 (mother tongue) and L2 (second language) in two different contexts (home, school), and therefore supposedly have two semantic systems and two codes. Conversely, compound bilinguals learn both L1 and L2 in the same context and supposedly have only one semantic system but two codes. Subordinate bilinguals learn the second language by reference to the L1 or the dominant language.

Bilingualism and cognition

The existing evidence strongly suggests that bilingualism has an effect on cognitive processing, at least for children and younger adults (de Groot & Kroll, 1997; Harris, 1992). Creativity (Kessler & Quinn, 1987), problem solving (Bain, 1975; Kessler & Quinn, 1980), perceptual disembedding (Duncan & De Avila, 1979), theory of mind (Goetz, 2003; Bialystok & Senman, 2004) and reversing ambiguous figures (Bialystok &

Shapero, 2005) are some of the domains across which bilinguals have reported better performance. In general, tasks showing a bilingual advantage are characterized by the presence of misleading (usually perceptual) information and the need to choose between competing response options. But a few studies on lexical processing have reported bilingual disadvantages on some tasks, such as lexical decision (Ransdell & Fischler, 1989) and semantic fluency (Gollan, Montoya, & Werner, 2002). Yet, studies consistently report bilingual advantages in nonverbal executive control in both for children (Bialystok, 2001; Mezzacappa, 2004; Carlson & Meltzoff, 2008) and adults (Bialystok, Craik, Klein & Viswanathan, 2004; Bialystok, Craik, & Ryan, 2006; Costa, Hernandez, & Sebastian- Galles, 2008).

There are equivocal findings regarding the influence of bilingualism on the development and functioning of memory when discussed from the perspective of recall and working memory. Bilinguals show disadvantages on tasks based on verbal recall but the involvement of non verbal material or more controlled processing requirements either equalizes the performances of both groups or even gives advantages to the bilinguals (Feng, Diamond, & Bialystok, 2007; Fernandes, Craik, Bialystok, & Kreuger, 2007; Bialystok & Feng, 2009). Studies investigating executive control abilities show bilingual advantages throughout the life span, with these processes developing earlier in children, maintaining more efficient performance in adulthood, and declining less severely with aging.

Evidence from psycholinguistic studies of adult language processing shows that the two languages of a bilingual remain constantly active while processing is carried out in one of them (Smith, 1997; Brysbaert, 1998; Francis, 1999; Gollan & Kroll, 2001; Kroll

& Dijkstra, 2002). The joint activity of the two systems requires a mechanism for keeping the languages separate so that fluent performance can be achieved without intrusions from the unwanted language. Green (1998) proposed a model based on inhibitory control in which the nonrelevant language is suppressed by the same executive functions used generally to control attention and inhibition. If this model is correct, then bilinguals have had massive practice in exercising inhibitory control, an experience that may then generalize across cognitive domains. If the boost given by childhood bilingualism is sufficiently strong, bilingualism may continue to influence certain control processes throughout the life span.

The overall conclusion from these studies is that bilingualism is one of the experiences capable of influencing cognitive function and, to some extent, cognitive structure. The highly integrated architecture of the cognitive system means that activities emanating from one domain, such as language, have consequences throughout the network. The effects, however, are not simple; the language deficit and the control advantage interact for monolinguals and bilinguals, but not in a way that can be simply defined as better, worse, or indifferent.

Aging, Bilingualism, and Language Loss

Aging impacts bilingual performance as it does other skills. It is well known, however, that 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. Second language (L2) is frequently associated with active working life, while retirement is often associated with moving to a more limited familiar environment. Moreover, older bilinguals may

experience increased difficulties handling two different languages due to the effects of cross-language interference. It is reported that Spanish/English bilingual older adults have more trouble switching between languages in response to an auditory cue as compared to young adults (Hernandez & Kohnert, 1999). This is consistent with impaired executive processing related to age. Increased proactive interference from previous tasks makes it more difficult for aging adults to disengage from previously activated task commands. These behavioral results mirror changes in brain function and architecture.

Decreased use and influence of the other language potentially influence apparent lexical-retrieval difficulties in bilingual attriters. In healthy aging, there may be a component of decreased language use, for example, we may expect that older individuals have fewer opportunities to use certain components of their vocabulary, especially if they no longer work or if their social interactions are limited. In both populations, speakers may experience increased insecurity in their language skills and their attitude toward their language ability may interact with performance. In all cases of attrition, speakers experience language changes over time in the representation and organization of the lexicon which may manifest as the inability to retrieve the target lexical item.

Brain organization of language may be partially different for the first (L1) and the second language (L2). Functional studies have supported that there is an only partially coincidental pattern of activation for both languages; usually L2 activates a more extended brain system, but the differences between the L1 and L2 are related to the mastery of L2, the age of acquisition, and the functional distance between them (Tatsuno & Sakai, 2005; Halsband, 2006; Klein, Zatorre, Chen, Milner, Crane, Belin, & Bouffard,

2006; Abutalebi, Annoni, Zimine, Seghier, Lee-Jahnke, Lazeyras, Cappa, & Khateb, 2008; Kovelman, Baker, & Petitto, 2008). Language disturbance patterns associated with brain pathology can be diverse for L1 and L2 depending upon different variables (Vilariño, Prieto, Robles, Lema, & Noya, 1997; Fabbro, 2001; Meinzer, Obleser, Flaisch, Eulitz, & Rockstroh, 2007; Lorenzen & Murray, 2008).

However, it is conceivable that similar cognitive mechanisms and common neuronal changes underlie the attrition processes in both study populations, but there is currently insufficient data to support or refute such hypotheses. There are, moreover, several differences between the two attriter populations. One important difference between L1 attrition in monolinguals and language attrition (and acquisition) in bilinguals is the result of the mutual effects between the two languages of bilingual speakers. The two languages may be competing for memory and processing resources (Green, 1986; Cohen, 1989; Seliger & Vago, 1991); moreover, features that characterize one language may transfer into the other (Selinker, 1972). Indeed, it has been recognized in the study of language attrition in bilingualism that changes in language representation and/or language use may be due to lack of use and/or due to the influence of contact with another language.

There is one theory which predicts greater decline in aging in a second or third language than in the first language. Paradis's neurolinguistic theory of bilingualism (Paradis, 2004b) claims that the first language is learned implicitly for the larger part while most people acquire their second language in an explicit way. Aging appears to have a greater effect on explicit memory than on implicit memory, leaving the second language more vulnerable than the first language.

The number of studies on foreign/second language proficiency and its decline in elderly is remarkably small. The most extensive study in the field of foreign-language attrition is undoubtedly Bahrick's (1984) study. In this study the retention of Spanish-learned in school was tested throughout a 50 year period for 733 individuals. Each individual was tested on a large number of aspects of language proficiency. The data showed that the memory curves for Spanish decline exponentially for the first 3 to 6 years of the retention interval. After that retention remains stable for periods of up to 30 years. Then the memory curves show what Bahrick calls a 'final decline'.

As Paradis (2004a) has argued, there is no basis for postulating different processing mechanisms or neurophysiological structures that are specific for multilingual vs. monolingual processing. What may differ is the extent to which multilinguals make use of different mechanisms and resources. It is not clear to what extent specific changes on all levels (neuro-physiological, functional, social) may lead to differential decline of language with aging and dementia.

In the Indian context, a study was done by Anagha and Vijayalakshmi (2010) to investigate the changes in syntactic processing as an effect of healthy aging in a multilingual population. Two groups, both older and younger group who were proficient in three Indian languages (Kannada, Telugu, and Hindi) were considered for the study. The findings from the study revealed that the older group performed more poorly than younger group indicating a decline in syntactic processing abilities due to declining age and these changes were attributed to attentional demands required for syntactic processing. The overall results suggested differences in performance between males and females in some subsections of Linguistic Profile Test, (Karanth, 1980; Monika &

Karanth, 1995; Suhasini & Karanth, 1997) unveiling that males are more prone to decline in syntactic abilities due to advancing age compared to females. The decline in the languages was observed in the order of L1< L2< L3, where L3 showed the maximum decline irrespective of age and gender. These results can be ascribed to the fact that the usage of language in daily communication play a very vital role in individual's language proficiency and the decline observed during the aging process. Thus studies report that aging bilinguals seem to have some protection for cognitive decline.

A study was undertaken by Rajsudhakar and Shyamala (2008), to examine whether the cognitive advantages of bilingualism were seen in adults and elderly by evaluating the changes on the performance on Cognitive-Linguistic Assessment Protocol (CLAP) (Kamath & Prema, 2003). Two groups of subjects participated in the study. Group I and II consisted of 40 young (Mean age: 24.5 years) and old (Mean age: 76.4 years) individuals respectively. Each group had twenty monolinguals and twenty bilinguals. The results revealed that younger individuals performed better on cognitive linguistic tasks than elderly individuals. Similarly, bilinguals performed better on all the domains on CLAP. Younger monolingual and older bilinguals performed relatively at par with each other. The study highlighted the existing theoretical knowledge on the relations of bilingualism and cognition and the persistence of bilingual cognitive advantages in aging. Other experimental paradigms continue to demonstrate enhanced bilingual cognitive function in late adulthood (Bialystok, Craik, & Ryan, 2006; Bialystok, Craik, & Ruocco, 2006).

Another study reviewed the age at which cognitive complaints were first noted, show that bilinguals turn for help over five years later than monolinguals (Bialystok et

al., 2007). According to Bialystok this protection against cognitive decline is because of the contribution of bilingualism to cognitive reserve. The mechanisms underlying such protective effects are not yet clear, and their results yielded no direct evidence on such mechanisms, but plausible candidates listed by Valenzuela and Sachdev (2006) include increases in resting phosphocreatine levels, increased generation of neurons, synapses and arborized dendrites, and functional reorganization of brain networks. In general, it is increasingly clear that biological factors interact with environmental experiences to determine cognitive outcomes. Bilingualism is one such experiential factor that can provide a positive benefit in this respect.

Changes in brain activity can be measured even at the earliest stages of L2 learning (Osterhout, Poliakov, Inoue, McLaughlin, Valentine, Pitkanen, Mestre- Frenck, & Hirschensohn, 2008). Thus it is clear that bilingual experience reorganizes implicated cortical areas over years of performance, even when L2 is acquired in adulthood. But what has been least examined is whether these effects persist over the life span and continue to influence changes in cognitive processing in bilingual older adults.

In summary, verbal perseverations are movement errors in speech with neural, neurobehavioral and linguistic correlates and are caused due to deficits in executive function. Perseveration is a symptom of reduced language processing and can be seen in brain damaged as well as in normal individuals. In normal healthy elderly, it may be seen as a result of cognitive aging, which affects various components of executive functions. The cognitive changes in elderly result in associated changes in language and two cognitive models have been proposed which addresses language changes seen in aging namely Transmission deficit hypothesis and Inhibitory deficit hypothesis. In the

bilingual, there is a possibility of differential changes occurring in the two languages during aging. There are evidences for second language loss in bilingual elderly and there are various challenging reasons attributed to this such as differences in cognitive processes involved for acquisition of second language, differences in the linguistic representations in the brain etc. However, it is conceivable that similar cognitive mechanisms and common neuronal changes underlie the attrition processes in monolingual and bilingual populations, but there is currently insufficient data to support or refute such hypotheses. Recent research in bilingualism provides enormous evidence for bilingual cognitive advantages specifically in the various components of executive functions. The studies investigating executive control abilities show bilingual advantages throughout the life span, with these processes developing earlier in children, maintaining more efficient performance in adulthood, and declining less severely with aging.

In order to investigate the continued persistence of bilingual cognitive advantages in the elderly, the current study was designed to examine the speech characteristics, particularly the perseveration of the bilingual elderly speakers. Grounding on the literature on perseveration and bilingual cognitive advantages, it is reasonable to suppose that the deficit in neuromodulatory mechanisms accompanying normal aging causes executive control dysfunction leading to perseveratory errors. However, if the bilingual cognitive advantages are persisting into old age, there could be less possible chances of occurrence of higher frequency of perseveration in normal healthy elderly bilinguals compared to elderly monolinguals. This speculation is excogitated in the present study. In addition to the aforementioned speculation, a hypothesis-driven test design structure with the following premises was conceptualized based on relevant literature. If the results of

the present study revealed the nature of perseverations to be more or less similar between the two languages of a bilingual, then this may support the inhibitory deficit hypothesis of aging according to which language changes during aging are caused due to deficits in inhibitory deficits as well as the disinhibition account of perseveration. If the results revealed a higher percentage of perseveration in the second language (L2) than the first language (L1), then this may support the transmission deficit hypothesis and the reduced language processing account of perseveration.

With the intention of answering the questions posed in the objectives, five tasks were carried out on bilingual and monolingual normal elderly speakers in the age group of 60-80 years, the details of which are provided in the next chapter.

CHAPTER III

METHOD

The present study investigated the differences in the nature of perseverations between bilingual and monolingual healthy aging individuals and also examined whether the perseverations varied with the first and second language of a bilingual. Further, the performance of the subjects with respect to their age and gender was analyzed.

Participants

The study included a total of 40 participants in the age group of 60-80 years.

Group 1 included 20 Malayalam-English bilingual normal elderly speakers in two age groups (60-70 years and 70-80 years) whose first language (L1) was Malayalam[1] (mother tongue) and second language (L2) was English (acquired during formal schooling).

Group 2 included 20 monolingual speakers with Malayalam as mother tongue. All the participants were matched for gender, age range, and socio economic status. They belonged to the upper-middle socioeconomic status.

Each age group consisted of a total of 10 subjects with equal number of males and females. They were selected based on the following inclusionary criteria.

Inclusionary criteria

The following criteria were used for selecting the subjects in both groups:

1. No history of speech and language disturbances
2. No history of any major neurologic or psychiatric illnesses

[1] Malayalam is a language spoken by the native people of the state of Kerala, in South India. It is also classified as a Dravidian language (Ladefoged & Maddieson, 1996).

3. No history of hearing problems
4. No deficit in vision or should have suitably corrected vision
5. Should have minimum of 10 years of formal education
6. Should score in the "no cognitive impairment category" (severity score – 24 - 30) of Malayalam Mini-Mental State Examination, M - MMSE, (Mathuranath, Hodges, Mathew, Cherian, George, & Bak, 2004).
7. A minimum score of '4' on each of the 4 macro skills in the International Second Language Proficiency Rating Scale (ISLPR) (Ingram & Wylie, 1997) on the second language proficiency for the Malayalam-English bilingual group. The ISLPR is a proficiency scale for the macro skills of Listening, Reading, Writing and Speaking. The test results range from a level of '0' (Zero Proficiency) to '5' (Native-Like Proficiency). The subjects who secures a score of '4' represents Vocational Proficiency i.e., they can use the second language fluently and accurately on all levels - personal, social, and in situations pertinent to their own 'vocational' fields. The subjects selected were coordinate bilinguals.

Ethical standards used in this study for Participant Selection: The participants were selected by ethical procedures. They were explained the purpose and procedures of the study and an informed verbal and written consent was taken.

Material

The following tasks were used to elicit perseveration. They were

1. Confrontation naming
2. Generative naming
3. Picture description

4. Defining words

5. Answering questions

These tasks were selected on the basis of the findings reported by Helmick and Berg (1976), Albert and Sandson (1986) and Ramge et al., (1999). According to them these tasks were sensitive to elicit verbal perseverations.

Task 1: Confrontation naming

The subjects were instructed to name the visually presented stimuli which consisted of 10 line drawings, adopted from the Dementia Assessment Battery in Kannada (Sunil & Shyamala, 2010), e.g., the line drawing of a cap. The stimuli used are given in Appendix I. The pictures were presented on the laptop screen of Compaq Presario C 700. The subjects were given adequate time to answer.

Task 2: Generative naming

In this task, the subjects were asked to generate as many exemplers as possible in one minute. Both verbal fluency and letter fluency were carried out. This was a timed task. The target category selected for verbal fluency task was 'animals' during which the subjects had to say as many animals as possible and the phoneme '/p/' was selected for the letter fluency task during which the subjects had to say as many words as possible beginning with the phoneme /p/ within the restricted time period.

Task 3: Picture description

For the picture description task, picture stimulus from the Western Aphasia Battery (Kertesz, 1982) was used. They were instructed to elaborately describe the scene in the given picture.

Task 4: Defining words

For this task, words were selected from Test of Aphasia in Malayalam (Philips & Karanth, 2002). The subjects were instructed to define the words. A total of five words were presented, e.g., coin. The stimuli words used for the study are provided in Appendix II.

Task 5: Answering questions

For answering questions in English, a standard comprehension passage 'People from Mars, Helena Norberg – Hodge', from the Language Proficiency questionnaire, an adaptation of LEAP-Q in Indian context, by Ramya & Goswami, (2010) was used. The same material was translated into Malayalam and appropriate questions were framed and asked. The passage in English and Malayalam has been provided in appendix III and IV respectively. A total of five questions were asked in Malayalam and English and the subjects had to answer appropriately.

Procedure

All the subjects were comfortably seated in a quiet room and tested individually on the selected tasks. The tasks were presented to all the subjects in the same order starting with confrontation naming followed by generative naming, picture description, defining words and finally answering questions. The bilingual subjects were tested in the

mentioned tasks, first in their L1, i.e., Malayalam and then in their L2, i.e., English. The testing was completed in one sitting itself with breaks in between whenever necessary. Similarly the second group of subjects, i.e., monolingual Malayalam speakers, was also tested in the mentioned tasks in a single sitting. The total time taken to complete the testing for bilingual group was approximately 1hour 30minutes while for the monolingual group it was around 60minutes.

Analysis of speech samples

The responses were audio recorded directly into the sound recorder software loaded in the Compaq Presario C 700 laptop system using the inbuilt microphone. Later these responses were transcribed verbatim using broad phonetic transcriptions. The audio recorded responses were analyzed for the type and frequency of perseverations. If perseverations were absent, a score of '0' was given and if perseverations were present, a score of '1' was given for each perseveratory utterance. Hence, depending upon the number of perseverations the scores were tabulated on the score sheet. The data was then compared for the frequency of perseveration for each subject on each task as a ratio (total number of perseverations/ total number of utterances). For the generative naming task, the total number of perseverations was counted for 'animals' and words with '/p/' in the initial position and was divided by the total number of utterances. By using the ratio data, it was possible to determine the severity of perseveration and make comparisons among subjects who differed in their responses. The ratio data were converted to percentage for each task by the following formula:-

$$\text{Percentage of perseverations} = \frac{\text{Total number of perseveration X 100}}{\text{Total number of utterances}}$$

The total percentage of perseveration for each task was computed for each subject in a similar manner.

Statistical analysis

The obtained data were appropriately tabulated and subjected to statistical measures. SPSS software (version 16.0) package was used for statistical analysis. The tabulated percentage scores were used to obtain the mean (M) and standard deviation (SD). Two-way ANOVA was used to find if significant difference was present between bilingual and monolingual speakers. The same was used to see if gender effects are seen in both groups in L1, Malayalam. Independent t-test was used to compare the gender differences across L2, English. Paired t-test was administered to examine if a significant difference was present between L1 and L2 within the bilingual speakers. A non-parametric test, Mann Whitney test was also employed to find out if there were significant differences in age groups across any of the variables such as gender, language conditions and language status.

CHAPTER IV

RESULTS AND DISCUSSION

The main aim of the study was to investigate the nature of perseverations in bilingual healthy aging individuals and to compare it with monolinguals to specifically look into bilingual cognitive advantages and to examine the first and second language of a bilingual to look for any differences in the extent of perseveration across languages. Further, the performance of the subjects with respect to their age and gender was analyzed.

Twenty bilingual normal elderly speakers from two age groups viz. 60-70 years and 70-80 years (ten each in each group) and twenty monolingual speakers matched for age, number and gender were the participants of the study. They were subjected to five different tasks for eliciting perseverative errors. The responses were audio recorded, transcribed and analyzed for the type and frequency of perseveration for each subject on each task. The total percentage of perseveration was computed for each task for both the groups. The data obtained was tabulated and subjected to appropriate statistical analysis. The following statistical procedures were carried out across groups of subjects.

1. Descriptive statistics to obtain the mean and standard deviation for all the participants across the variables such as age, gender, language status (Bilingualism Vs Monolingualism) and language conditions (Malayalam Vs English).

2. Two-way ANOVA for comparison between bilingual and monolingual speakers along with gender in L1 (Malayalam) (Results of two way ANOVA are discussed under separate sections).
3. Independent t-test for comparison of gender in L2 (English) in bilinguals.
4. Paired t-test for comparison between L1 and L2 in the bilingual speakers.
5. Mann Whitney Test for comparison of age groups across gender, language status and language conditions.

The results obtained were compared between monolingual and bilingual speakers with respect to age, gender and also between the two languages in the bilingual group. These results have been presented and discussed below under separate sections.

I. Comparison of perseveration between both the groups

a. Frequency of perseveration

The table 2 below represents the percentage of perseveratory errors across the groups of differing language status (bilingualism versus monolingualism), across two language conditions (Malayalam and English) and with respect to age and gender. Figure 1 below depicts the percentage of perseveratory errors for two groups viz. bilingual and monolingual speakers with respect to age and gender

Table 2:

Mean Percentage of Perseveration and Standard Deviation (SD) with respect to Age, Gender, Language Status (Bilingualism Vs Monolingualism) and Language Conditions (Malayalam Vs English) for the Bilingual and Monolingual group.

*Language status & gender	60- 70 yrs		70 - 80 yrs		Total	
	Mean	SD	Mean	SD	Mean	SD
BL1M	2.05	0.99	2.25	0.68	2.15	0.81
BL1F	2.08	1.08	2.24	0.59	2.16	0.82
BL2M	2.12	0.77	2.36	0.97	2.24	0.84
BL2F	2.18	0.85	2.35	0.71	2.26	0.74
ML1M	3.55	0.80	3.77	0.95	3.66	0.84
ML1F	3.54	0.68	3.74	1.03	3.64	0.83

*BL1M: Bilingual male - percentage of perseveration in L1; BL1F: Bilingual female - percentage of perseveration in L1; BL2M: Bilingual male - percentage of perseveration in L2; BL2F: Bilingual female - percentage of perseveration in L2; ML1M: Monolingual mal - percentage of perseveration in L1; ML1F: Monolingual female - percentage of perseveration in L1.

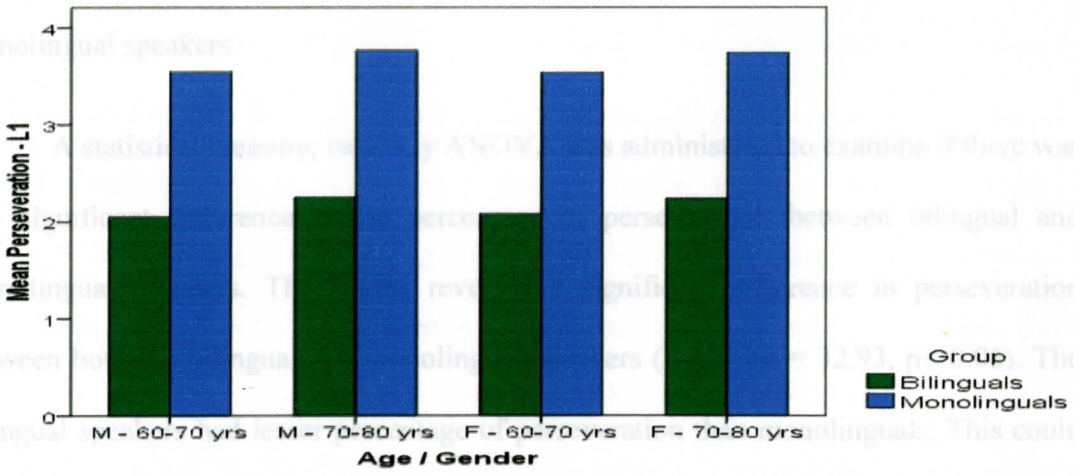

Figure 1: Mean percentage of perseveration between bilinguals and monolinguals with respect to age and gender.

In total, the mean of the percentage of perseveration obtained for the bilingual speakers was lesser (M= 2.15, 2.25 in L1 and L2 respectively) compared to the mean obtained in the monolingual speakers (M= 3.65), which has been depicted in the figure 2 given below.

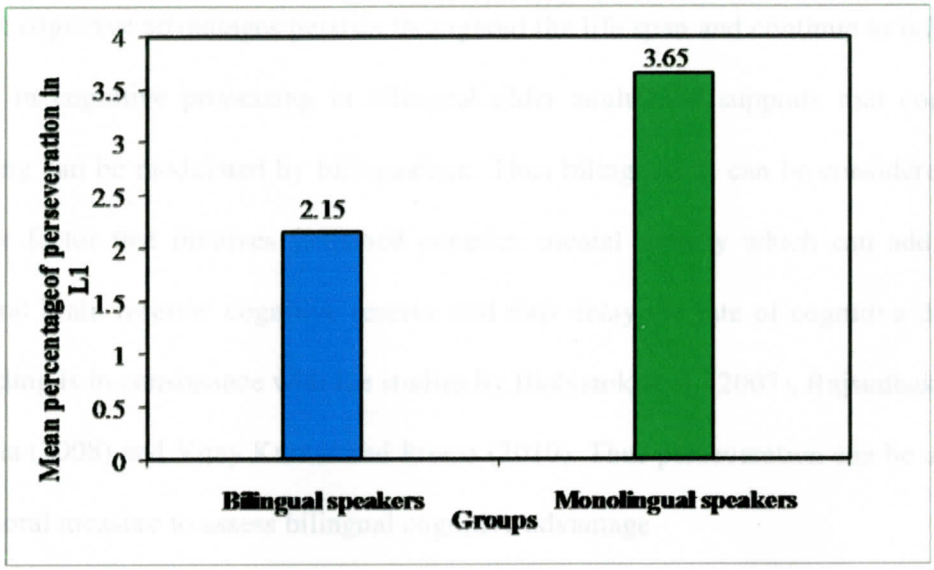

Figure 2: Overall mean percentage of perseveratory errors between bilingual and monolingual speakers.

A statistical measure, two-way ANOVA was administered to examine if there was any significant difference in the percentage of perseveration between bilingual and monolingual speakers. The results revealed a significant difference in perseveration between both the bilingual and monolingual speakers ($F(1, 36) = 32.93$, $p < 0.05$). The bilingual speakers had lesser percentage of perseveration than monolinguals. This could be because of the bilingual speaker's advantage in nonverbal executive control (Bialystok et al., 2004; Bialystok, Craik, & Ryan, 2006; Costa, Hernandez, & Sebastian-Galles, 2008). Moreover, in individuals who are bi/multilingual activation of lexicons are

facilitated (Finkbeiner, Forster, Nicol, & Nakamura, 2004), thereby gaining proficiency in both languages. Higher states of activation enhance accurate selection and thus diminish the chances of occurrence of perseveration or any other linguistic errors, thus supporting the results of the present study. The current finding also suggests that bilingual cognitive advantages persists throughout the life span and continue to influence changes in cognitive processing in bilingual older adults and supports that cognitive processing can be modulated by bilingualism. Thus bilingualism can be considered as a life style factor that involves sustained complex mental activity which can add on to behavioral brain reserve/ cognitive reserve and thus delay the rate of cognitive decline. This finding is in consonance with the studies by Bialystok et al. (2007), Rajsudhakar and Shyamala (2008) and Vijay Kumar and Prema (2010). Thus perseveration can be used as a behavioral measure to assess bilingual cognitive advantage.

The mean percentage of perseveration obtained in the study is also very less for both the groups (3.65% and 2.15% in L1, Malayalam for monolingual and bilingual speakers) compared to the significantly greater percentage of perseveration reported in the brain damaged population (Albert & Sandson, 1986; Pietro & Rigordsky, 1986; Lundgren, Helm – Estabrooks, Magnusdottir, & Emery 1994; Mukunthan & Prema, 2003). Ramage et al. (1999) concluded that in normal aging individuals the frequency of perseverations was less (4%) and a significant difference existed between normal elderly individuals and individuals with brain damage in terms of perseveration which can be used to differentiate both the groups. Chandralekha & Prema (2003) reported 3.6% of perseveration in the higher age group of 75-80 year old normal elderly subjects included in their study. Likewise Bayles, Tomoeda, Patrick, Helm-Estabrooks, and Hawley (2004)

also reported significantly less amount of perseveration in normal elderly speakers (8.5%) compared to persons with Alzheimer's Disease (30%). Preethi & Goswami (2010) in their study could elicit only 2.23% of perseveratory errors in normal elderly controls while in Alzheimer's Disease, the percentage of perseveration obtained was around 11.69%. Thus the perseveratory percentage obtained in the current study is comparable with the studies done previously in normal aging population.

b. Type of perseveration elicited

The type of perseveration seen in both languages of the bilingual and monolingual speakers in the current study was the recurrent type. There were no instances of continuous or stuck-in-set type of perseverations. But, there were reports of significant percentage of continuous type of perseveration compared to other types of perseveration in normal elderly Tamil speaking population in the study by Chandralekha and Prema (2003) and Mukunthan and Prema (2003). Preethi and Goswami (2010) reported of both continuous and recurrent types of errors in normal Malayalam speaking elderly. However, the results of the current study are in consonance with the study by Troster et al. (1989) and Bayles et al. (1999), in which they could elicit only recurrent type of perseveration in their subjects during generative naming task. Thus it can be presumed that generative naming tasks may be more sensitive towards eliciting recurrent perseveration than other types of perseverations. The absence of other types of perseveration in the current study, could also be attributed to the strict inclusionary criteria used wherein the mental status of the subjects were screened using Malayalam version of Mini Mental State Examination (M-MMSE) before including them in the study. It is apparent from various studies that continuous and stuck-in-set types of

perseveration are seen significantly in brain damaged population (Yamadori, 1981; Vilkki, 1989; Pekkala et al., 2008; Preethi & Goswami, 2010). Pekkala et al. (2008) studied Alzheimer's disease (AD) patients and reported that the different types of perseveration are likely to reflect the progressive deterioration of different brain regions. In their study with dementic patients, they could elicit recurrent and continuous perseverations in early stages of AD. As the disease progressed in severity into moderate stage, the number of recurrent and continuous perseverations increased and stuck-in-set perseverations emerged. According to Yamadori (1981) continuous perseverations are seen when there is a complete failure of post activation inhibition mechanism, and recurrent would reflect partial failure of that mechanism. It can thus be speculated that continuous and stuck-in-set perseverations may be reflecting more severe disruptions in post activation mechanisms than the recurrent type. Thus the current study presumes that the different types of perseveration, recurrent, continuous and stuck-in-set falls into a continuum with recurrent appearing even with slight constraints over inhibitory mechanisms and stuck-in-set with more severe disruptions in inhibitory mechanisms.

c. Type of task that elicited perseveratory errors:

Of the five different tasks employed, only generative naming task was found to elicit perseverative errors in both monolingual and bilingual speakers. The other tasks namely, confrontation naming, picture description, defining words and answering questions failed to elicit perseverative errors.

This finding is in consonance with the findings reported by Bayles et al. (2004). According to them, the task difficulty influenced the rate of occurrence of perseveration. According to Craik (1984) the cognitive and language processes may vary according to

changes in tasks, materials and strategies. Generative naming is a more difficult task as it assesses verbal fluency both letter and category. Generative naming requires actively searching for the lexicon in the semantic buffer, retrieving the target item and finally stating the names of the items rapidly (Bayles et al., 2004). Thus generative naming is likely to recruit additional processing mechanisms than just lexical retrieval including executive functioning and short term memory. Preethi and Goswami (2010) also reported that generative naming yielded highest mean percentage of errors, which occurred due to increased cognitive demands.

Confrontation naming of pictures was another task that was carried out. Here since the stimuli were presented visually, they provide a perceptual additional cue for the lexicon retrieval from the memory. According to Bayles et al. (2004) this cue offers increased activation in the semantic system and reduces the stress on the working memory during the retrieval. This plausibility explained as to why confrontation naming resulted in no perseverations. Similarly other tasks such as picture description and question and answer also required less effort as the subjects had sufficient time to recognize and generate ideas. According to Helmick and Berg (1976), the tasks that elicited the fewest number of perseverative responses were defining words and answering questions. These tasks were not bounded by speeded time conditions and thus may not have stressed the language system adequately to elicit perseverations. Rather enough time was given and the subjects were not constrained in any way to produce large number of ideas. Most often, it was observed that they enjoyed the freedom to limit their speech output. This would have affected their overall frequency scores (Bayles et al., 2004). In word definition tasks too, the subjects had the freedom to give any relevant responses,

there were no time constraints or constraints regarding the number of alternate ideas that had to be produced. Even though this task tests divergent thinking of cognitive flexibility, the system may have still enjoyed the flexibility as no constraints were imposed over cognitive linguistic processing.

However, the finding of perseveration as being seen in only the generative naming task is in contrast to several other studies. In the Indian scenario, it contrasts the studies by Chandralekha and Prema (2003), Mukunthan and Prema (2003) and Preethi and Goswami (2010), wherein they could elicit perseveration in various tasks other than generative naming alone. This difference could be because of the subject selection criteria used in the present study; the subjects were screened for their mental status unlike the above mentioned studies. In such cases, it can be assumed that in order to elicit perseverations the language processing system needs to be highly constrained.

II. Comparison of perseveratory errors of L1 vs. L2 in bilingual speakers

In the bilingual group, the percentage of perseveratory errors with respect to the two different languages viz. first language (L1) and second language (L2) were analyzed. The mean values obtained were subjected to paired t-test. The mean and standard deviation values in both the languages along with the t-values obtained are depicted in table 3.

Table 3:

Mean, Standard Deviation and t-values of Percentage of Perseveration for L1 (Malayalam) and L2 (English) in Bilinguals.

Bilingual Group	Mean	Std. Deviation	t-value (19)
First Language (L1)	2.15	0.80	0.424 (p>0.05)
Second Language (L2)	2.25	0.77	

The mean values for L1 and L2 is represented graphically in the figure 3 given below.

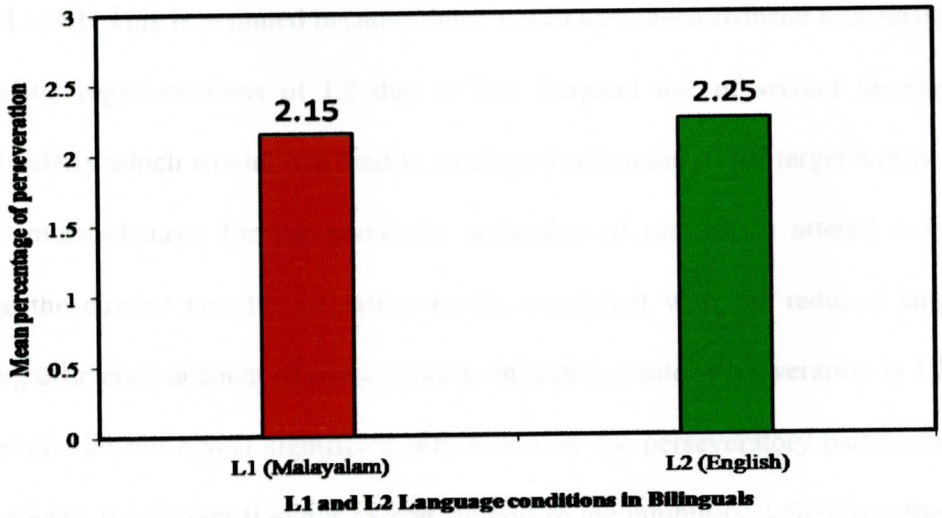

Figure 3: Overall mean percentage of perseveratory errors in L1 and L2 of bilingual speakers.

The results indicated that there was no significant difference in the percentage of perseverations between both languages for the bilingual speakers (t (19) = 0.424, p>0.05). Moreover, the only type of perseveration seen was recurrent perseveration in both languages of the bilingual. This finding supports the inhibitory deficit hypothesis of language changes with aging and the disinhibition account of perseveration since the

perseverations in L1 were more or less similar to perseverations in L2. Inhibitory deficit hypothesis suggests deficient inhibitory processes as contributing to cognitive linguistic changes during aging. According to the disinhibitory account of perseverations, the residual activation from the prior response interferes with the person's ability to retrieve a new response from long-term memory because its representations have been recently activated and thus cause perseverations. On the other hand, for the transmission deficit hypothesis and reduced language processing efficiency account of perseveration to have been true, there should have been significantly higher rates of perseverations in L2 compared to L1. This is assumed because there would have been reduced transmission to the linguistic representations of L2 due to less frequent use of second language in bilingual elderly which would then lead to weakened activation of the target words. Thus there are more chances for the persistent activation of previously uttered words to overcome the current target's activation levels, consistent with the reduced language processing efficiency account of perseveration, inducing greater perseveration in L2. But as the results did not reveal significant differences in the perseveratory patterns across both languages, the current findings extend support to the inhibitory deficit hypothesis of language and aging as well as to the disinhibition account of perseveration. The findings also support the conjectures put forth by Hudson (1968), Yamadori (1981) and Pietro and Rigordsky (1986) wherein failure of inhibitory mechanisms is implicated in causing perseverations. Thus from the current study it can be postulated that the changes in inhibitory functioning will affect the bilingual lexicons equally. That is the general cognitive decline associated with aging affects the two languages of a bilingual equally. In other words, the neural level mechanisms associated with general cognitive decline

during aging affects the representation of both languages of a bilingual more or less similarly. However, in spite of the above findings, it is too premature to argue on lines of semantic degradation versus lexical access deficits of language representations in second language so as to conclusively postulate that there is no language specific loss/ attrition that are seen in bilingual elderly.

III. Effect of age on perseveration

The mean perseveratory errors for the monolingual and bilingual group were analyzed to examine whether any significant difference existed between the age groups. The data was subjected to Mann Whitney test and the mean, SD and the /z/ values are shown in table 4. The mean percentages of perseveration across the age groups are depicted graphically in figure 4.

Table 4:

Mean, Standard deviation (SD) with /z/ values for the various age groups for both groups.

Language status & gender	**60- 70 yrs**		**70 - 80 yrs**		**/z/ value***
	Mean	**SD**	**Mean**	**SD**	
BL1M	2.05	0.99	2.25	0.68	0.73
BL1F	2.08	1.08	2.24	0.59	0.10
BL2M	2.12	0.77	2.36	0.97	0.52
BL2F	2.18	0.85	2.35	0.71	0.31
ML1M	3.55	0.80	3.77	0.95	0.31
ML1F	3.54	0.68	3.74	1.03	0.21

*$p > 0.05$

The combined mean (M) and standard deviation (SD) of all the participants in L1 for the two age groups viz. 60-70 years and 70-80 years were M= 2.80 (SD= 1.12) and M= 3.0 (SD=1.19) respectively. Similarly the combined mean and standard deviation of all the participants for the two age groups in L2 were 2.14 (SD= 0.76) and 2.35 (SD= 0.80) respectively. This is depicted in the figure 4 below.

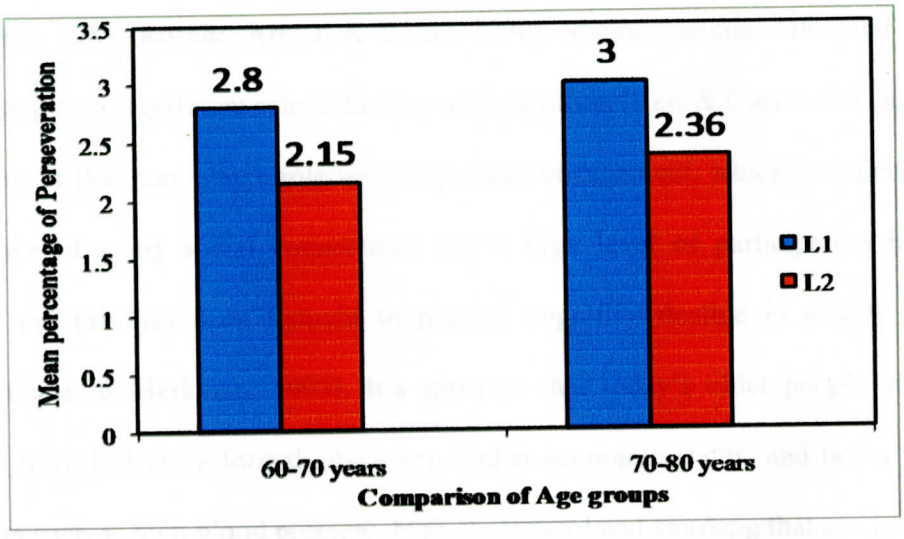

Figure 4: Mean percentage of perseveratory errors between two age groups across all the variables.

The results of the Mann Whitney test showed no significant difference between various age groups across any of the variables. This particular finding is not in consonance with the studies which have reported an age effect on perseveratory errors such as Troster et al. (1989), Daigneault et al. (1992) and Chandralekha and Prema (2003). But support can be drawn for the current findings from the studies done by Ramage et al. (1999) and Foldi et al. (2003), in which they report no age effect on verbal perseveration. As in the study by Ramage et al. (1999), the current study also assessed mental status before including the subjects for testing. Thus the lack of any age effect

may be because of the confirmation of absence of pathological cognitive impairment by screening the participants using M-MMSE before including them in the study, which was not carried out in the above mentioned opposing studies. Moreover, the factors of personality, literacy, educational history etc. could be some other factors contributing to this finding. Schooling has also been reported to improve cognitive functioning (Garcia & Guerreiro, 1983; Roselli, Ardila, & Rosas, 1990). Socioeconomic status and cultural factors also play a significant role in literacy and cognition (Reis & Castro-Caldas, 1997). Another factor that may play a role would be social engagement, which is defined as the maintenance of many social connections and a high level of participation in social activities and this has been thought to prevent cognitive decline in elderly persons (Bassuk, Glass, & Berkman, 1999). It's apparent that today's older people are much likelier to have had more formal education, higher economic status, and better care for risk factors such as high blood pressure, high cholesterol and smoking that can jeopardize their brains. These results are significant especially in the Indian context for prevention of age related communication disorders. The findings are in consonance with the study by Vijay Kumar and Prema (2010) wherein the authors attribute extraneous variables such as linguistic exposure i.e., bilingualism, life style, culture, profession, physical and communicational activity, physical and mental exercises, dietary habits etc. to the prevention of cognitive rigidity in elderly. Thus the absence of any age effect on the frequency of perseveration may be because of the above mentioned factors which might be contributing to lesser cognitive decline in elderly.

IV. Effect of gender on perseveration

The results of two-way ANOVA revealed no interaction effects between language status and gender [F (1, 36) = 0.002, p>0.05]. Moreover, there was no significant difference between both genders [F (1, 36) = 0.00, p> 0.05] in L1.

Following the above analysis, an independent t-test was used to analyze gender effects in second language, L2 (English). The results revealed that there was no difference between males and females even in L2 (t (18) = 0.068, p>0.05). Thus, on the whole, there was no gender difference that could be found in the current study with respect to the percentage of perseveration. The absence of any gender effect in the current study is not in agreement with the study in Indian Tamil population by Chandralekha and Prema (2003). While, the absence of gender difference in the current study is in consonance with the study by Ramage et al. (1999). The results of the same are depicted in the figure 5 given below:

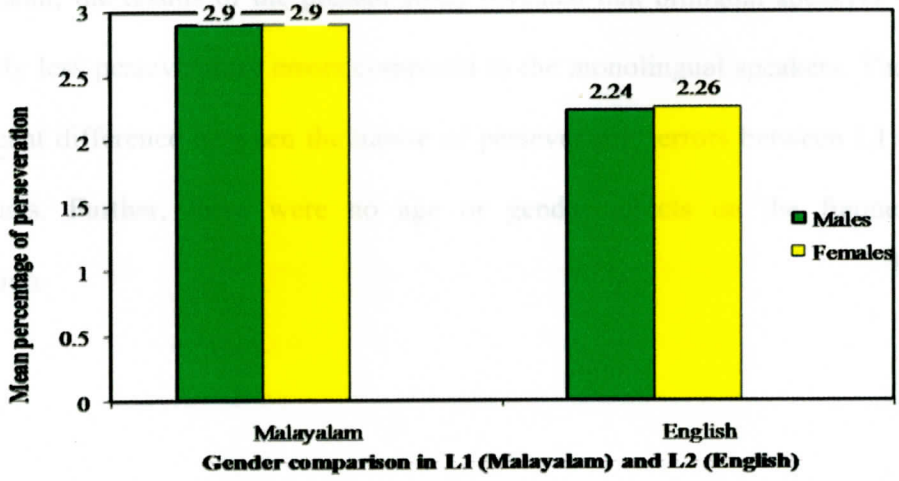

Figure 5: Mean percentage of perseveratory errors of males and females in L1 and L2.

There are many studies in the literature which report of gender differences in cognitive functions. Most of these studies attempted in adults report that women perform at a substantially higher level than men on verbal production, episodic memory, and face recognition tasks while men perform at a higher level on visuospatial tasks. The reasons speculated for these differences include variations in the sex hormones, socio-cultural factors, educational factors, training etc. (Weiss, Kemmler, Deisenhammer, Fleischhacker, & Delazer, 2003; Herlitz & Lovén, 2009). A study by Mohan and Shyamala (2009) on the development of stroop effect in bilinguals also show a substantial difference in the performance between males and females where females outperformed males. But the authors also report that there was an absence of gender effect after the age of 60 years due to the general cognitive decline nullifying the still debated female advantage in language processing. Thus the same explanation can be reasoned out for the absence of gender differences in the present study.

In sum, the results of the present study revealed that bilingual speakers showed significantly less perseveratory errors compared to the monolingual speakers. There was no significant difference between the nature of perseveratory errors between L1 and L2 of bilinguals. Further, there were no age or gender effects on the frequency of perseveration.

CHAPTER V

SUMMARY AND CONCLUSIONS

The present study intended to investigate the perseveratory errors, if any in normal elderly Malayalam-English bilinguals. The specific objectives of the study were

1. To look for the type and frequency of perseverations if any, in bilingual normal elderly individuals and compare these with that of monolingual age and gender matched individuals to specifically examine the existence of bilingual cognitive advantage.
2. To compare the nature of perseveratory errors, in the first language, L1 (Malayalam) and second language, L2 (English) of Malayalam-English bilingual elderly speakers.

Although verbal perseveration is crucial for understanding various aspects of language and other cognitive functions, it has only recently begun to receive the attention it deserves. However, even now researchers have not actualized the utility of this particular behavioral measure to explore the intricacies of language and cognition. Moreover, reports on the history of perseveration remain highly selective in their scope. There is abundant evidence through behavioral experiments regarding the occurrence of perseveration in brain damaged population. Of late attempts are being made to study the same in normal elderly as well as young adults. Majority of studies have reported that speakers without language impairment produce perseverative errors when performing language tasks, but less frequently than brain damaged individuals. This challenges theories that perseverative errors result from damage to specific brain regions, as

unimpaired speakers have no such damage. Rather, it suggests that studying the perseverative errors made by both populations may lead to converging evidence regarding theories of language processing. Also studying these errors may open up new avenues of research in second language loss as well as in bilingual cognitive advantages.

Research on cognitive aging is receiving enormous attention currently. But an overwhelming majority of studies on language and aging has taken a monolingual perspective. There is immense scope of research in the realm of healthy aging and multilingualism in Indian context and the number of studies on foreign/ second-language proficiency and its decline is also remarkably small. Recent researches have started to examine cognitive decline associated with aging from the perspective of bilingualism, where bilingual cognitive advantages are implicated.

However, so far, none of the studies have explored the territory of bilingual perseveratory behavior in normal elderly, which may pave way to derive some insight into second language status during cognitive aging. Remarkably, none of the studies have attempted to explore the existence of bilingual cognitive advantages and its persistence into old age, exclusively focusing on perseveratory measures. Hence this study was taken up to chiefly explore on perseveratory characteristics in normal bilingual elderly and to investigate on the persistence of bilingual cognitive advantages during aging.

The study included twenty normal bilingual elderly speakers (L1-Malayalam, L2-English) and twenty normal monolingual elderly speakers in the age group of 60-80 years. In each age group viz. 60-70 years and 70-80 years, ten monolingual and ten bilingual speakers were included with equal number of males and females in each group.

The subjects were tested in two language conditions (Malayalam and English) using five tasks viz. confrontation naming, generative naming, picture description, word definition and question-answering, so as to elicit perseveration. The responses were audio recorded, transcribed and percentage scores of perseveration for each individual was tabulated. The data was subjected to appropriate statistical analysis using SPSS (version 16.0) software package. The mean and standard deviation for each subject belonging to each language status (bilingualism and monolingualism) and each language condition (Malayalam and English) along with the type of perseveration were calculated. Two-way ANOVA was carried out to find if significant differences were seen between bilinguals and monolinguals and also to look for gender effects across these groups in L1, Malayalam. Later, an independent t-test was done to analyze gender effects in L2 (English) in bilinguals. To compare the percentage of perseveration in L1 and L2, Paired t-test was carried out. Mann Whitney test was administered to check for age related effects if any, on perseveration across both the groups.

On the whole the important findings of the present study can be encapsulated as follows:-

1. Perseveration is a phenomenon that could be seen in healthy aging.
2. Bilinguals elicited less significant perseveration than monolinguals highlighting the bilingual cognitive advantage and the effectiveness of perseveratory measures to assess the same.
3. There was no significant difference between the type and frequency of perseverations across both languages of a bilingual.
4. There was no gender and age related differences in perseveration.

It can be concluded from the study that perseveration is a cognitive linguistic behavior with a neurophysiological basis and can be seen during aging. Perseverations are thought to reflect deficits in executive functions. In an attempt to ameliorate the imbalances in the concerned literature regarding perseveratory theories and language related changes in aging, the current study extends it support to the disinhibition account of perseveration as well as to the inhibitory deficit hypothesis of language and aging since no significant difference was found between the two languages of bilingual speakers. Moreover, the conclusions drawn from the current study is corroborated with the previous studies, wherein the task difficulty is suggested as a factor which determines the nature of perseveratory errors. The study proposes generative naming, as the most useful task to elicit perseverations, particularly in individuals with adequate cognitive reserve.

The present study revealed only recurrent perseverations in healthy aging population which indicates that tenably the various types of perseveration falls into a continuum wherein recurrent perseverations are elicited even with minimal disturbances to language processing system whereas stuck-in-set perseverations are obtained only if the system is severely disturbed. The findings also suggest similar nature of perseveratory errors in both languages of bilingual speakers which permits to foresee that both languages of a bilingual may be equally vulnerable to the general cognitive decline associated with aging. This view is not reconcilable with modular views of cognition, where the various cognitive processes including language, have specialized and dedicated processes responsible for performance. Instead, there are strong interactions across

knowledge representations and control processes which will reflect the interaction of experience and ability.

The current results suggested that there is hardly any relation between age and gender on perseveration. These results thus yielded unambiguous evidence for the diverse results over age and gender related issues in perseveration. The results of the current study proves bilingual cognitive advantages and its continued persistence in old age as bilinguals had less significant perseveration compared to monolinguals. Thus bilingualism can be considered as a form of cognitive stimulation that can delay the cognitive changes associated with aging.

Implications of the study

The current study adds evidence to the literature that supports bilingual cognitive advantage and its persistence to old age by using behavioral data on perseveration. Thus the study highlights the use of perseveratory measures for assessing bilingual cognitive advantage. In addition to the above, the study implies the striking need for a deeper understanding of perseveratory phenomenon so as to reflect on the potential of this particular cognitive linguistic behavior as a sensitive cognitive linguistic measure. It also highlights the importance of cognitive stimulation which can delay the devastating effects of cognitive impairments.

In the current scenario, where there is no, one accepted theory for perseveration or theory explaining age related changes in aging, the data driven cues from the current study extends support for the disinhibition account of perseveration as well as for the inhibitory deficit hypothesis of language and aging. Thus it provides some outline to

move along this path. The study assumes that the general neurocognitive changes seen during aging affect the linguistic representations of a bilingual similarly giving some insight in to the less explored frontiers of second language loss in healthy elderly bilinguals, which is a fertile area where research is heavily warranted.

The results of the study are of clinical importance for the treatment of perseveration. It offer evidences for reducing the rate of speaking, providing time between stimulus presentations etc., which are some of the strategies used for treating perseveration. The type of perseveration observed gestated the different types of perseveration, falling into a continuum of recurrent, continuous and stuck-in-set according to the degree of cognitive constraints imposed.

Nevertheless, the results of the present study have to be interpreted with caution as the findings are concluded on the basis of the data obtained from a single task (generative naming) which was used for eliciting perseveration. Moreover, there was limited number of subjects within each age group.

Future directions

The present study is a preliminary attempt towards understanding bilingual perseveratory behavior in normal individuals. More systematic and in depth analysis of perseveration especially in terms of its linguistic description can be carried out so as to elaborate on the currently accepted models on language processing. It would be interesting to carry out similar studies in bilingual young adults by inducing perseveration. New tasks with increasing task complexity can be conceived that will unfold the interactional effects of languages in a multilingual. The study can be done in

bilingual clinical population too. Research is needed in future to comprehensively evaluate and see the patterns of perseveration in bi/multilinguals so as to develop models on bilingual perseveratory behaviors. Finally potential research should be directed towards attempting similar studies with other types of bilingualism such as compound and subordinate, other language pairs, amount of bilingualism necessary etc. to understand the complex picture of bilingualism and cognition.

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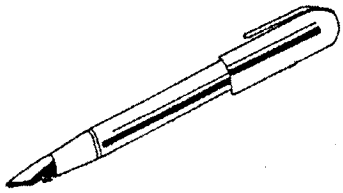
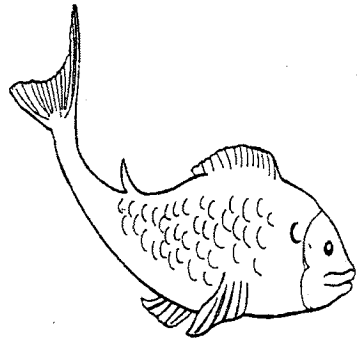
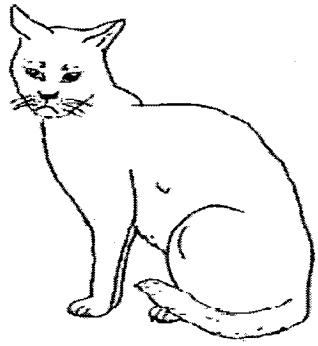
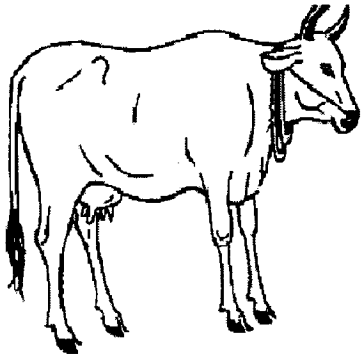
APPENDIX 1

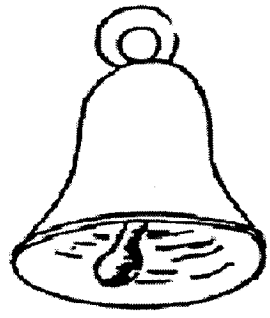
Confrontation Naming

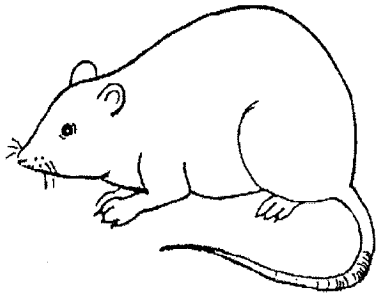


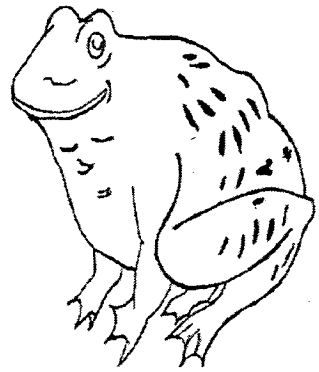


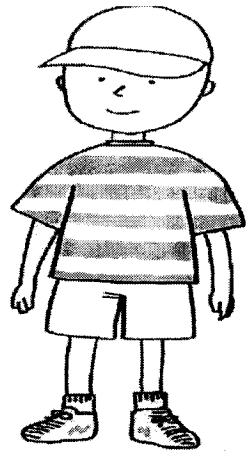


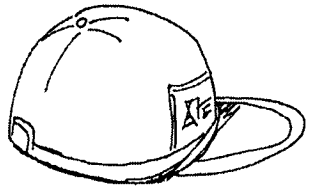


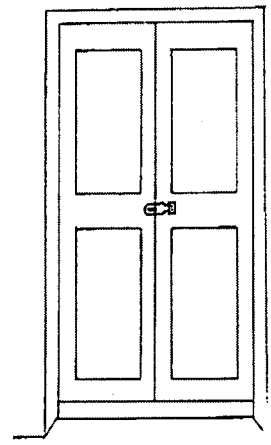












APPENDIX II

DEFINING WORDS

English

1. Coin
2. Plate
3. Key
4. Pencil
5. Match box

Malayalam

1. പൈസ
2. പാത്രം
3. താക്കോൽ
4. പെൻസിൽ
5. തീപ്പെട്ടികൂട്

APPENDIX III

Comprehension passage in English

People from Mars (Helena Norberg – Hodge)

Imagine living your day to day life as usual and suddenly waking up to find your town invaded by people from another planet. Speaking a strange tongue and looking even strangers, these extraterrestrials lead quite extraordinary lives. They do not appear to know what work is but enjoy constant leisure. Moreover, they have special powers and inexhaustible health.

I was in Ladakh from the time tourism started, and was able to observe the process of change from the beginning. Since I spoke the language fluently, I gained an insight into the intense psychological pressures that modernization brings.

With no warning, people from another world descended on Ladakh. In one day a tourist would spend the same amount that a Ladakhi family might in a year. The tourists for their part think that Ladakhis are backward. The few who experience the hospitality of village home invariably speaks of this as the highlight of their holiday. But most of them can only see Ladakhi culture from the outside, and they view it out of experience of their own culture and economy. They assure that money plays the same role in Ladakh as at home. If they meet a Ladakhi who is earning only two dollars per day, they are horrified and show it. Implicitly/ explicitly, they say to him, "Oh! You poor thing, I would better give you a big tip". To western eyes Ladakhis' look poor. Tourists can only see the material side of the culture worn out woolen robes, the dzo pulling a plough, the

barren land. They cannot see peace of mind/ the quality of family and community relations. They cannot see the psychological, social and spiritual wealth of the Ladakhis'.

Questions:

1. Who are the extraterrestrials that the authors refer to?
2. What are the distinguishing features of the extraterrestrials?
3. Contrast the role played by money in traditional Ladakhi economy with the role it had for foreigners.
4. Give a brief insight into the tourist's impressions of Ladakhi people.
5. What are the inherent features of Ladakhis that the tourists fail to see?

APPENDIX IV

Comprehension passage in Malayalam

ചൊവ്വയിലെ മനുഷ്യർ

നമ്മുടെ ദൈനം ദിന ജീവിതവുമായി മുന്നോട്ടു പൊകുമ്പോൾ അപ്രതീക്ഷിതമായി നമ്മുടെ രാജ്യത്ത് മറ്റു ഗ്രഹത്തിലെ മനുഷ്യർ എത്തിയതായിരിക്കട്ടെ. കാഴ്ചയിലും സംസാരത്തിലും ജീവിതചര്യകളിലും നമ്മളിൽ നിന്നും ഏറെ വിത്യാസമുള്ളവരാണ് ഇവർ. എപ്പോഴും ആനന്ദത്തിൽ ഏർപ്പെട്ടിരിക്കുന്ന ഇവർക്ക് തൊഴിൽ എന്താണെന്നു അറിയില്ലെന്നു തോന്നും. ഇതിനെലാമുപരി ഈ കൂട്ടർക്കു വളരെയധികം ശക്തിയും ആരോഗ്യവുമുണ്ട്.

ലഡാക്കിൽ ടൂറിസം തുടങ്ങിയ കാലം മുതലെ ഞാൻ അവിടെയുണ്ടായിരുന്നതു കൊണ്ട് അവിടുത്തെ മാറ്റങ്ങൾക്ക് തുടക്കം മുതൽ തന്നെ ഞാൻ തുടക്കം മുതൽ തന്നെ ഞാൻ ദൃക്സാക്ഷിയായിരുന്നു. അവരുടെ ഭാഷ നന്നായി അറിയാമായിരുന്നതുകൊണ്ട് തന്നെ ആധുനീകരണം ആ ജനതയുടെ മാനസികതലങ്ങളിൽ ഉണ്ടാക്കിയ മുറിവുകൾ കാണാൻ എനിക്കു സാധിച്ചു.

ഒരു മുന്നറിയിപ്പും കൂടാതെ അന്യ ലോകത്തിലെ ജനങ്ങൾ ലഡാക്കിലെത്തി. ഒരു വർഷം ഒരു ലഡാക്കി കുടുംബം ചിലവാക്കുന്ന പണമാണ് ഒരു വിനോദസഞ്ചാരി ഒറ്റ ദിവസത്തിൽ ചിലവിടുന്നത്. ലഡാക്കികൾ തങ്ങളെയപേക്ഷിച്ചു പിന്നോക്കക്കാരാണെന്ന ധാരണയായിരുന്നു ഈ വിനോദസഞ്ചാരികൾക്ക്. എന്നാൽ ലഡാക്കി ഗ്രാമത്തിലെ കുടുംബാഗങ്ങളുടെ ആതിഥ്യം അനുഭവിച്ചവർ അവരുടെ ഒഴിവുകാലത്തിലെ മധുരമായ അനുഭവം അതായിരുന്നു എന്ന് ഒറ്റ സ്വരത്തിൽ പറയാറുണ്ട്. പക്ഷെ ഭൂരിപക്ഷം ജനങ്ങളും തങ്ങളുടെ സംസ്കാരത്തിന്റെയും മിതവ്യയത്തിന്റെയും അടിസ്ഥാനത്തിലാണ് ലഡാക്കി സംസ്കാരത്തെ നോക്കി കാണുന്നത്. തങ്ങളുടെ കുടുംബങ്ങളിലെ പോലെ,

പണമാണ് ലഡാക്കി കുടുംബങ്ങളിലേയും മുഖ്യനിയന്ത്രാവ് എന്നവർ ചിന്തിക്കുന്നു. വെറും രണ്ട് ഡോളർ മാത്രം ദിവസക്കൂലി ലഭിക്കുന്ന ഒരു ലഡാക്കിയെ കണ്ടാൽ ഒരു ഞെട്ടലാണ് ഈ വിനോദസഞ്ചാരികൾക്ക് ഉണ്ടാകുക. സ്പഷ്ടമായി ഉച്ചത്തിലൊ അന്തർമുഖമായോ അപ്പോൾ അവർ പറയും, "അയ്യോ! പാവം, ഞാൻ നിനക്ക് കൂടുതൽ കൈമടക്ക് തരാം" എന്ന്.

പാശ്ചാത്യസംസ്കാരമുള്ളവർക്ക് ലഡാക്കികൾ നിർദ്ധനരാണ്. വിനോദസഞ്ചാരികൾക്ക് ലഡാക്കികളുടെ ജീവിതത്തിന്റെ ഭൗതിക വശം മാത്രമേ കാണാൻ കഴിയാറുള്ളൂ. കീറിയ കുപ്പായങ്ങളും, വറ്റിവരണ്ട ഭൂമിയിൽ നിലം ഉഴിയാൻ ശ്രമിക്കുന്ന തൊഴിലാളികളേയും മാത്രം. എന്നാൽ ലഡാക്കി ജനതയുടെ ജീവിതത്തിലെ പ്രശാന്തിയെയോ സർവജനബന്ധങ്ങളുടെയും കുടുംബബന്ധങ്ങളുടെയും ആഴത്തേയോ, സാമൂഹികവും ആത്മീയവുമായ അവരുടെ ഓജസിനേയോ കാണാൻ വിനോദസഞ്ചാരികൾക്ക് കഴിയാറില്ല.

<u>ചോദ്യങ്ങൾ:-</u>

1. കഥാകാരൻ ആരെയാണ് അന്യഗ്രഹജീവികളായി പരാമർശിച്ചിരിക്കുന്നത്?

2. അന്യഗ്രഹജീവികൾ എങ്ങനെയാണ് വൃത്യസ്തരാകുന്നത്?

3. എങ്ങനെയാണ് പണം വിദേശികളേയും ലഡാക്കികളേയും തമ്മിൽ വേർതിരിക്കുന്നതെന്ന് ചുരുക്കത്തിൽ വിവരിക്കുക

4. ലഡാക്കികളെ കുറിച്ച് വിനോദസഞ്ചാരികൾക്കുള്ള കാഴ്ചപ്പാടെന്താണ്?

5. ലഡാക്കികളുടെ എന്തെല്ലാം നൈസർഗികവാസനകളാണ് വിനോദസഞ്ചാരികൾക്ക് കാണാൻ കഴിയാത്തത്?