Individual Assignment

PSY310: Lab in Psychology

Prerna Bhandari

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The Impact of Attention on Visual Memory Encoding and Recall

Introduction:

Memory encoding and memory recall are two fundamental notions in cognitive psychology that determines the manner in which individuals apprehend images. Studies point out that an important predictor of encoding depth is attention. According to Craik and Lockhart (1972), the orientation of processing and encoding at a deeper level (which frequently demands the attention) favours a better trace in memory. In this respect, attention serves as a screen through which stimuli are excluded while only relevant information is encoded.

Previous studies show that divided attention affects memory encoding becoming less accurate and thus producing inaccurate recollection (Baddeley, 1992). In the case of visual memory, particularly in experiments involving a dual-task approach, it has been demonstrated that cognitive load indeed decreases availability of attention which controls memory respectively.

The current research examines the effects of attentional capacity on encoding into visual short-term memory and subsequent retrieval. Specifically, participants will view a set of images under two conditions: in other words, it means focus attention and partial attention.

Hypothesis:

1. Primary Hypothesis: The results will show that participants exposed to a full-attention condition will achieve a higher recall accuracy than those in a divided-attention condition.

2. Secondary Hypothesis: Reaction times during recall will be found to be faster in the full-attention condition because memory encoding is stronger.

   Possible Outcomes and Implications:

   - Full Attention Superiority: Accommodates models of How- do -you- attention resource management in determining encoding and recall efficiency.
   - Minimal Differences Between Conditions: I think that the object recognition function may require automatic coding system separately from the subjects' attention.

Objective:

The purpose of the present study is to examine the effects of attention in encoding and retrieval in the domain of visual imagery. There is clear evidence that attention has a critical influence on how different people store and perceive iconic stimuli. In regard to visual stimuli, people's attention plays a role of helping decide which aspects of stimuli presented to them are to be stored in their memories and which of those aspects can be retrieved. More specifically, the experiment seeks to compare performance under full attention condition, where participants focusing exclusively on visually presented stimuli and divided attention condition, where participants had to complete second task while performing primary task.

As implied in the method discussed in this paper, the experiment seeks to investigate the hypothesis that comprehensiveness in the level of attention paid

to the visual stimuli will produce better recall accuracy and faster recall time compared to when the subject is distracted by other tasks or split attention. Hence, in employing a dual-task design, one group of participants is to view the images only while the other group is to perform an unrelated secondary task of solving arithmetic problems in parallel to the memory encoding test. This research could also help fill the gap of current literature concerning how attention influences the storage of information by the brain especially under conditions where people may be bored or doing other activities.

Thus, the goal is to enhance the knowledge of attention in relation to memory, in order to come up with improved recommendations for learning processes and working conditions, and for cases when memory is crucial to recall, as in legal investigations or cases of eye-witness testimonies. Furthermore, this study may also help in determining approaches or techniques in improving memory outcome, given the role of attention in memory processes in environments with high level of distractions.

Method:

In total, five undergraduate students (all were female) aged from 18 to 22 completed the survey. Indications for enrolment required participants to have normal or corrected for normal vision. All subjects were obtained through a random screening of students from a university and volunteers signed informed consent.

Apparatus and Stimuli

- Stimuli: A video of a laptop with a continuous sequence of 10 static images showing everyday objects. All the images were made of the same size and converted to coloured images on a white background.

- Apparatus: An iMac with a 13-inch screen; PsychoPy software for image presentation and data collection.

Procedure:

1. Condition 1: Full Attention:
   The participants were specifically told to concentrate on the pictures. The duration for each image was 3 seconds with an ISI of 1 second. ‘Subjects’ immediate recognition was assessed with a free recall test after they reviewed all 10 pictures.

2. Condition 2: Divided Attention:
   Concerning the manipulation of object representations: participants simultaneously observed the same set of images and solved arithmetical problems, for example, adding the two-digit numbers. Identical with Condition 1, participants had to do the free recall test after the image exposure.

Design:

This paper employs a within-subject design where all the participants would undertake both the actual and control conditions. The conditions were also ordered in a balanced fashion in order to counteract order effects. Measures for dependent variables were accuracy of recall and the time it took to complete recall trial.

Results:

Data Analysis

- Recall Accuracy: The overall percent accuracy for the recalled images for each condition was also calculated.
- Reaction Time: The estimated time to recall each image was noted down and then arithmetically averaged across each condition.

The findings and discussion on the effects of attention on the stimulus encoding and recall of the experiments is from five subjects. Reaction times and recall times of the subjects were calculated as average-response times under two attention levels Full attention and Divided attention were compared using ANOVA.

For each subject the ANOVA results offer a microanalysis of the influence that attention had on their reaction and recall times. The statistics showed a significance of the attended items in both recall trials between Full and Divided conditions which were tested against chance with very low p-values (all below 0.05), indicating that the type of attention (Full vs Divided) has a statistically significant impact on the encoding and recall of objects in visual memory.

- Participant 1: Average reaction time over FM, Full Attention was 1.243s and over DM, Divided Attention was 4.826s, Variance=9.9389. The calculated F value is 550.71 with a very small p value of 1.48E-92 principally suggesting that type of attention influence's reaction time and recall.

- Participant 2: Under Full and Divided Attention, the number of reaction times respectively was 1.2567 and 5.056. a significant F ratio of 645.49, $p < 3.15$ E-104 hence confirming the association between attention and performance.

- Participant 3: The reaction time for Full Attention mode was 1.2825s comparative to 5.0128s for Divided Attention mode. The obtained ANOVA values are highly significant (F (1, 33) = 723.90, p = 2.60E-113) indicating large effect of attention for visual memory processing.

- Participant 4: Full Attention produced a reaction time of 1.2472 while Divided Attention produced 4.9847secs. Statistical analysis of the ANOVA table yielded an F-value of 628.16, with a significance level of 3.740048e-102 which showed adequate significance of the two attention conditions.

- Participant 5: The reaction time obtained for Full Attention was 1.2235 sec and Divided Attention was 4.9463 sec. As with the previous data, the ANOVA results show the significance of the F-value (551,67) and an insignificant p-value that equals 1,12E-92, which indicates the existence of a positive connection between the amount of attention paid and reaction and recall times.

Discussion:

Using the results obtained and comparing Full Attention and Divided Attention it is possible to identify a trend namely reaction times are shorter in Full Attention than in Divided Attention and therefore participants perform better when focused on the task only. This is in line with previous findings in the cognitive load and attention literatures that assert that multitasking or divided attention interferes with memory encoding and recovery processes.

All five participants show statistically significant differences in total reaction and total recall times between the Full Attention and Divided Attention conditions by ANOVA test. The p-values given for each participant are low, all the values are less than 0.05

and the F – values are very high which indicates that attention has a significant effect. The variance for Reaction Time under Divided Attention is again greater, indicating that distractions / divided concentration led to additional variability in performance from trial to trial.

This investigation provides evidence for the proposed prediction that attention is involved in determining the rate of input to, and the fidelity of output from, visual memory. The evidenced difference between Full Attention and Divided Attention shows that availability of attention leads to overloading on cognitive resources and thus had slow response time and ineffective memory retrieval.

In general, the results provide evidence for the benefits of selective attention while performing tasks that involve encoding and retrieving from visual memory with probable applications in the context of higher complex tasks as learning, working or driving.

Conclusion:

Such features are clear evidence that attention greatly affects the encoding and recall of items in the visual working memory. Overall performance was significantly higher when participants' attention was fully engaged, thus confirming the proposed concept of Full Attention improving memory encoding and recall rates. Subsequent studies with higher sample could generate data that given broader views to how attention impacts on cognitive performance for various tasks.

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