Inhibition of related items in long-term memory specificity depends on confidence
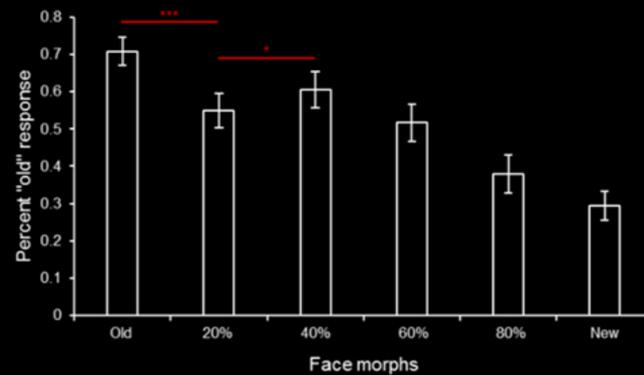
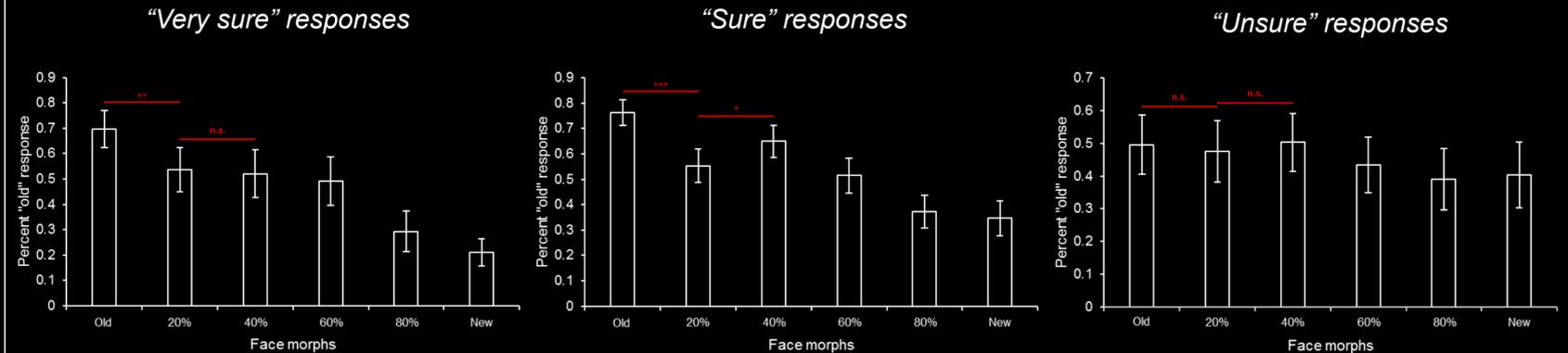Brittany M. Jeye[1] and Scott D. Slotnick[2] [1]Worcester State University, [2]Boston College

Introduction

- We are capable of remembering an incredible amount of specific objects [1, 2]
- However, fundamental questions about visual long-term memory still exist: How detailed are long-term memory representations? What are the underlying mechanisms that allow us to distinguish between these detailed memories?
- Previous research from our lab demonstrated that memory representations were very specific during an old-new recognition paradigm utilizing faces
- Unexpectedly, we also found that the "old" response rate for closely related faces was less than that for more distantly related faces, which may reflect an inhibitory mechanism
- In the current experiment, we aimed to evaluate whether this pattern of inhibition in long-term memory depends on confidence

Results

"Very sure" responses *"Sure" responses* *"Unsure" responses*

- The "old" response rate for 20% morphs and old faces (0% morphs) was significantly different for both "very sure" confidence ratings (weighted $F(1,169) = 7.95$, $p < .01$) and "sure" confidence ratings (weighted $F(1,192) = 24.03$, $p < .001$)
- There was no significant difference in "old" response rates between old faces and 20% morphs for "unsure" confidence ratings (weighted $F(1, 138) < 1$)
- The "old" response rate was significantly lower for 20% morphs as compared to 40% morphs for "sure" confidence ratings (weighted $F(1, 194) = 4.27$, $p < .05$), but not for "very sure" confidence ratings (weighted $F(1, 157) < 1$) or "unsure" confidence ratings (weighted $F(1, 140) < 1$)
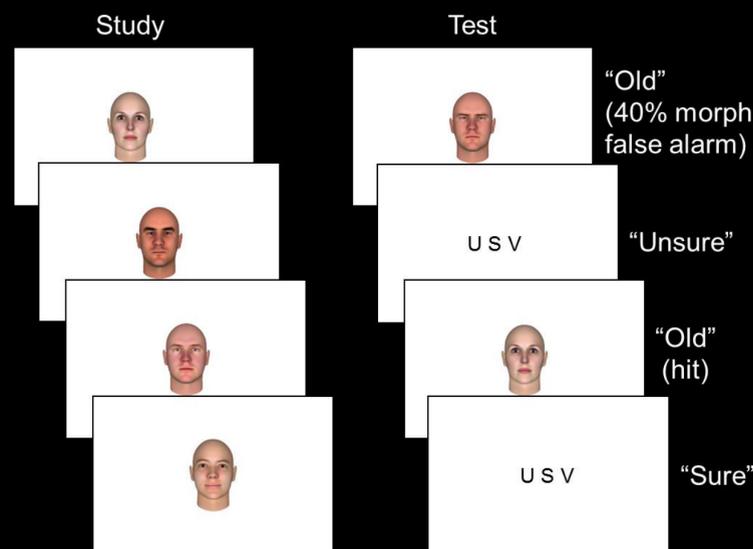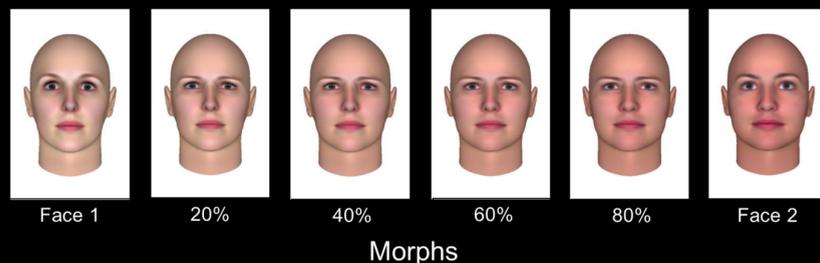
Methods

Memory Paradigm

- <u>Study</u>: faces were presented in the center of the screen
- <u>Test</u>: old faces, related faces, and new faces were presented and participants classified each face as "old" or "new"
- Participants also made "unsure", "sure", or "very sure" confidence ratings

Experimental Stimuli

- Neutral male and female European faces were randomly constructed using the FaceGen Modeller
- Related faces were constructed by morphing two faces in steps of 20%
- Independent raters indicated that the pairs of faces to be morphed were perceptually dissimilar

Study   Test

"Old" (40% morph, false alarm)

"Unsure"

"Old" (hit)

"Sure"

Face 1   20%   40%   60%   80%   Face 2

Morphs

Discussion

- We found that memory representations were very specific as the "old" response rates differed between 20% morphs and old faces for both "very sure" and "sure" confidence ratings
- This is consistent with previous research demonstrating high specificity of visual long-term memory [1, 2]
- However, the difference in "old" response rate between 20% morphs and 40% morphs only appeared for "sure" confidence ratings, not for "very sure" or "unsure" confidence ratings
- These findings may reflect an evolutionary advantage for recognizing specific faces, which may require inhibition of closely related faces
- These findings also suggest that inhibition of closely related faces may be flexibly directed depending on confidence level, and may be primarily associated with intermediate confident responses
- Future research will utilize event-related potentials and functional magnetic resonance imaging to investigate the brain basis of this long-term memory inhibition

References

[1] Brady, T. F., Konkle, T., Alvarez, G. A., & Oliva, A. (2008). Visual long-term memory has a massive storage capacity for object details. *Proc. Natl. Acad. Sci., 105*, 14325-14329.
[2] Brady, T. F., Konkle, T., Gill, J., Oliva, A., & Alvarez, G. A. (2013). Visual long-term memory has the same limit on fidelity as visual working memory. *Psych. Science, 24*, 981-990.