# Effects of Enhancement and Suppression Cueing on Long Term Memory

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## Introduction

Although our long term memory has a vast storage capacity, occasional variation in our ability to remember influences our everyday lives. The goal of this study is to see if cueing to remember or forget stimuli will affect the visual long term memory of object images. Previous research has found that more often participants are able to up-regulate their memory, or remember stimuli because of cueing, rather than down-regulate their memory, or forget the stimuli because of cueing (Sundby, Woodman, & Fukuda 2018, Williams and Woodman 2012, Macleod 1999). EEG results from past research show that frontal positivity is greater for items that were recognized with high confidence compared to those that were missed (Sundby, Woodman, & Fukuda 2018, Friedman and Johnson 2000). The current study would like to replicate Sundby's methodology by using pictures of objects to investigate visual long term memory in response to cueing and its representation in the brain. We hypothesize that EEG results will show higher ERP's during upregulation and while recognizing the upregulated stimuli.

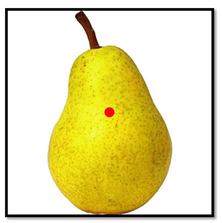
## Methods

- 44 (5 male) participants aged 18-22 (M= 19.48, SD= 1.39).

Encoding Task

- Participants viewed 300 pictures
- Three cues preceded the images
  - Green dot, remember the picture (Enhance)
  - Yellow dot, passively view the picture (Neutral)
  - Red dot, forget the picture (Suppress)
  - 100 images were presented with each cue



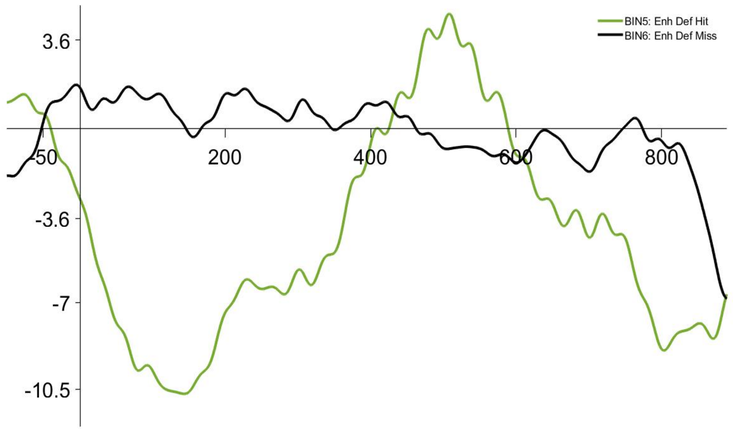


Recognition Task

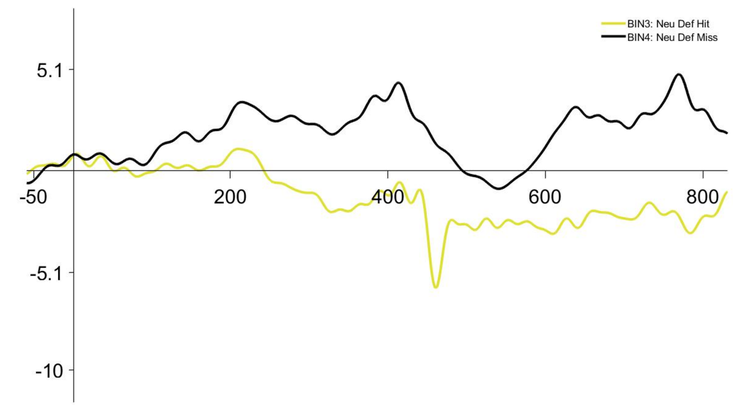
- Participants viewed 600 pictures
  - All 300 from the encoding task
  - 300 never seen
- Participants respond on a button box:
  1. Definitely old (have seen before)
  2. Maybe old
  3. Maybe new
  4. Definitely new (have not seen before)

## Results

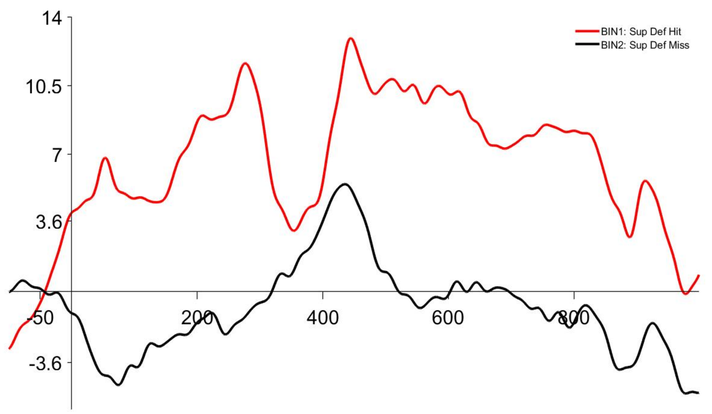
Average ERP for Enhanced Stimuli at Encoding at Fz



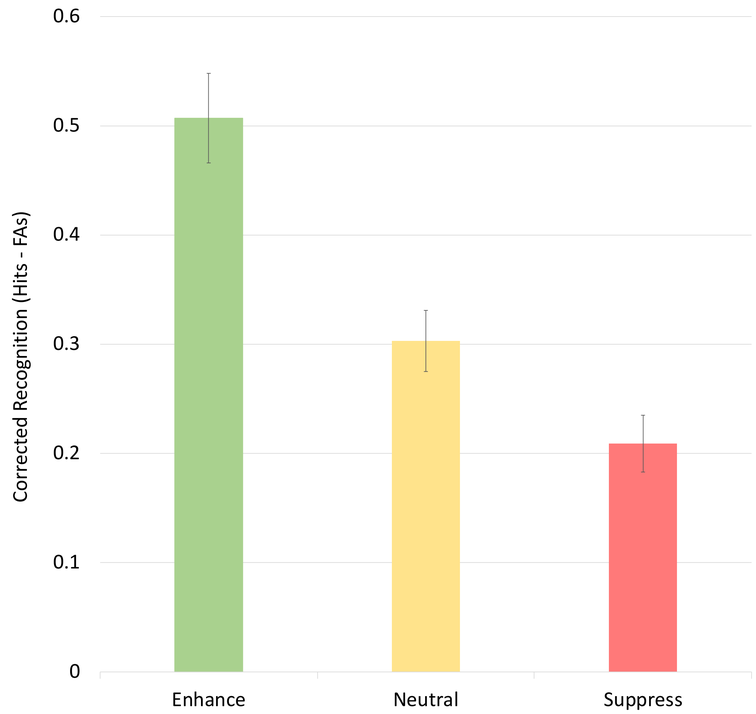

Average ERP for Neutral Stimuli at Encoding at Fz




Average ERP for Suppressed Stimuli at Encoding at Fz




Memory Performance




## Discussion

Our behavioral results are consistent with past research, that there is a significant effect of cue on long term memory. Not only are participants able to enhance their memory (Sundby, Woodman, & Fukuda 2018, Williams and Woodman 2012, Macleod 1999), but our results show that they are able to suppress it as well. Our EEG results at point Fz, based on past research, show no significant differences between hits and misses for all three conditions.

Future direction of this project will include further ERP analysis of each condition, including time-blocking at the time of the cue.

## References

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MacLeod C. M. (1999). The item and lost methods of directed forgetting: Test differences and the role of demand characteristics. *Psychonomic Bulletin & Review*. 6 (1), 123-129.
Sundby, C. S., Woodman, G. F., Fukuda K. (2018). Electrophysiological and behavioral evidence for attentional up-regulation, but not down-regulation, when encoding pictures into long-term memory.
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