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PY-03 The Effect of Notifications on Different Levels of Processing of Memory

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The Effect of Cell Phone Notifications at Different Levels of Processing on Memory

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INTRODUCTION

Memory and Levels of Cognitive Processing

Memory is a process that involves the acquiring, encoding, storing, and retrieving of information obtained from the environment. According to the levels of processing theory, proposed by Craik and Lockhart, the perception of stimuli requires analysis at various cognitive levels. Processing things at greater "depth" involves more cognitive analysis and making connections with already known material. This deeper analysis is associated with longer retention and better performance on memory recall tasks (Craik & Lockhart, 1972).

Load Theory of Attention

The Load Theory of Attention states that processing capacity, how much information input a person can handle at one time, is limited (Lavie, 2004). The perceptual load, the difficulty of a given task, varies between different actions; high-load tasks, such as reading, use up more cognitive resources than low-load tasks; therefore, they use more processing capacity (Lavie, 2004; Stothart et al., 2015). Overall, dividing attention between multiple stimuli prevents individuals from fully focusing on and processing the "to-be-remembered" information, which can be especially harmful in an academic setting.

Cell Phones as Distractions in Academic Settings

A study by Dietz and Henrich concluded that texting during class resulted in significantly worse performance on memory recall and recognition tasks (2014). What many students fail to realize is that these notifications cause distractions far after the *bing* noise stops; cell phone notifications promote task-irrelevant thoughts and prevent students from focusing on the material. Even when students ignored the notification, their performance on memory recall tasks decreased (Stothart et al., 2015).

Hypotheses

This experiment tested the effect of cell phone notifications at different levels of cognitive processing (deep vs. shallow) on semantic memory recall and recognition. We expected to find:

- A main effect of *depth of processing* and *notifications* on both recall and recognition tasks
- An interaction effect such that the deep processing condition shows more deficit from the notifications than the shallow processing condition

Treatment Groups

Deep Processing, Notifications Present	**Deep Processing, Notifications Absent**
Shallow Processing, Notifications Present	**Shallow Processing, Notifications Absent**

METHODS

Participants

All **49 participants** were sampled from the population of undergraduate students at Presbyterian College.

Experimental Design

This experiment follows a 2x2 between subjects design. The first independent variable, **depth of processing** has two levels: **shallow and deep**. The second independent variable, **notifications**, also has two levels: **present and absent**. The dependent variable is **memory performance** which will be measured in two ways. The first is through a **free recall task** where the participants generate as many of the target words as they can. The second is a **recognition task**, where the participants identify target words from a list containing distractors.

Procedure

Upon arrival, participants were thanked for their participation and informed consent was obtained. The participant was then escorted into a quiet room with a computer featuring directions for the task, and they were asked to turn off their phone. They then began the deep/shallow processing task. In the shallow processing task, the participant was asked to indicate whether the word contains the letters A and/or O. In the deep processing task, the participants were asked to indicate whether the word was pleasant or unpleasant. In the notifications present condition, the experimenter's phone went off four times during the task. In the notification absent condition, no cell phone was present. Once the presentation was completed, the recall task began, followed by the recognition task. After the recognition task, the participants were debriefed.

RESULTS

Figure 1

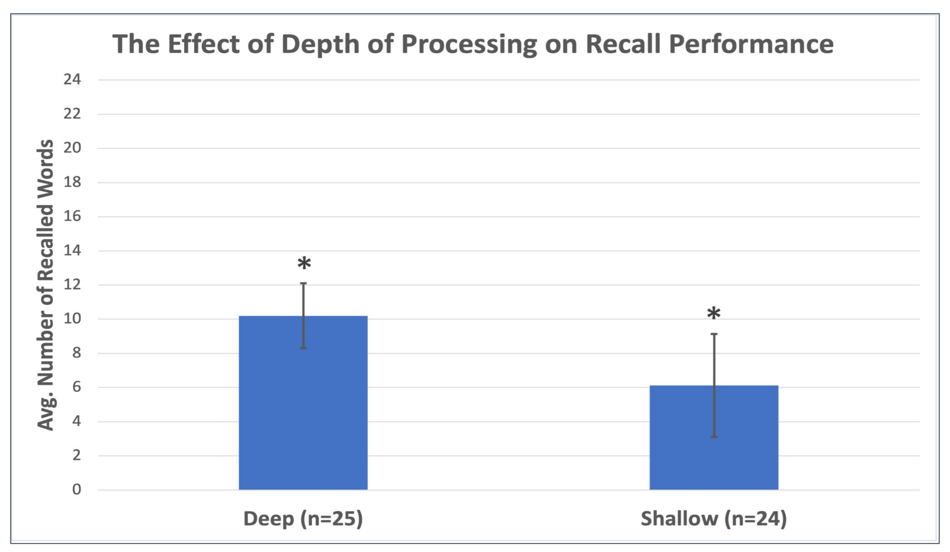


Figure 2

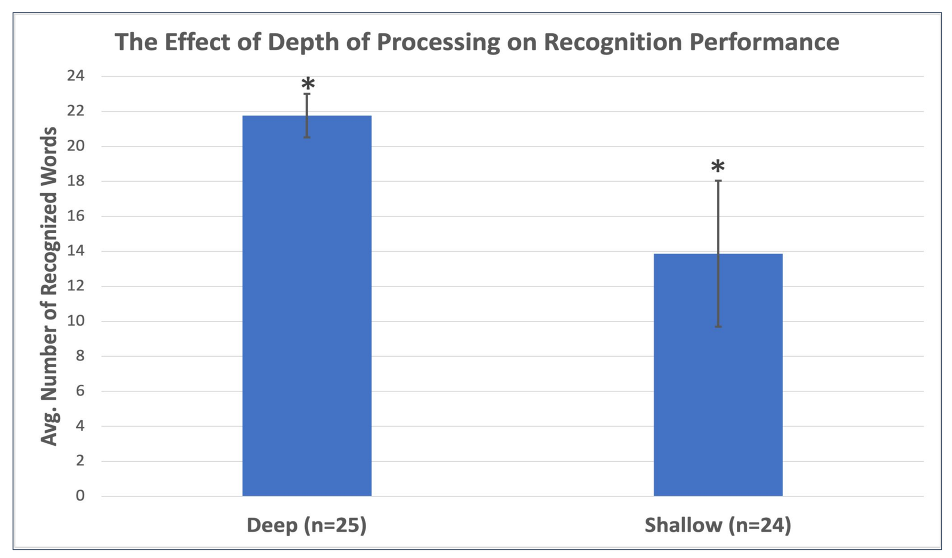


Figure 3

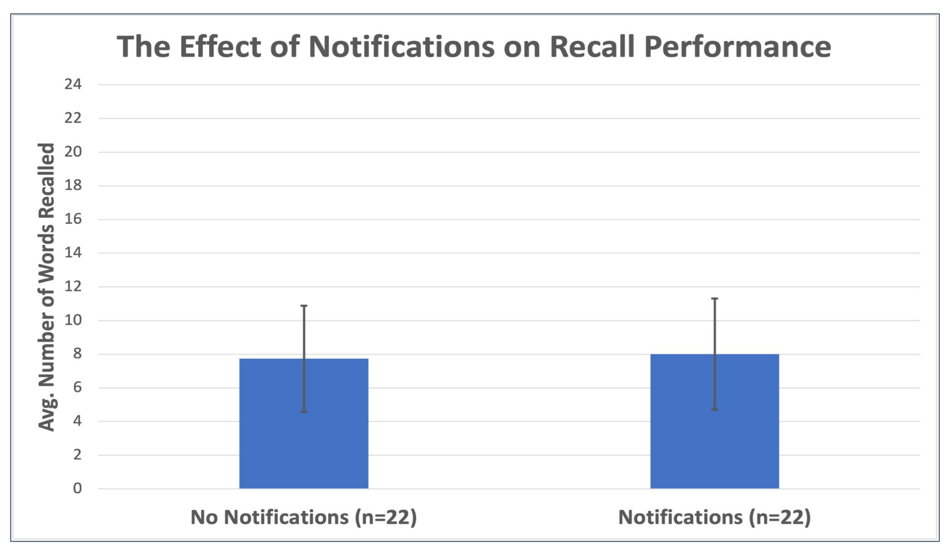
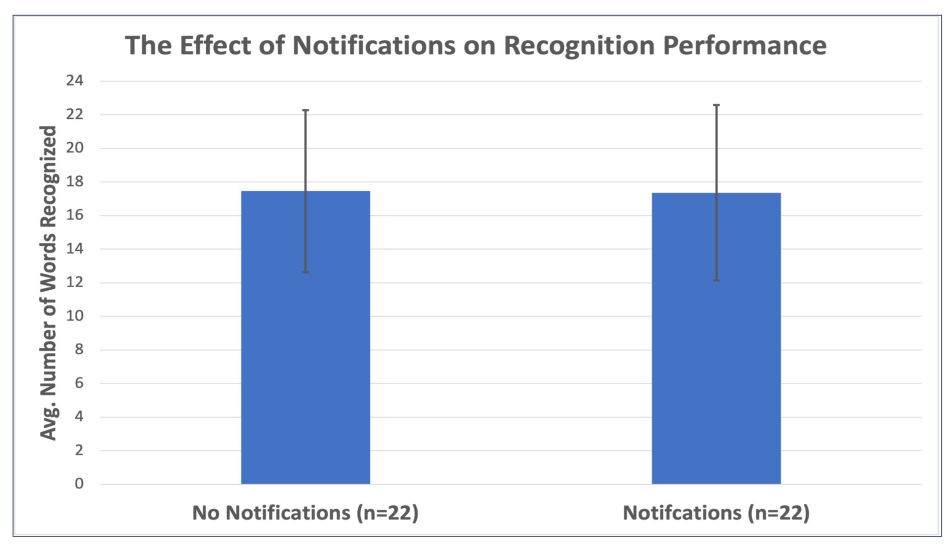


Figure 4



A 2x2 between-subjects ANOVA was conducted to analyze the effect of depth of processing and phone notifications on memory performance as measured in two ways. Depth of Processing had two levels (deep, shallow), as did notifications (present, absent). The main effect of depth of processing on recall performance yielded an F ratio of $F(1,40) = 21.40$, $p < .001$, indicating that those participants in the deep condition ($M = 10.20$, $SD = 1.93$) had significantly higher recall performance than those in the shallow condition ($M = 6.13$, $SD = 3.08$). Additionally, the main effect of depth of processing on recognition performance, measured by d', yielded an F ratio of $F(1,40) = 11.59$, $p = .002$., indicating that those in the deep condition ($M = 2.68$, $SD = 0.56$) had significantly better recognition performance than those in the shallow condition ($M = 1.83$, $SD = 0.82$). The main effect of notifications on recall was non-significant [$F(1,40) = .098$, $p = .756$], as well as the effect of notifications on recognition performance [$F(1,40) = .376$, $p = .54$]. The interaction of depth of processing and notifications was non-significant on recall [$F(1, 40) = .037$, $p = .849$] as well as recognition performance [$F(1,40) = .390$, $p = .536$].

CONCLUSIONS

Was the Hypothesis Supported?

According to the results, the hypothesis was only partly supported. As seen in Figures 1 and 2, there was a significant difference in recall and recognition performance between deep and shallow processing. Participants in the deep processing condition had significantly higher performance on both the memory recall and recognition tasks. However, because we found no significant effect of cell phone notification distractors on recall or recognition performance (Figures 3 and 4), the hypothesis was not fully supported. Additionally, no interaction effect of depth of processing and notifications was found.

Possible Explanations and Future Directions

There are many possible explanations for why no significant effect was found between notifications and memory recall and recognition performance. First, it's possible that the four notifications were not enough or too soft to cause a significant disruption of focus. Additionally, all participants were college students, who tend to spend more time on their phones than most of the population; have they become adept at tuning out notifications? If so, this would contradict previous studies that have found a negative correlation between cell phone notifications and memory performance, like Dietz and Heinrich (2014). It is also quite possible that the data is not an accurate representation of our reality due to a small sample size. To further understand the effect of cell phone notifications on memory performance, future studies could include more notifications with a stronger distractor such as having the phone vibrate and receive phone calls instead of text messages.

REFERENCES

Please use the following QR code to access our references.

ACKNOWLEDGMENTS

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