

# Effect of Sustained and Selective Attention Paradigm in Recalling Task: A Cross-language Study

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## Abstract

Attention is the ability to channelize the resource towards the stimulus. Sustained attention refers to the process of holding attention for a considerable span of time while selective attention refers to the ability selectively channelize the attention to an selected set of stimulus governed by instructions. This task would require the selective inhibition of the irrelevant stimulus. The current study was carried out with the aim of investigating the sustained attention and selective attention on recall task in young neuro-typical Malayalam-English bilinguals. Two tasks based on recall was designed exclusively for the study. Task A, the first task required the participants to recall items from 12 item recall list while the second task designated as task B required the participants to selectively recall one of the two stimulus sets based on the instructions provided by the investigator. The stimulus was presented in L1 and L2 of the participants and the performance in L1 and L2 across task A and B was also carried out. The data was initially checked for normality by using Shapiro-Wilk's test and the data was non-parametric. The median scores were more task B compared to Task A and the results was attributed to capacity limitation. In the same lines, median scores were more for L2 compared to L1 and this was attributed to exposure. Within group analysis was carried out using Wilcoxon's signed rank test and the results showed that there was a significant difference between Task A and Task B, while the performance on L1-L2 was significant only for Task A and not for Task B.

**Keywords:** Task complexity, inhibition, selectivity, concentration, bilingualism

## INTRODUCTION

Cognition refers to the mental action or process of learning knowledge and understanding through thought, experience, and the senses. Cognitive psychology studies all aspects of intellectual functions and processes, such as perception, memory, knowledge and expertise acquisition, language comprehension and production, problem solving, creativity, decision making, and reasoning [1]. Performance in behavioural tests is utilized to draw conclusions about these covert brain processes.

While perception refers to an individual's subjective view of the world, it also includes objective neurological processes that generate that experience. Some perceptions are directly linked to sensory information. However, it rarely delivers more than a few raw data points. Other cognitive processes contribute to our world's stability and meaning [2].

Attention, among other cognitive processes, plays a significant role in the aforementioned context. While testing attention, the participant is asked to pick some stimuli for further processing from the stimulus provided to him/her. This ability of the participant to direct or channelize the cognitive resources to some event is known as attention [3]. Several proponents have presented

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several models of attention. These are based on a variety of sources, including cognitive neuropsychology, electrophysiological research, and psychometric score patterns. Clinical model of attention made up of five components. These include focused attention, selective attention, sustained attention, alternating attention, and divided attention [4]. Table 1 provides a description for each category. "Freedom from distractibility" is incorporated into the concept of selective attention. Working memory is the principle that underpins sustained attention

**Table 1.** Types of attention and their description given by Sohlberg and Mateer adapted from Sohlberg and Mateer [4].

Type of attention	Description
Focused attention	Being able to respond independently to various visual, aural, and haptic inputs.
Sustained Attention	Being able to sustain a continuing behavioral reaction throughout prolonged and recurrent activities.
Selective Attention	Demonstrates one's capacity to concentrate in the presence of distractions.
Alternating Attention	Refers to being capable of shifting focus across tasks with different cognitive requirements..
Divided Attention	Being able to handle various tasks or demands at the same time.

Auditory working memory is the process of keeping auditory stimuli in mind for a brief period of time in the absence of the stimulus, which is used to execute the job at hand [5]. Auditory working memory has been shown to be a good predictor of successful communication and academic success [6]. It is also crucial in a variety of other tasks, including reading, learning, and comprehension, thus having very much impact on one's language [7]. The faculty of verbal memory is required for learning new words wherein, meaning of an item enters into more permanent semantic storage.

Recall is an important task that requires memory and is closely related to linguistic ability. It is shown to be a valuable clinical marker for language and working memory disorders as well [8]. The recall task demands participants to recall facts, events, or information that are not immediately physically present and must be accessed directly from memory. Several elements have been identified as influencing individuals' recall performance. These include, but are not limited to, environmental context, mood and internal context, and mental context restoration [9].

Depending on the time frame, recall can be immediate or delayed. Immediate recall is the retrieval of items shortly after they are heard/learned. In contrast, delayed recall is the process of recovering information after a brief distracting interval between the termination of the stimulus and the commencement of the reaction. These two activities are frequently used in cognitive assessments [10]. The recall task is also useful for determining the relationship between attention and recall [11]. Furthermore, existing data demonstrates high sensitivity and specificity in these assessments [12–14].

Many constraints found to be affecting the recall abilities of individuals. These includes aging, [15–17] cognitive impairment [17–19] and language [19–21] Other elements such as working memory, speech, metalinguistic abilities, and inhibitory control, have also been demonstrated to influence attention and thus in-turn affecting recall. Even-though the unique link between recall abilities and language skills are well established, effect of bilingualism on the recall abilities is a lacuna in literature which needs to be filled. Using more than one language puts a strain on the human brain, which alters its neurocognitive functions [22].

Thus, given that the majority of recall task studies have focused on digit recall tasks and that there has been a significant amount of research emphasizing the impact of language on attention, how the process of bilingualism/multilingualism affects our brain during attention and recall activities needs to be investigated further. The current study aims to address this research question in bilingual individuals using immediate auditory recall tasks in two languages under selective and sustained attention conditions [23,24].

## **METHODS**

### **Participants**

A total of 30 individuals were chosen via convenient sampling. All the participants were Malayalam-English bilinguals with a mean age of 22.8 years. The participants are native speakers of Malayalam (L1) and did not report any history of linguistic or academic challenges. Language Experience and Proficiency Questionnaire (LEAP Q) was administered to the participants, where the participants were asked to self-rate their exposure and proficiency of their L1 and L2. Two types of recall tasks (A and B) were administered to the participants. Task A tapped the relationship between sustained attention and recall, where participants had to remember all the words they heard, requiring them to maintain concentration throughout the presentation. Task B tapped into the relationship between selective attention and recall, where participants had to remember words from a specific category (spoken by a particular gender, either in males or females), hence requiring them to filter out words spoken by the other gender. Each participant completed tasks A and B in their native Malayalam (L1) and their second language, English (L2).

### **Procedures**

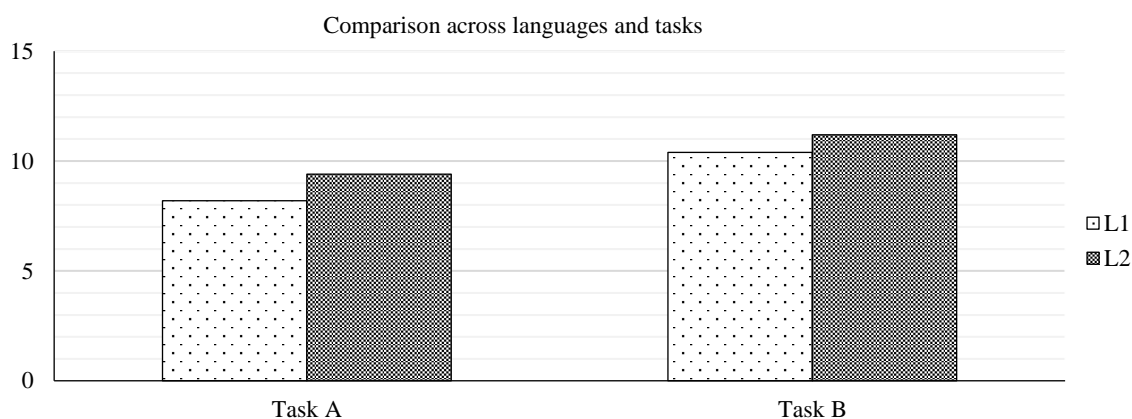
For each task, 12 bi-syllabic words were used as auditory stimuli. There are two such groups for both languages. For the English language, twenty-four words from the Modified Rey Auditory Verbal Learning Test (RAVLT) were chosen and divided into two groups of twelve words each (5). The word set for Malayalam is the same as RAVLT's since the authors generated a list of 36 terms based on criteria. Subsequently, the stimulus list is validated by three speech-language pathologists with at least a master's degree and two years of experience. Twenty-four words were picked from among the 36 and divided into two groups of 12 terms. The words were then audio-captured and normalized using Audacity software. A female voice recorded the first six words in each list, while a male speaker recorded the last six. They were later concatenated, and two-second gaps were added between each word.

Participants listened to the stimuli, which were words presented on a list, through headphones. They were given sheets of paper to write down the words they recalled. The experiment consisted of two parts: Under the Sustained attention task, the participants listened to an entire list of words in one language (either the first or second; the order wasn't varied throughout the experiment). Later, they were instructed to write down all the words they could remember from the list on the paper sheet. Under the Selective attention task, the participants listened to another word list of 12 words, again in either the first or second language (still in the same order). This time, the list was divided into two sets of 6 words each, spoken in either a male or female voice (the order of male/female voices isn't specified). Importantly, each participant was instructed to remember only the words spoken in a specific voice (male or female) and write those down on the paper sheet. The stimulus was presented in English first followed by Malayalam; the sequence was not counterbalanced across the two languages.

The administration of the experimental tasks, encompassing both the sustained and selective attention tests, required approximately 20 minutes per participant. Following test completion, the LEAP-Q questionnaire was mailed to participants with instructions on completing it and returning it at their earliest convenience.

## **RESULTS**

Figure 1. The mean, median and standard deviation scores was calculated for the participants for task A and task B in L1 and L2. For task A, the median scores were 8.2 in L1 and 9.4 in L2. For task B, the median scores were 10.4 and 11.2 in L1 and L2 respectively. The median score was more for the task B tapping selective attention compared to task A tapping sustained attention. The median scores were more for L2 compared to L1. The data was subjected to the test of normality using Shapiro-Wilk's test of normality.



**Figure 1.** Comparison across Languages and Tasks.

The p value obtained was less than 0.05 indicating that the data was non-normal hence Wilcoxon's signed rank test was used to compare across the two tasks and languages respectively. Wilcoxon's signed rank test administered to compare the performance for task A v/s task B yielded Z scores of 2.33 and 2.14 ( $p < 0.05$ ) in L1 and L2 respectively. The corresponding p values showed a significant difference for task A v/s task B. Wilcoxon's signed rank test was also administered to compare the performance across L1 and L2 for Task A and task B. The Z score obtained was 2.03 ( $p < 0.05$ ) and 1.08 ( $p > 0.05$ ). The corresponding p values showed significant difference only for task A and not for task B. Task A required the participants to channelize their attention through the length of the task.

## DISCUSSION

The current study was carried out with the aim of investigating selective and sustained attention in young Malayalam-English bilinguals. Two tasks based on recall was designed exclusively for the current study tapping sustained attention and selective attention [10]. The first task designated as Task A required the participants hold 12 items in their memory at once. They were asked to recall the items they could remember in any order of their choice. Task 2 also used similar stimulus. Here the two stimulus sets were presented in the voice of male and female speakers to enable differentiation. Following the presentation of the test items, the participants were asked to recall either the first list or the second list governed by the instructions of the investigator. The basic difference between the two tasks was that the first task required the participants to invest attention unequivocally through-out the length of the stimulus presentation. While the second task required the participants to selectively channelize their attention based on the instructions provided.

The median scores were higher for the second task compared to the first task. This can be attributed to the task complexity. The first task required higher cognitive flexibility [7] compared to the selective attention as the individual is assumed to remember 12 items at a time. This is beyond the capacity limitation of neuro-typical adults, the short term memory store is assumed to hold around 6-7 items. When the individual is asked to remember and recall items beyond the capacity limitation it would evoke some constraint on the individual owing to this the participants would have found it difficult to recall all items at once/ The selective attention on the other hand would require the participants to hold 6 items in their memory by selectively inhibiting the other 6 items [7] (the scores on the selective attention was doubled for facilitating linear comparison across the two tasks). This could have played a significant role in deciding the results of the current study. This required the participants to selectively inhibit the stimulus. The difference in the performance showed a significant difference statistically as evident on Wilcoxon's signed rank test as the current study is exploratory in nature, it was not possible to correlated with supporting studies.

The performance on recall was also compared across the two languages for task A and task B respectively. The comparison on the statistic yielded significant difference only on task A, however the

trend of performance was uniform across the two tasks with better performance in L2 compared to L1. This could be attributed to the usage factor. All the participants considered for the study were younger participants (with mean age of 22.8 years) and were primarily exposed to English on day-to-day basis. Language Experience and Proficiency questionnaire was administered on the participants a correlation analysis can suggest the inter-relationship between these variables. However, it was not carried out as it was beyond the purview of the current study. The study used a novel paradigm to unveil the relationship between the type of attention and recall, hence the results was not correlated with previous studies as mentioned earlier, however the study has significant potential to be replicated in clinical population like intellectual disability [18-19]. The limitation of the current study was that it was carried out on limited number of participants limiting the generalization of the findings, the study can also be extended considering this premise

## CONCLUSIONS

The study was carried out to determine the relationship between type of attention (sustained and selective attention; task A v/s B) on recall of words in L1 and L2 in young Malayalam-English Bilinguals. Recall was better for task B tapping selective attention compared to task A tapping sustained attention, this was attributed to the task complexity and executive functions handling recall. The performance was also compared across L1 v/s L2. Recall was better for L2 than L1, this can be attributed to exposure factor as the participants were exposed to English more than Malayalam.

## Note

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## REFERENCES

1. Kellogg RT. Fundamentals of cognitive psychology. Sage Publications; 2015.
2. Clifford T Morgan. Introduction to psychology. Second edition. NEW YORK: McGRAW HILL; 1961.
3. Baars BJ, Gage NM. Cognition, brain, and consciousness: Introduction to cognitive neuroscience. Academic Press; 2010.
4. Sohlberg MM, Mateer CA. Improving attention and managing attentional problems: Adapting rehabilitation techniques to adults with ADD. Annals of the New York Academy of Sciences. 2001 Jun;931(1):359–75.
5. Roy RA. Auditory working memory: A comparison study in adults with normal hearing and mild to moderate hearing loss. Global Journal of Otolaryngology. 2018;13(3):1–4.
6. Daneman M, Merikle PM. Working memory and language comprehension: A meta-analysis. Psychonomic bulletin & review. 1996 Dec;3(4):422–33.
7. Baddeley A. Working memory and language: An overview. J Commun Disord. 2003;36(3):189–208.
8. Archibald LMD, Joanisse MF. On the sensitivity and specificity of nonword repetition and sentence recall to language and memory impairments in children. 2009;
9. Marian V, Neisser U. Language-dependent recall of autobiographical memories. Journal of Experimental Psychology: General. 2000 Sep;129(3):361.
10. Echemendia RJ, Meeuwisse W, McCrory P, Davis GA, Putukian M, Leddy J, et al. The sport concussion assessment tool 5th edition (SCAT5): background and rationale. Br J Sports Med. 2017;51(11):848–50.
11. Gavett BE, Horwitz JE. Immediate list recall as a measure of short-term episodic memory: Insights from the serial position effect and item response theory. Archives of Clinical Neuropsychology. 2012 Mar 1;27(2):125–35.

12. Gavett BE, Poon SJ, Ozonoff AL, Jefferson AL, Nair AK, Green RC, Stern RA. Diagnostic utility of the NAB List Learning test in Alzheimer's disease and amnesic mild cognitive impairment. *Journal of the International Neuropsychological Society*. 2009 Jan;15(1):121–9.
13. Grammaldo LG, Giampa T, Quarato PP, Picardi A, Mascia A, Sparano A, Meldolesi GN, Sebastiano F, Esposito V, Di Gennaro G. Lateralizing value of memory tests in drug-resistant temporal lobe epilepsy. *European journal of neurology*. 2006 Apr;13(4):371–6.
14. Bazarian JJ, Wong T, Harris M, Leahey N, Mookerjee S, Dombovy M. Epidemiology and predictors of post-concussive syndrome after minor head injury in an emergency population. *Brain injury*. 1999 Jan 1;13(3):173–89.
15. Craik FI. On the transfer of information from temporary to permanent memory. *Philosophical Transactions of the Royal Society of London. B, Biological Sciences*. 1983 Aug 11;302(1110):341–59.
16. Gunter TC, Jackson JL, Mulder G. Priming and aging: An electrophysiological investigation of N400 and recall. *Brain and Language*. 1998 Nov 1;65(2):333–55.
17. Jacobs DM, Rakitin BC, Zubin NR, Ventura PR, Stern Y. Cognitive correlates of mnemonics usage and verbal recall memory in old age. *Cognitive and Behavioral Neurology*. 2001 Jan 1;14(1):15–22.
18. Wetzell CD, Squire LR. Cued recall in anterograde amnesia. *Brain Lang*. 1982;15(1):70–81.
19. Butters N, Granholm E, Salmon DP, Grant I, Wolfe J. Episodic and semantic memory: A comparison of amnesic and demented patients. *J Clin Exp Neuropsychol*. 1987;9(5):479–97.
20. Jones D. A family living with Alzheimer's disease: The communicative challenges. *Dementia*. 2015;14(5):555–73.
21. Neisser U. *Cognitive psychology: Classic edition*. Psychology press; 2014.
22. Phelps J, Attaheri A, Bozic M. How bilingualism modulates selective attention in children. *Scientific Reports*. 2022 Apr 16;12(1):6381.
23. Baharav E, Reiser C. Using telepractice in parent training in early autism. *Telemedicine and e-Health*. 2010 Jul 1;16(6):727–31.
24. Boisvert M, Lang R, Andrianopoulos M, Boscardin ML. Telepractice in the assessment and treatment of individuals with autism spectrum disorders: A systematic review. *Developmental neurorehabilitation*. 2010 Dec 1;13(6):423–32.