

Interleaved Training Improves Category Learning by Increasing Perceptual Similarity of Within-Category Exemplars



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BACKGROUND

Category learning paradigms using naturalistic stimuli have found that **interleaving exemplars across categories** during training (rather than blocking by category) leads to superior category learning^{1,2,3}.

Behavioral paradigms have suggested that the interleaving benefit is driven by increased **between-category discrimination and differentiation**^{2,3}.

Using a cognitive model that infers feature representations from similarity judgments, referred to as **psychological embedding**, we quantified how learning-related changes in perceptual similarity differ by training sequence^{4,5,6}.

- We predict learning category groupings will **reduce variance among same-category exemplars**.
- We predict the interleaving benefit is driven by **increasing distance between categories**, which enhances category discriminability.

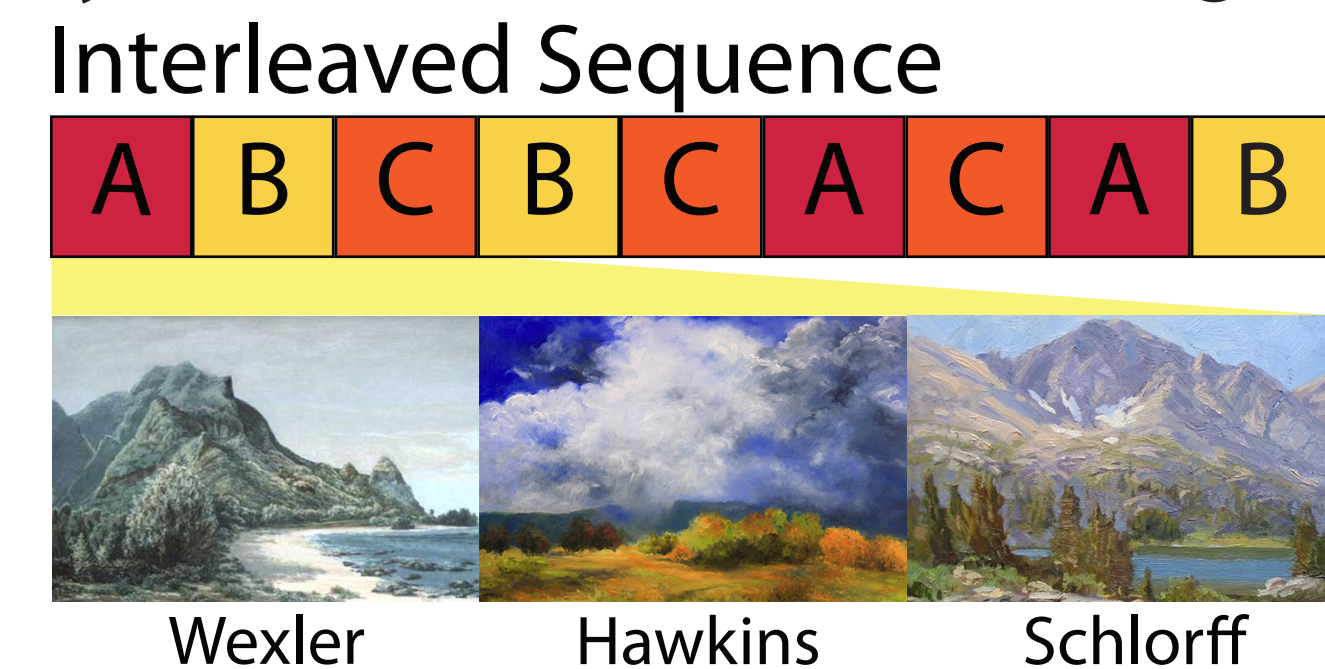
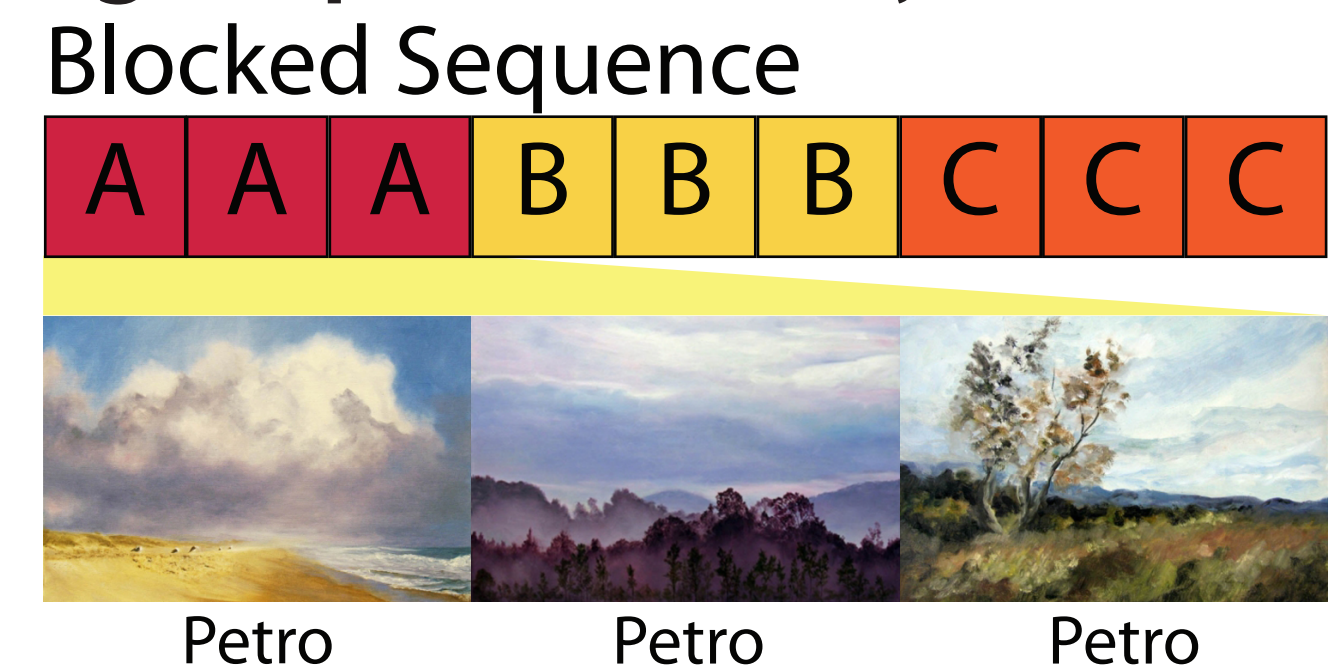
METHOD

Subjects: Recruited via Amazon Mechanical Turk (N=101) and UT Psych pool (N=246)

Stimuli: Landscape paintings from 6 artists (categories) × 12 unique paintings per artist

Design: Learning sequence (blocked vs. interleaved) manipulated between-subjects

Learning Sequences: study **blocked** by category, or **interleaved** across categories



PROCEDURE

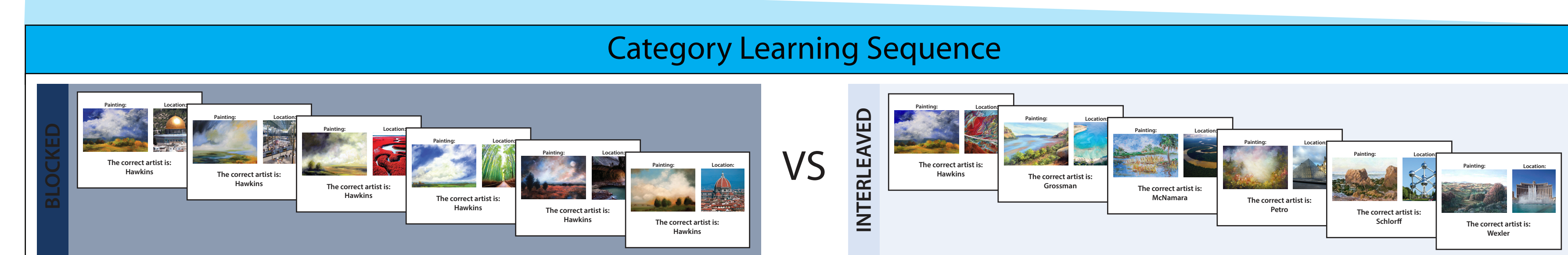
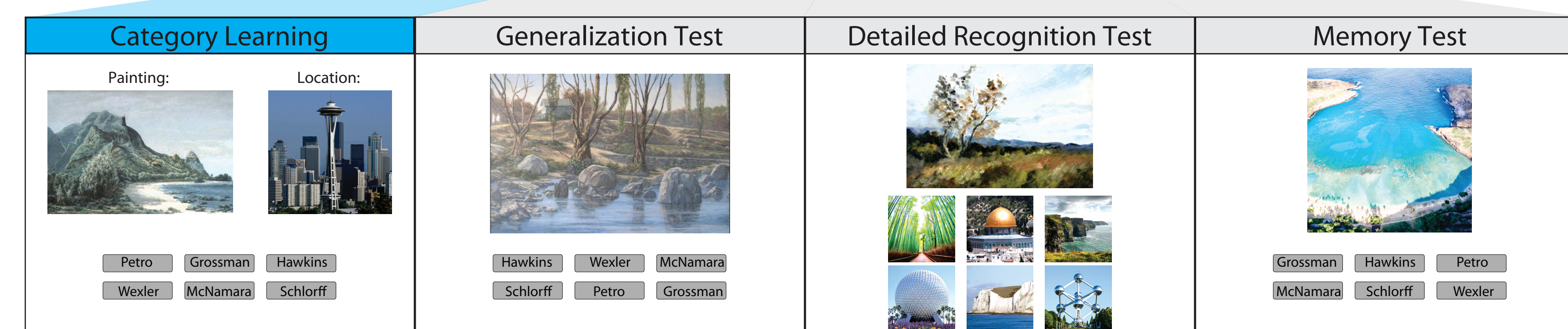
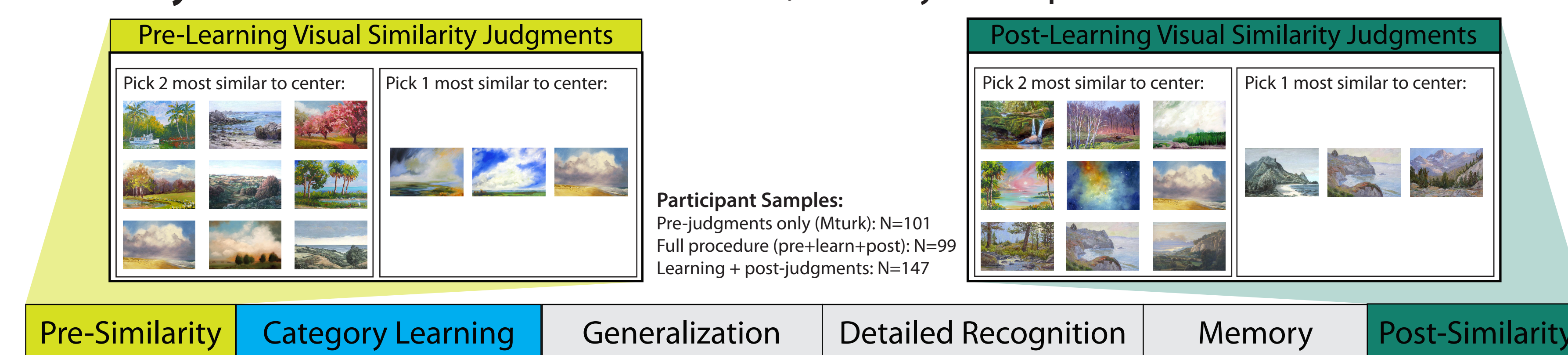
Similarity Judgments: Pick images most visually similar to center (query) image

Learning Phase: Study 36 painting+location pairs to learn artist styles

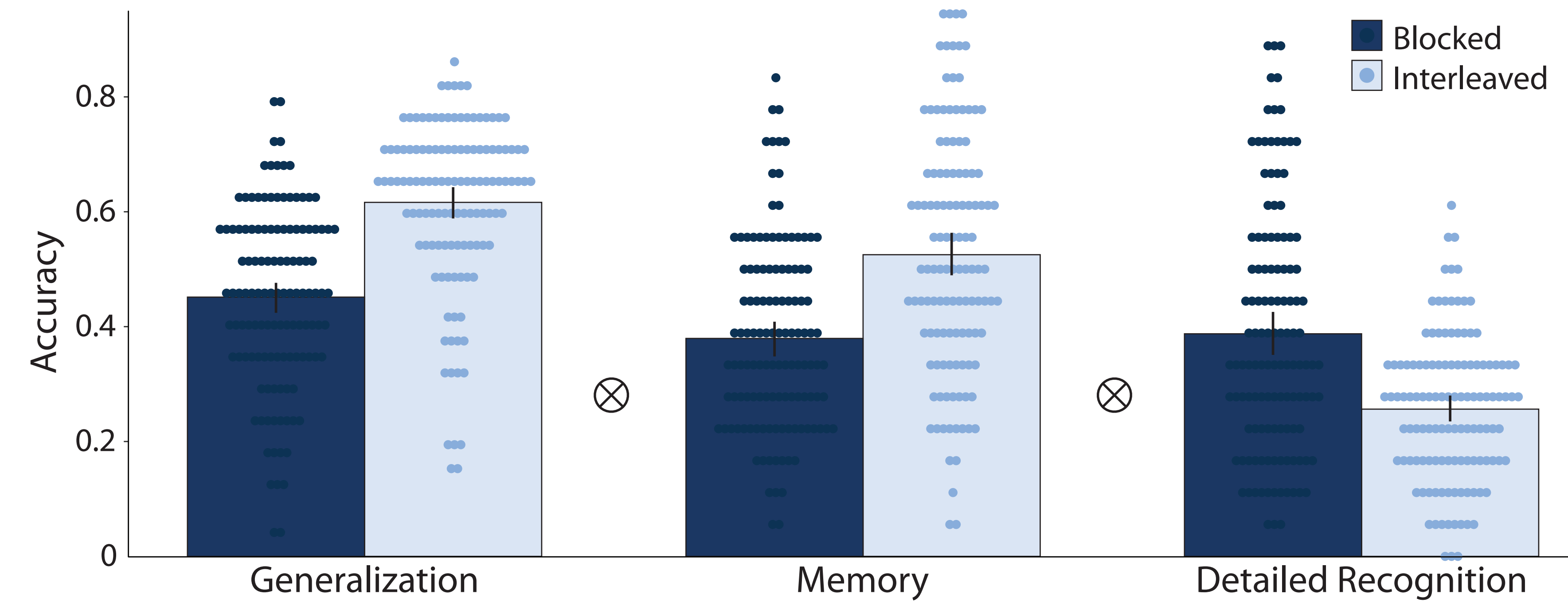
Generalization Test: Categorize 6 new paintings per artist (36 trials)

Detailed Recognition Test: For half of studied paintings, identify location

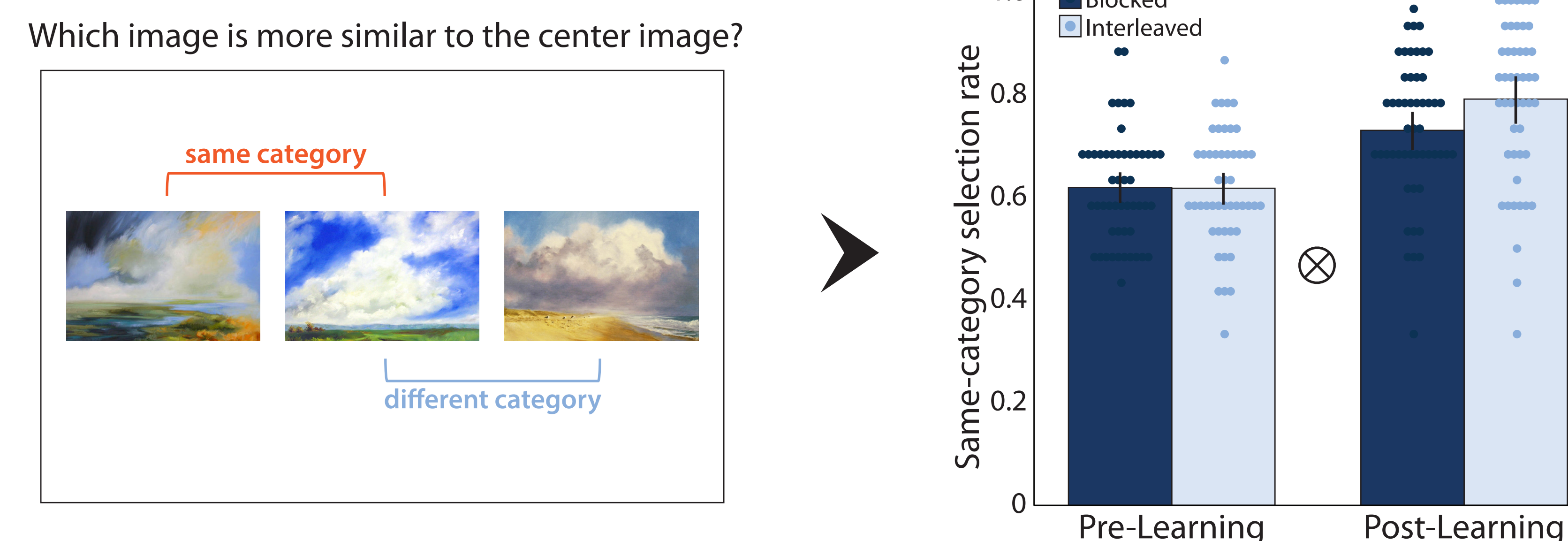
Memory Test: For half of studied locations, identify artist paired w/ that location



Interleaving benefits generalization and general recognition, blocking improves detailed recognition

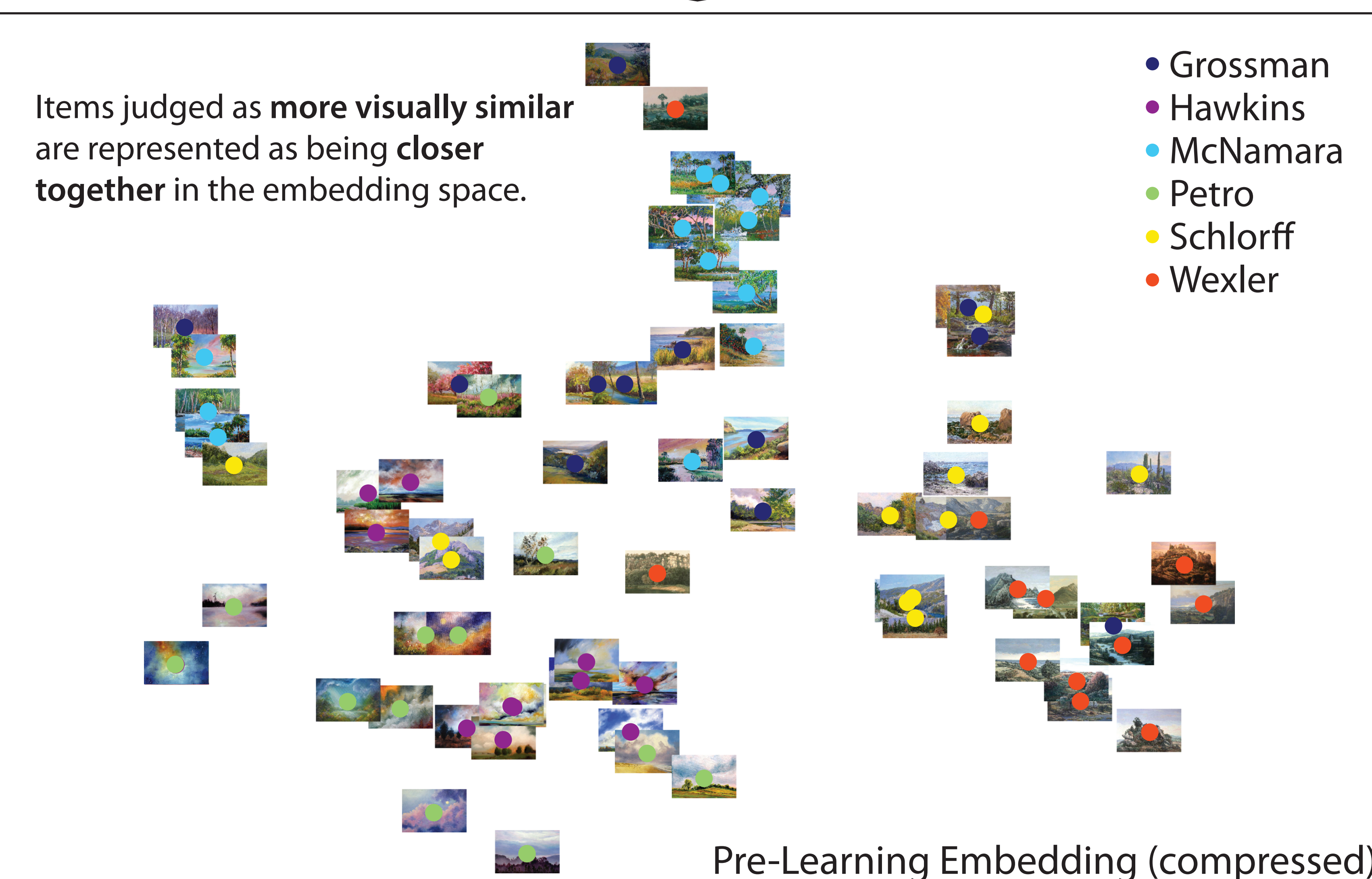


Participants judge exemplars from the same-category as being more visually similar after interleaved training

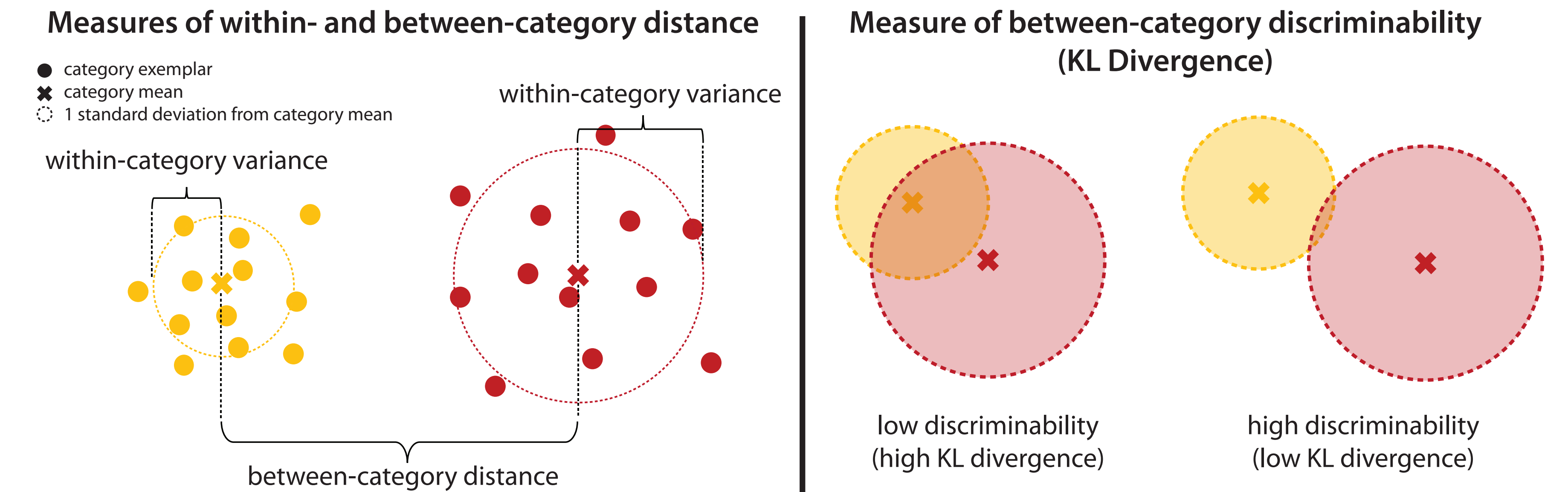


What drives the increase in perceived similarity for same-category exemplars?

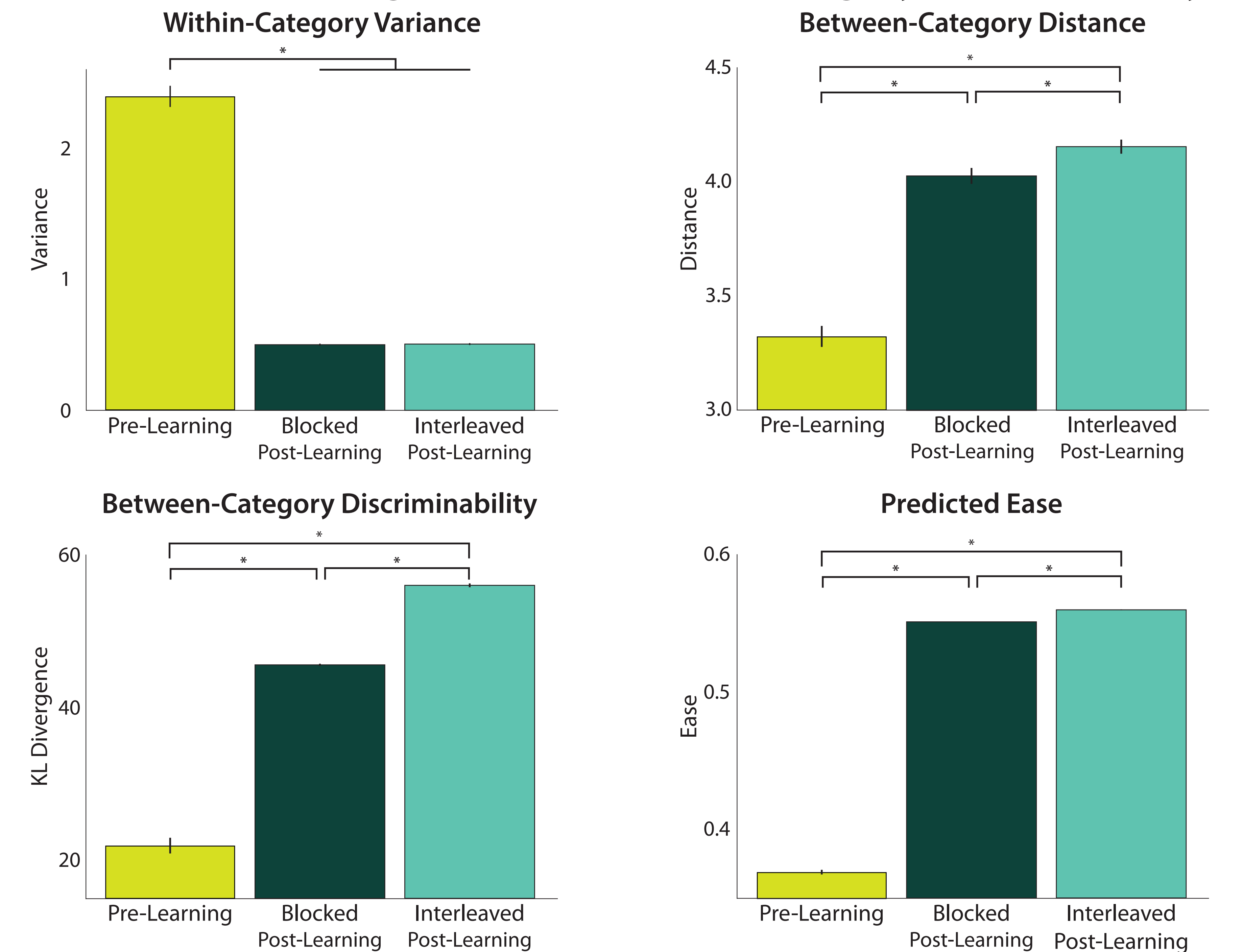
PSYCHOLOGICAL EMBEDDING



LEARNING-RELATED REPRESENTATION DIFFERENCES



Interleaved training increases between-category discriminability



- Interleaving is beneficial for improving general knowledge, whereas blocking is better for improving specificity and learning of details.
- Category learning can **change perception** such that same-category exemplars **appear more visually similar**.
- Psychological embeddings reveal that the interleaving benefit is driven by **increasing between-category distance and discriminability**.

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