IMPACT OF AGING ON DIVIDED ATTENTION IN BILINGUALS

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ABSTRACT Cognition is a collective term for all the conscious and unconscious processes by which information is gained, such as perception, recognition, conceiving and reasoning. Attention and memory play a vital role in the perception and comprehension of speech. Our brain's ability to attend to two different stimuli at the same time, and respond to the multiple demands of one's own surroundings is referred to as divided attention. As age progresses, there is a decline in the cognitive processes. Attention and memory are the primary cognitive functions which are affected as age progresses. Thus need of the study is extracted to note the change in attention in three adult age groups (31-45, 46-60, 61-75) in Malayalam and English language. It was noted that greater mean reaction time and accuracy scores were obtained for tasks given in Malayalam compared to tasks given in English as well as a decline in attention was also observed as age progresses.

KEYWORDS : Cognition, divided attention, mean reaction time

INTRODUCTION

Cognition is a collective term for all the conscious and unconscious processes by which information is gained, such as perception, recognition ,conceiving and reasoning. Cognitive processes refer to a number of tasks that the brain does continuously. They are procedures responsible for processing all the information we receive from the environment.

Attention is an inevitable cognitive process that is important to understand the information present in our daily living environment. Attentional mechanisms influence how linguistic and non-linguistic information are processed together. Attentional flexibility has a predominant role in second language (L2) learning [1].

Attention and memory play a vital role in the perception and comprehension of speech. There is a chance that the listener may miss out information due to factors such as emotions, inner meanings, context., etc which can lead to communication breakdown. In such conditions, the cognitive process that is required is attention.

Our brain's ability to attend to two different stimuli at the same time, and respond to the multiple demands of one's own surroundings is referred to as divided attention . Divided attention is a type of simultaneous attention that allows us to process different information sources and successfully carry out multiple tasks at a time. It has been found that our ability to attend to multiple stimuli and do various tasks at a time does have its limits. When you divide your attention, the efficiency with which you do these actions is decreased, and you will almost certainly perform poorly [2].

As age progresses, there is a decline in the cognitive processes. Attention and memory are the primary cognitive functions which are affected as age progresses [3]. There exist adult age differences in divided attention performance, especially in situation involving relatively complex perceptual-motor skills [4,5,6].

Need For The Study

To improve the effectiveness of performance in higher level cognitive tasks, attention, speed of processing each and every information and an individual's ability to inhibit the irrelevant information has a predominant role. Most of the time, the cognitive functions go hand in hand interacting with each other in a complex manner. The effect of practice and training under conditions of divided attention would be an important remedial activity for the older population[5]. More cues and greater attention resources would be required to retrieve and encode information which will be lacking in older individuals in memory demanding complex situations.

Attention is one of the major component in cognition for speech and language processing. Specific changes in different cognitive skills can be noted as the age progresses[5,7]. The pattern of change in cognitive abilities across the age groups is an interesting fact to be studied. Thus need of the study is extracted to note the change in attention in three adult age groups (31-45, 46-60, 61-75).

AIM AND OBJECTIVE

To investigate the performance difference in divided attention when tasks are given in Malayalam(L1) and English(L2) across age groups.

METHOD

Participants:

90 neurotypical individuals were categorized into 3 groups according to their age. Group I includes individuals of age 30-45 , Group II consists of individuals of age range 46-60 and the final Group III comprised of individuals of age 61-75. The 3 groups consisted of 30 individuals each. The participants were Malayalam-English bilinguals with a minimum educational qualification of tenth grade. They should also possess a proficiency level of 3 or 3 + for the reading domain according to ISLPR[7] in their second language.

Current study compiled the ethical guidelines and informed consent were obtained from the clients.

Stimulus And Materials:

Divided attention was assessed through two conditions;

First task was letter recognition with two preset letters. In English, 'B' and 'K' were the preset letters given to the participants. A set of 30 English words were randomly presented which included words with 'B' alone, 'K' alone and neutral words which does not have either of the target letters. Likewise, a set of 30 Malayalam words having the preset letters /ba/ and /ka/ were presented which consisted of words

with /ba/ alone, /ka/ alone and neutral words. Participants were directed to respond by pressing 'Right Ctrl' key if either of the target letters are present in the word heard, and 'Left Ctrl' key if the preset letters are not present in the word (DA 1).

For the second task of divided attention in English, Pictures from BNT[8] were randomly presented visually on the laptop screen and recorded phrases in English were presented simultaneously through headphones. The participants were asked to pay attention to both the visual and auditory stimulus and press the 'Right Ctrl' key if the visual stimulus matched with the phrase presented through auditory mode and 'Left Ctrl' key if the stimuli doesn't match (DA 2).Similarly, 30 pictures from BNT were presented through visual mode randomly with corresponding recorded phrases in Malayalam through auditory mode via the headphones simultaneously. The participants were asked to press the 'Right Ctrl' key if the visual stimulus matched with the phrase presented through auditory mode and 'Left Ctrl' key if the stimuli doesn't match.

Instrumentation:
The stimulus was presented through VPCZ21C5E Sony VAIO laptop and Sony MDR-ZX310AP headphones with the help of DMDX software 5.0 version. Praat software were used to record the auditory stimulus.

Analysis:
The present study tried to compare the performance between three age groups with respect to performance in terms of mean reaction time and accuracy scores in both Malayalam(L1) and English(L2). The study computed mean reaction time and accuracy scores across the three age groups in two tasks of divided attention. Bonferroni post hoc analysis was used to compare performance between groups since there was a statistically significant difference in the performance of the three groups. Further, paired T-test was used to compare the divided attention task of L1 and L2 across groups.

RESULTS AND DISCUSSION
The current study aimed to expound the performance difference in divided attention when tasks are given in Malayalam(L1) and English(L2) across age groups. The mean and standard deviation of the performance in terms of mean reaction time(in seconds) and accuracy scores(%) of the three age groups on divided attention with respect to the language in which the task was given(English v/s Malayalam) were measured.

Figure 1 represents mean and standard deviation for the 2 tasks of divided attention in English and Malayalam for the three age groups in terms of mean reaction time (ms).
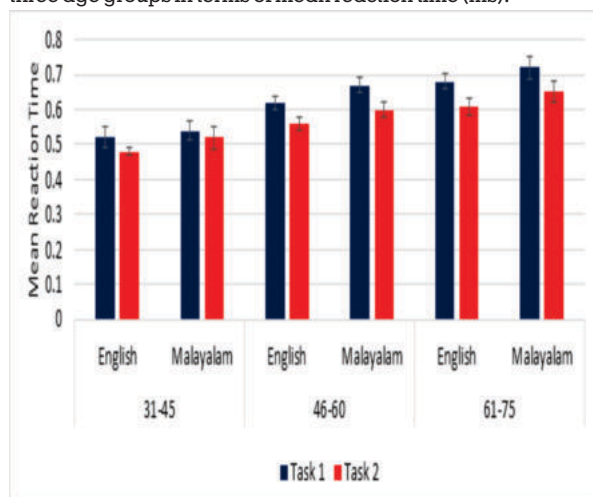

Figure: 1

The above figure indicate that the reaction time for the 3 age groups;

In Malayalam, the mean reaction time for the group I individuals were less compared to group II and group III individuals. Group III individuals consumed more time in completion of tasks compared to group II and group III individuals. Standard deviation for DA 1 was greater for group III and for the DA 2 standard deviation was greater for group I individuals demonstrating a greater variability. Across the tasks of divided attention in Malayalam, mean reaction time was less for DA 2 compared to DA 1 in all the three groups.

Statistical analysis was further carried out using bonferroni post hoc test to compare the performance of the three groups. The p value obtained when group I was compared with the other two groups were 0.000 (p<0.05) indicating a statistically significant difference in the performance of the groups. Identically, when the performance of group II and group III individuals were compared with the other two groups based on the mean reaction time on DA 1 and DA 2 in Malayalam, the p value established was 0.000 (p<0.05) which indicate a statistically significant difference among the groups compared.

In English, the mean reaction time for group I participants was less compared to other two groups. Group III individuals consumed more time in completion of both the tasks when compared to the other two groups. Standard deviation was greater for Group I for DA 1 when compared to group II and group III. For DA 2, the standard deviation was found to be greater for group III individuals compared to the other two groups. The present results are in consonance with the findings of McDowd & Craik, (1988) where they stated that the ability to perform concurrent tasks declines with age. Furthermore, the attentional resources theory states that the number of available attentional resources declines in old age (McDowd & Craik, 1988). Across the tasks of divided attention, mean reaction time was less for DA 2 in English compared to DA 1 in all the three groups.

Statistical analysis was carried out using ANOVA to compare the performance of the three groups on the 2 tasks. The P value obtained was 0.000 for both the tasks indicating that there is statistically significant difference across the tasks of divided attention among the three groups.

Table: 1

Age groups	English		Malayalam	
	Task 1	Task 2	Task 1	Task 2
31-45	85.1000%	94.8667%	85.1000%	94.8667%
46-60	87.9333%	80.9667%	89.6667%	82.5000%
61-75	77.9000%	81.9667%	79.4333%	84.4000%

The above table indicate that the accuracy scores for the 3 age groups in Malayalam(L1) and English(L2);

In **Malayalam,** Greater accuracy scores were obtained for greater for group II for the first task of divided attention in Malayalam. When compared to group III, accuracy scores were found to be better for group I individuals. For the second task of divided attention in Malayalam, greater accuracy was obtained for group I when compared to the other 2 groups. The p value obtained when bonferroni post hoc comparison was used to compare between group I with group II and group III was 0.000 (p<0.05) indicating that there is a significant difference between the three age groups. Likewise, the performance of group II was compared with group III and group I and significant difference was found between the groups.

In **English**, Group II individuals had better mean accuracy scores (%) compared to group I and group III individuals in DA

1 and Group I had greater accuracy scores compared to other groups in DA 2. Statistically significant difference was noticed among the groups on both tasks of divided attention. The better performance of group II individuals compared to group I and group III can be attributed to the participants higher educational status (majority of group II participants had Masters degree in various subjects) compared to participants of other two groups and their prolonged exposure to complex cognition demanding tasks. This result can be correlated with findings of Bherer et al., 2006; Maquestiaux et al., 2004 where they stated that older adults can improve their dual task performance given appropriate training.

Table: 2

Task	Mean	SD	t value	Sig.
Pair 1 Task 1 Eng time Task 1 Mal time	-0.03711	0.02068	-17.027	0.000
Pair 2 Task 1 Eng accuracy Task 1 Mal accuracy	-1.089%	1.8581%	-5.559	0.000
Pair 3 Task 2 Eng time Task 2 Mal time	-0.04122	0.02207	-17.716	0.000
Pair 4 Task 2 Eng accuracy Task 2 Mal accuracy	-1.322%	2.1244%	-5.905	0.000

Paired sample t test (Table 2) was carried out to compare between the performance of the three groups with respect to mean reaction time (in seconds) and accuracy scores (%) on divided attention when the tasks were given in Malayalam(L1) and English(L2) indicated a significant difference between the pairs compared.
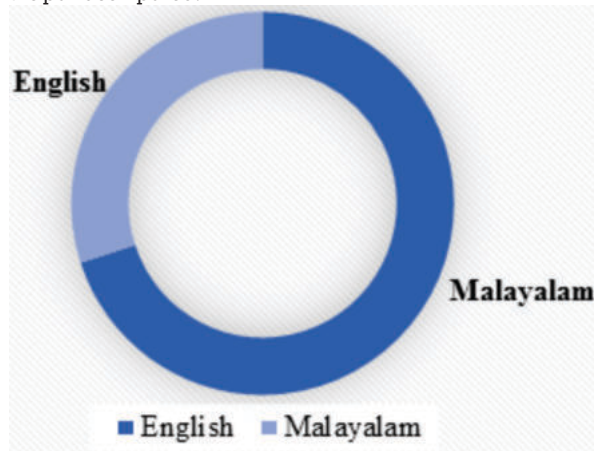

Figure 2

Overall, the results reveal that as age progressed the reaction time increased and accuracy score reduced and greater mean reaction time and accuracy scores were obtained for tasks given in Malayalam compared to tasks given in English (Figure 2).

SUMMARY AND CONCLUSION

The objective was to find out the performance difference in divided attention when tasks are given in Malayalam(L1) and English(L2) across younger, middle-aged and older adults. It was noted that greater mean reaction time and accuracy scores were obtained for tasks given in Malayalam compared to tasks given in English. The result gives a proof on connection between language and attention as the participants were assessed in their L1(Malayalam) and L2(English). This could be due to the participant's higher exposure in their second language.

The present study also helps to understand age related changes in divided attention and helps to infer that like any other cognitive processes, attention also declines with age. This decline also varied according to the complexity of the task and the language in which the task was given. Hence while assessing or during treatment for attention processes, these factors need to be regulated and planned keeping in mind the age of the individual. It can be inferred from the current study that there is an influence of attention in the processing of language, which helps to monitor age related changes in older population.

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