



Intricate Relationship between Memory and Attention

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Abstract: Memory and attention are viewed as important cognitive processes which we use in our daily routine. Attention is regarded as a prerequisite for memory. Memory involves three stages namely encoding, storage and retrieval. Attention is found to be important for encoding. The study was carried out with the aim of determining the relationship between memory and attention. 20 Participants in the age range of 18-30 years served as participants. In the first second tasks, the stimuli was presented orthographically and the task of the participants were asked to recall the items in the absence and presence of noise. In the third and fourth tasks, the participants were asked to recall one specific item (not told beforehand) and recall all items respectively. Statistical analysis revealed that there was no difference between task 1 and task 2 and significant difference was seen between task 3 and 4 respectively showing that attention and memory are related.

Keywords: Memory, Encoding, Storage, Retrieval

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1. Introduction

Memory, attention, reasoning is considered as common intellectual or cognitive functions which we use in our daily routine. In most of the situations, these cognitive functions overlap and interact and would be treated as a common entity. Attention is considered to be a vital factor in the acquisition of intelligence (Burgoyne, Mashburn, Tsukahara, Hambrick, & Engle, 2021). As far as research is concerned they are treated as separate cognitive functions. Memory is considered as vital cognitive function and the memory processing is assumed to take place in three steps: encoding, storage and retrieval. Encoding refers to the process of registering information from our senses, while storage refers to the process of storing this information in a concrete form while retrieval refers to the process of accessing the information. Attention is supposed to play a fundamental role in encoding of information as all the perceptual information cannot be given equal weightage practically and all the incoming perceptual information many not be equally important too as proven by studies on listening comprehension (Shipstead, Harrison, Redick, Bunting & Engle, 2020). Thus selectivity in processing information becomes pivotal for memory in other words the selective attention plays an instrumental role in processing information (Posner & Peterson, 1990; Smith & Jonides, 1999) The role of attention in encoding has been researched constantly and the findings from research show uncontroversial role of attention in focusing on a fact or event will enhance the likelihood of later memory. This means to say that the allocation of attention would decide the longevity of memory. Experimentally the role of attention in memory process can be investigated by subjecting the participants to dual tasks (Cherry, 1953; Mangun and Hillyard, 1991). However the attention is assumed to get divided in this case as the attention is devoted to both the tasks equally hence the findings of such study cannot be considered as a reference in understanding the importance of attention in memory (Smyth & Scholey, 1994). In addition to this, the modality of stimulus presentation also can affect the performance on recall task (Kovaacs, Mollenar & Conway, 2019)

The role of selective attention over memory can be determined by designing specific studies in which the participants are subjected to conditions which are unusual or complex which in turn would demand the role of attention in performance (Pashler, 1998). The current study attempts to delineate the relationship between memory and attention on a series of tasks of different complexity levels with the intent of unveiling the role of attention on recall.

In summary, attention and memory both are cognitive functions. Attention is sometimes considered as a prerequisite and sometimes as overlapping aspect in memory. The current study aimed to determine the intricate relationship between attention and memory through the window of overlapping experimental tasks. The premise of the first two experimental tasks was to subject the participants to conditions which required less and more attention and examine the scores on recall. The third and fourth experiment on the other hand tried to identify the role of selectivity in recall. Thus the overall study aimed to investigate the intricate relation between attention and memory, the first objective of study was to compare the scores on recall in the presence and absence of noise and the second objective was to compare the scores on recall in selective and non-selective conditions.

2. Method

The aim of the study was to determine the relationship between memory and attention under four experimental conditions.

2.1 Participants

A total of 20 participants in the age range of 18-25 years were considered for the study. Out of 20 participants, 15 of them were females and the remaining were males. The participants were selected using volitional/purposeful sampling. Informed consent was taken from all the participants following this the four experimental tasks were administered on the participants.

2.2 Stimulus and Procedure

Task 1 and Task 2: Recall was common across all the four experimental conditions. The stimulus was presented in the form of words (in orthographic mode). The stimuli were presented as Power-point slides. Each slide had 6 words presented in successive order (one after the other) in a legible bold font. The distance between the laptop and the participants was 1 foot. Each stimulus set contained 6 units and the task of the participants was to



see the stimulus and then recall the stimulus in the same order of presentation (serial recall). There were three stimulus sets in the first task the second task was similar to the first task in terms of the stimuli, the modality of presentation, number of stimulus sets task for the participant etc. However, the only difference was that noise was presented in background at a level corresponding to 60db. The noise was routed through an audio player embedded in the same laptop which was used to present the words. The participants were asked to recall the items in the same order of presentation like the previous task.

Task 3 and Task 4: The participants were asked to recall the items similar to the first and second task. The basic difference here was that the stimuli was presented in the form of pictures and the linguistic labels was provided beneath each picture and the pictures (with their linguistic labels) were presented in a successive order. There were 6 stimuli in each set and there were three stimulus sets overall in task 3. The task of the participant was to recall two items based on the instruction provided by the tester. The items to be recall were not instructed before-hand and were told spontaneously after the stimulus presentation. For task 4, the stimuli used, number of items in each stimuli set, the modality of presentation was similar to task 3 however here the participants were asked to recall all the items unlike task 3 where the participants were asked to recall specific items based on instruction.

3. Results

The mean scores were computed for task 1, task 2, task 3 and task 4. The first objective of the study was to compare the scores on recall in presence and absence of noise. In order to accomplish the first objective, the mean scores on task 1 and task 2 (recall in the presence and absence of noise) tested was compared. The second objective of the study was to compare the recall in selective and non-selective conditions. In order to address the second objective, the mean scores on Task 3 and task 4 (recall in selective and non-selective task) were compared. The maximum score was 18 for all the four tasks. The mean scores on the first task were 12 and the mean scores on the second task was 13. In order to verify if there was any significant difference between the scores on recall for task 1 and task 2, Wilcoxon's signed rank was used (as the data did not abide by the properties of normal distribution). The Z score was 0.34 and the corresponding p value showed no significant difference between the recall scores in the presence and absence of noise. Task 3 tapped selective recall and task 4 tapped non-selective recall. The mean scores for task 3 was 9.2 and the mean scores for task 4 was 13.5. In order to verify if there was any significant difference between the recall score on selective and non-selective conditions, Wilcoxon's signed rank test was carried out (as the data did not abide by the properties of normal distribution) and the Z score was 2.33 and the corresponding p value showed significant difference between the recall scores on selective and non-selective conditions.

4. Discussion

There was no significant difference between recall scores in the presence and absence of noise, while there was a significant difference between recall scores in selective and non-selective conditions. The first task tested the relationship between recall and attention by subjecting the participants to a condition where the extrinsic redundancy was reduced by using noise. For the young-neuro typical participants in the current study there was no significant difference between the recall scores in the presence and absence of noise. In the presence of noise, the participant had to pay more attention relatively and the recall scores in the presence of noise was equally good as the condition where noise was not used. The second tested selective recall by presenting the items to participants and they were asked to retrieve selective items based on the demand posed by the investigator. While the non-selective recall (task 4) condition required the participants to recall all the items. The scores on selective recall were less compared to non-selective condition and the difference in the median scores for the two conditions was significant statistically. In the selective recall condition, the participants were not instructed in prior regarding the items to be recalled. This task requires the participants to sustain their attention across all the items presented even though the name of task suggests otherwise. The results of the study can be compared with studies which used a dual task paradigm. A study carried out by Pashler, 1994 used a dual task paradigm. This study required the participants to carry out two tasks at a time and they opined that the competing stimulus may not have a potential effect on the concurrent task or the main task. The similarity and dissimilarity between the competing task and concurrent task is considered significant in determining the effect the competing stimuli. In task 2, the participants were asked to recall in the presence of



noise. The noise did not have any significant effect on recall. In other words, noise was not effective as a competitive stimulus. Smith & Jonides (1999) carried out a study with the aim of determining the relationship between executive function and storage (memory). The results of this study were partially applicable to the current study as this study. Third and fourth task tapped the effect of selective attention on recall. The selective attention involves response inhibition to ignore the irrelevant stimulus and pay attention to the main stimulus. Task 3 required the participants to name the items asked for which involves selective attention and response inhibition. Lower scores were seen for this task showing that response inhibition was difficult to exercise in the given scenario. As the tasks used in the study was unique, the findings could not be correlated with the previous studies in this direction. The limitation of the study was that the study was carried out on only a small number of participants. The study can be extended on a larger number of participants to ensure generalisation. The study can also be extended on older participants (>55 years) to study the relationship between memory and recall in this population.

5. Conclusions

The study was carried out with the aim of investigating the relationship between attention and memory. The participants were subjected to conditions which required more attention. It was found that the recall scores were equally good in the presence and absence of noise. While there was significant difference between selective and non-selective conditions showing that the recall scores would vary as a function of attention.

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Author Contribution Statement

Manasi – Design, Data acquisition, Data analysis, Statistical analysis, Manuscript preparation, Manuscript editing and Review; **Chandana** - Data acquisition and Data analysis; **Abhishek** – Conceptualization, Manuscript preparation, Manuscript editing and Review and Supervision.



Does this article screened for similarity?

Yes.

Conflict of interest

The Authors have no conflicts of interest to declare that they are relevant to the content of this article.

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