



Context Similarity and Free Recall Organization

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Introduction

- Free recall paradigms measure the order that items were recalled from memory – **how memories are organized**¹.
- Our memories are bound to **contexts**² (e.g., where/when an experience occurs), which frequently share similarities.
- Memories that share a common context during encoding **tend to be grouped together** during free recall^{3,4}.
- Similar contexts increase the likelihood of **memory interference**, where one memory disrupts the retrieval of another, blending details from separate events⁵.
- With **repeated experience**, memory interference is reduced, and the ability to discriminate between similar contexts improves^{6,7}.

Research Question

- How does contextual similarity influence the organization of free recall?
- How does experience with contexts influence the organization of free recall?

Design

Scenes

24 man-made scenes (locations) had a highly similar pairmate.



Experiment #1

Individuals (n=35) were recruited from an online sample (Prolific) for a within-subjects design.

Learning Phase

Task: Make a yes/no judgement as to whether you could find the word in the scene.

Scenes



Words 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16



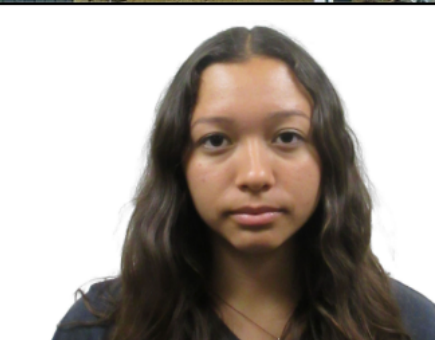
Each block contained a pair of similar images and two unrelated images.

1.00 s 500 ms 2.50 s

Experience Task

Experiment #2

Individuals (n=34) were recruited from SONA at the University of Oregon for a within-subjects design.



Study Phase

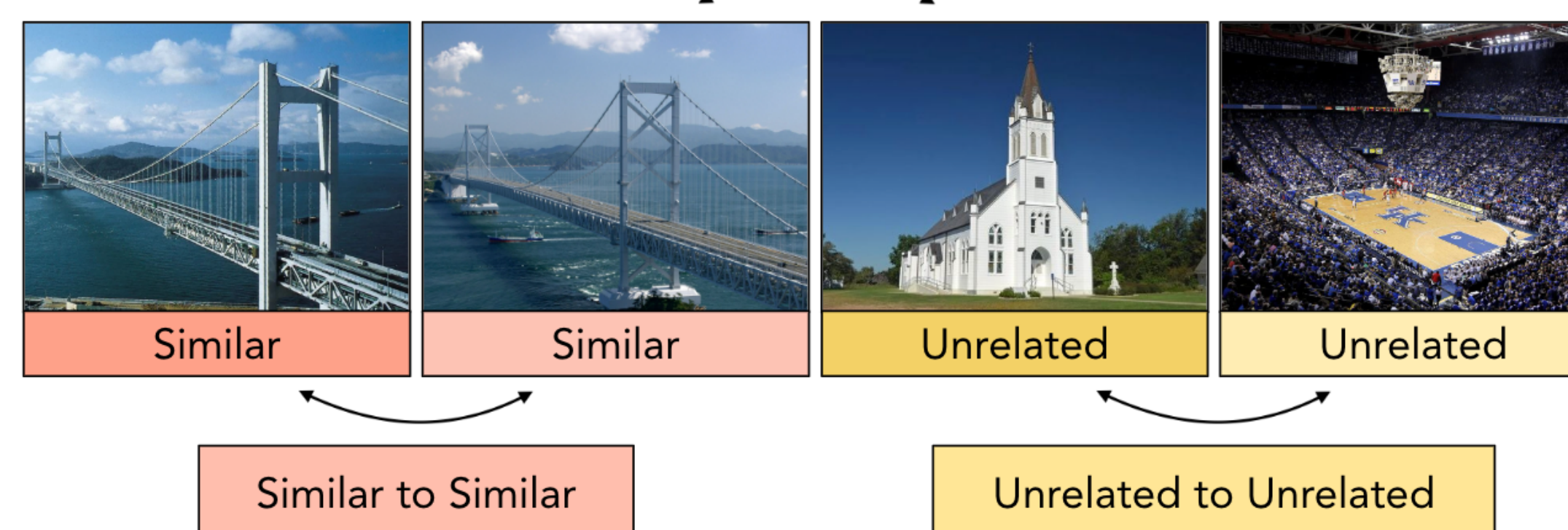
Subjects viewed and were tested on each pair-association three times.

Test Phase

Data Analysis

Recall Transitions

Between Shift

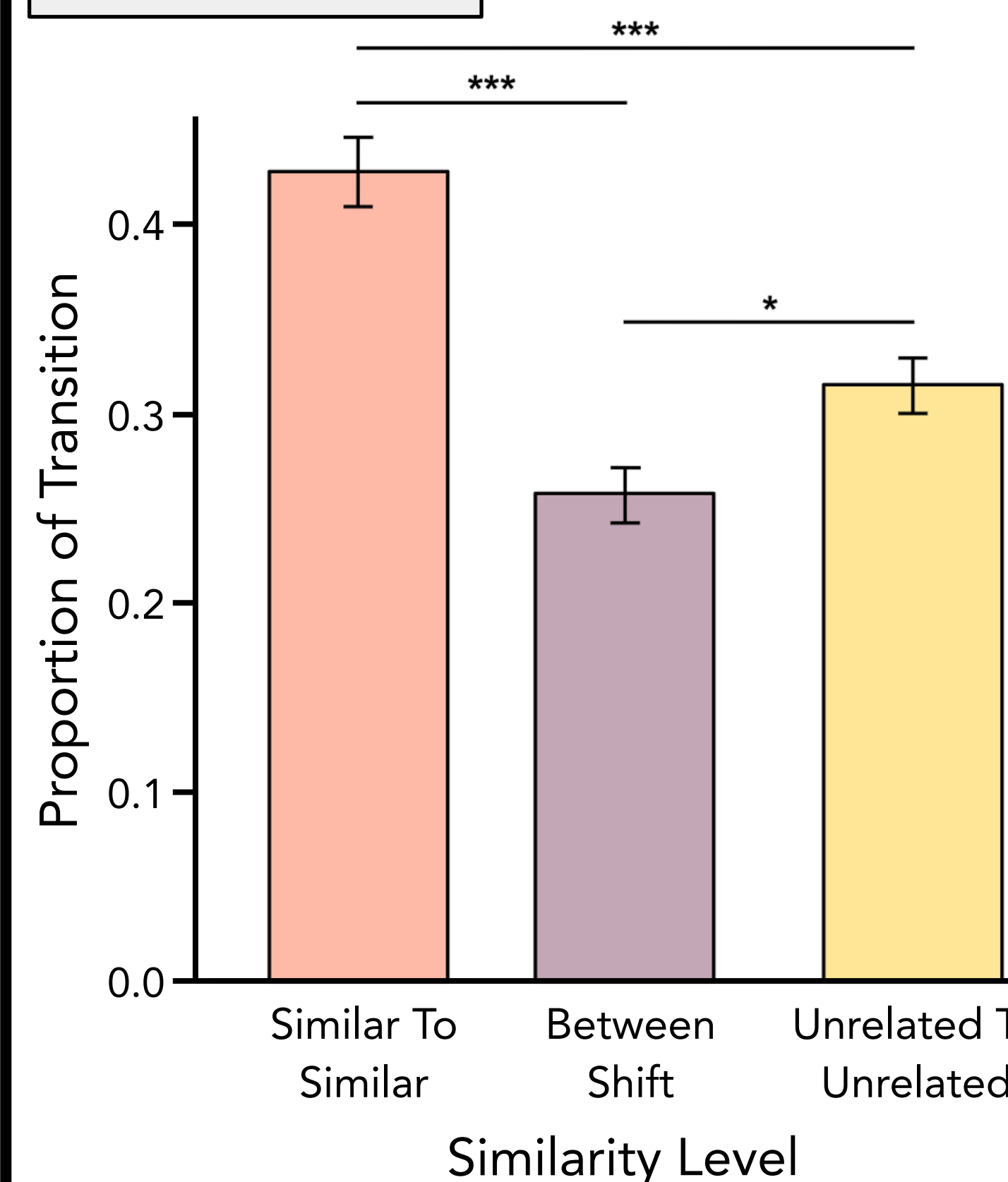


Recall transitions were used to assess the organization of memory.

Recall Organization

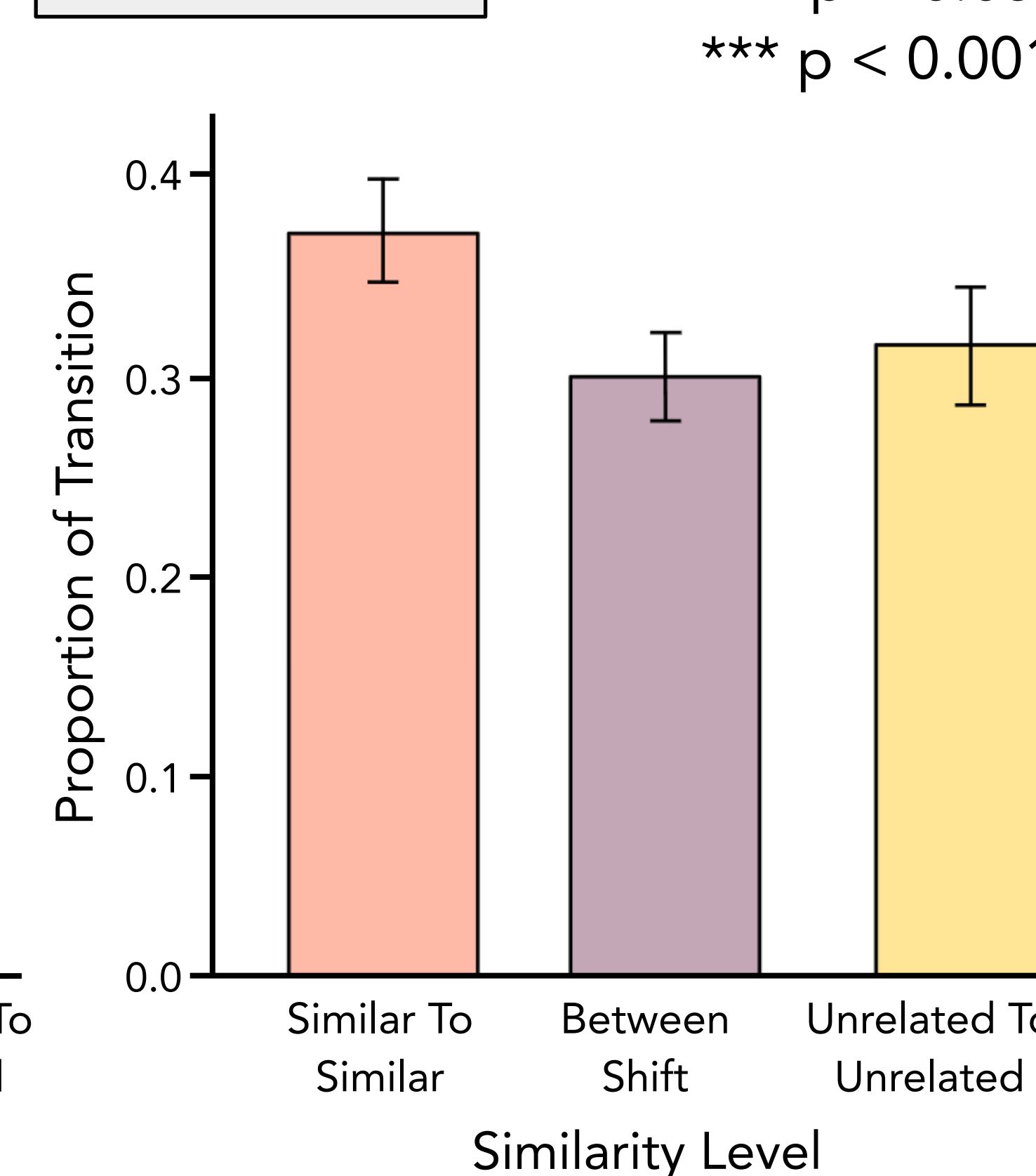
Recall Organization By Scene Context

Experiment #1



Recall transitions between similar images were made most often.

Experiment #2

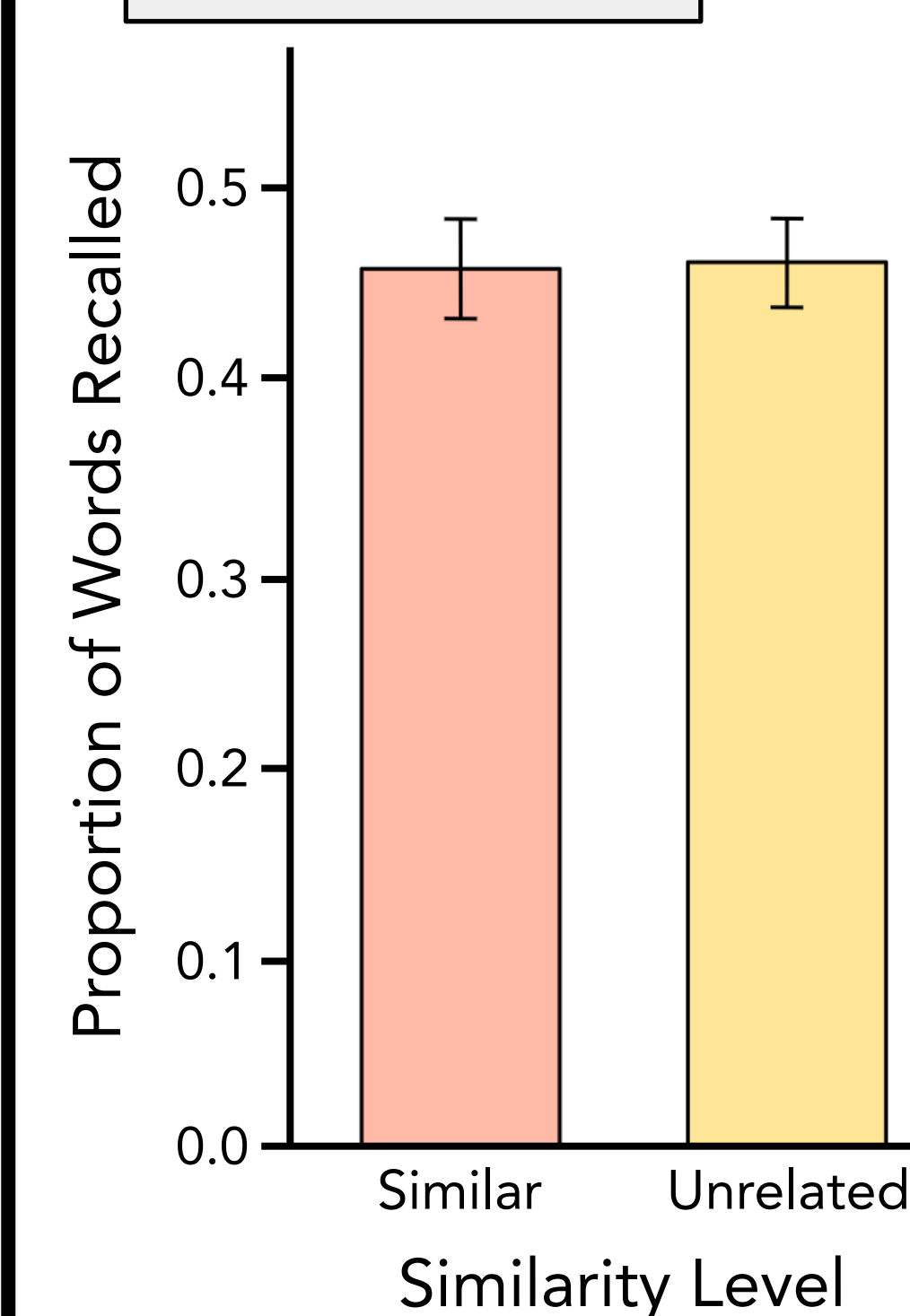


No difference in recall transitions across context types.

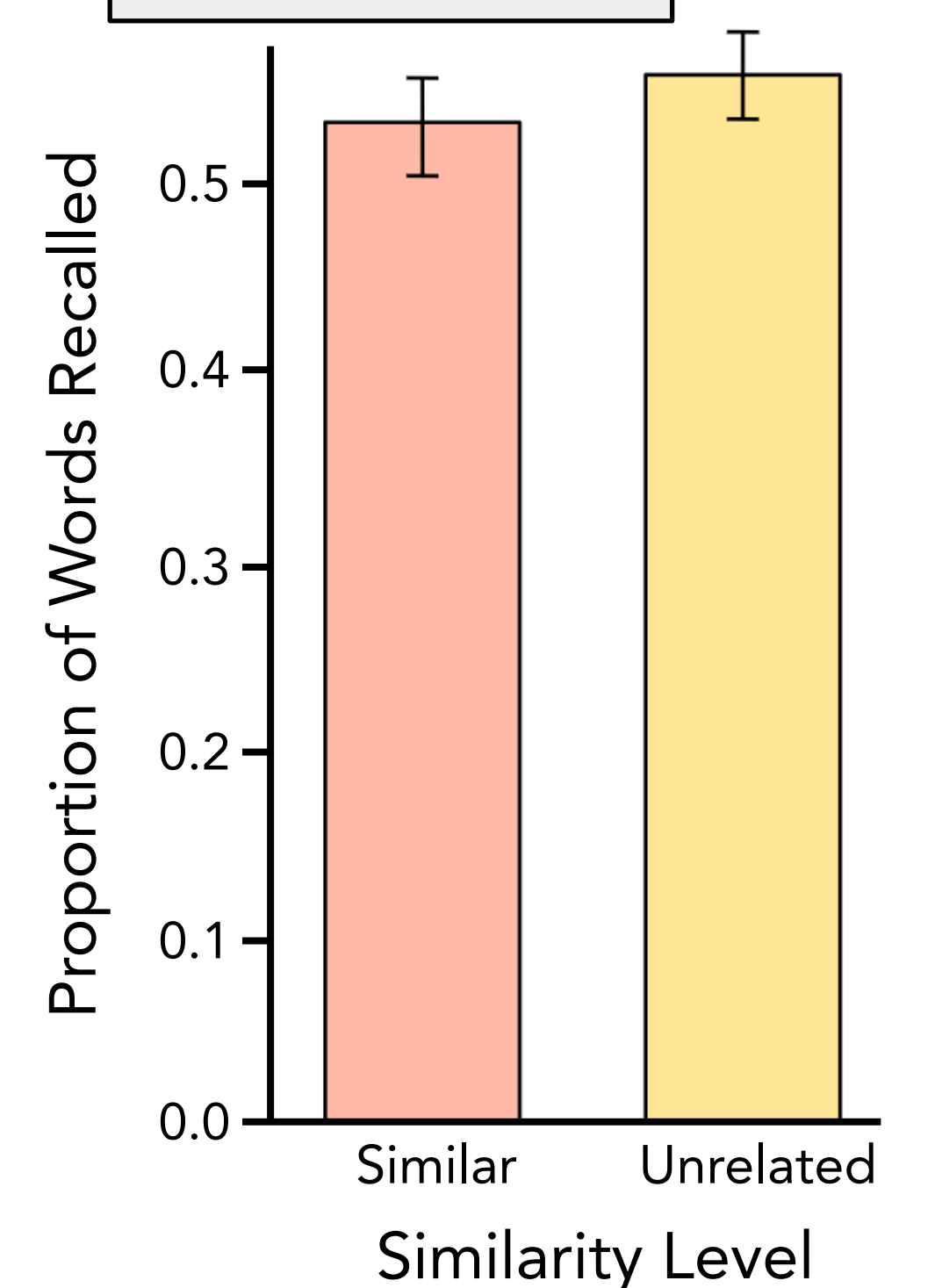
Recall Performance

Proportion Recalled By Similarity

Experiment #1



Experiment #2



There was no significant difference in the proportion of words recalled between similar and unrelated images.

Conclusion

- Without experience, participants tended to group items from similar scenes, indicating that shared contexts promote memory clustering.
- This suggests that similar contexts increase the likelihood of memory interference, making it harder to keep experiences distinct.
- With repeated experience, the ability to discriminate between similar contexts improves, and memory interference can be reduced.

References

- Polyn, S. M., Norman, K. A., & Kahana, M. J. (2009). A context maintenance and retrieval model of organizational processes in free recall. *Psychological review*, 116(1), 129.
- Lohnas, L. J., & Healey, M. K. (2021). The role of context in episodic memory: Behavior and neurophysiology. In *Psychology of Learning and Motivation* (Vol. 75, pp. 157-199). Academic Press.
- Lohnas, L. J. (2022). *Free recall and memory search. The Oxford Handbook of Human Memory: Foundations and Applications*. Oxford University Press.
- Polyn, S. M., Norman, K. A., & Kahana, M. J. (2009). Task context and organization in free recall. *Neuropsychologia*, 47(11), 2158-2163.
- Robertson, Edwin M. "New Insights in Human Memory Interference and Consolidation." *Current Biology: CB*, vol. 22, no. 2, Jan. 2012, pp. R66-71.
- Chanales, Avi J. H., et al. "Overlap among Spatial Memories Triggers Repulsion of Hippocampal Representations." *Current Biology: CB*, vol. 27, no. 15, Aug. 2017, pp. 2307-2317.e5.
- Favila, Serra E., Avi J. H. Chanales, and Brice A. Kuhl. 2016. "Experience-Dependent Hippocampal Pattern Differentiation Prevents Interference during Subsequent Learning." *Nature Communications* 7(1): 11066. doi:10.1038/ncomms11066.

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