Hold that thought! When mental contexts survive interruptions to bind memories

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Introduction

Changes in category and task create separation in memory. (e.g., DuBrow & Davachi, 2013; Polyn et al, 2009).

However, lingering representations can persist across changes to contextualize memories (Chan et al, 2017).

Thus, tracking context persistence may help us understand when memories become segmented.

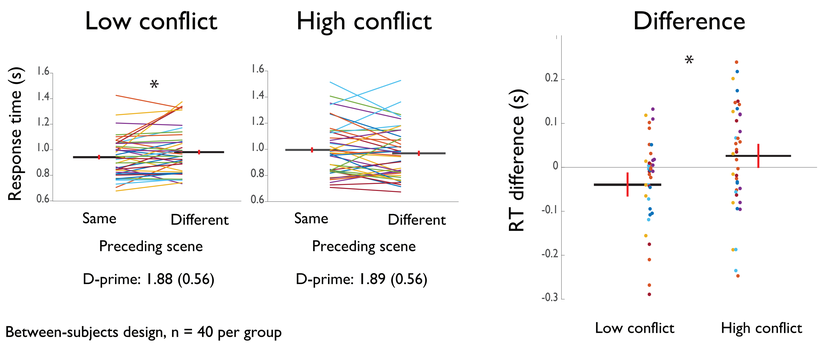
Questions:

Can task contexts persist across short interruptions?

Does conflict modulate persistence and segmentation?

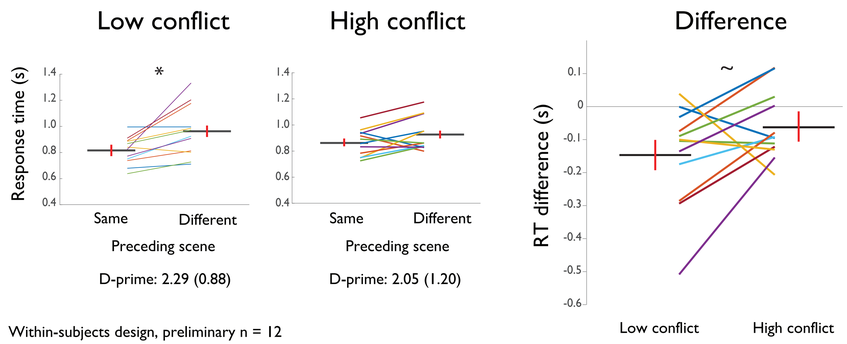
How can we use neural decoding to track multiple contexts simultaneously and independently?

Pilot study behavior



Between-subjects design, n = 40 per group

fMRI study behavior



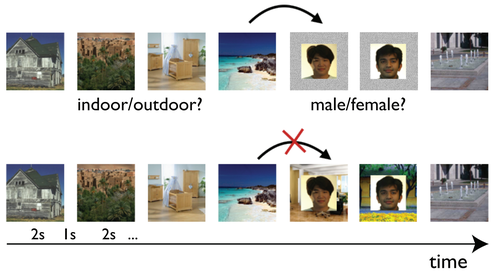
Within-subjects design, preliminary n = 12

Priming effects indicate binding can occur across switches when conflict is low but not high.

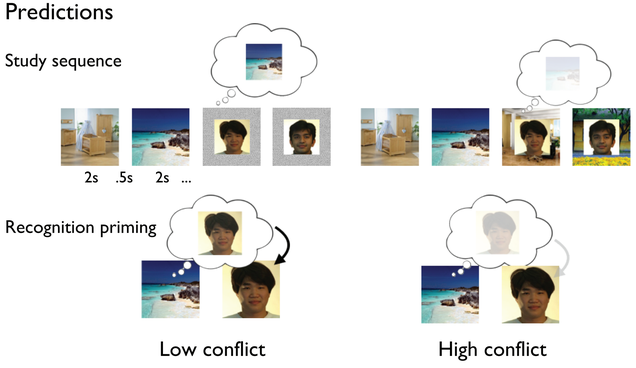
* p < .05
~ p < .10

Experimental logic and design

Conditions



Predictions

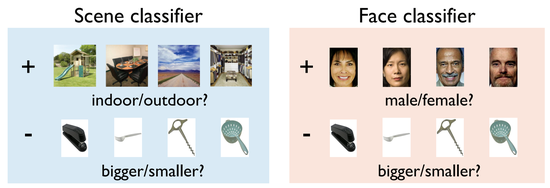


Behavioral experiment run on Mechanical Turk in a between-subjects design with 6 study-test rounds.

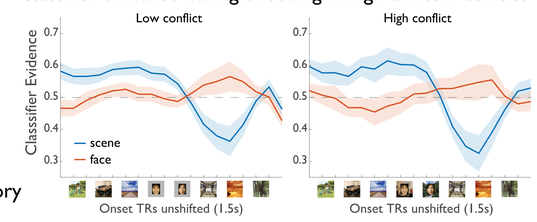
fMRI study is within-subjects design with blocked study-test rounds: 4 per condition, counterbalanced start.

fMRI approach to track contexts independently

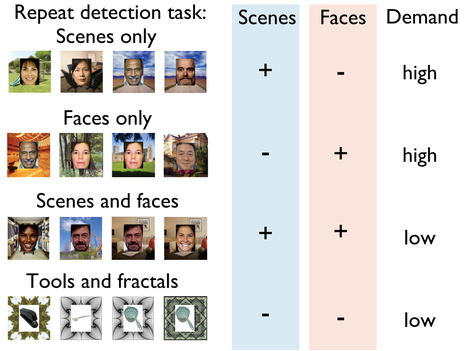
Third category classifier

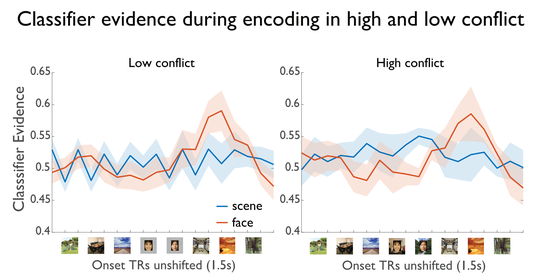


Approach 1: train each category of interest against third category



Orthogonalizing scene and face attention





Approach 2: train classifier to ignore presence of second category

fMRI Predictions

1. The dominant task context will persist across brief interruptions to bind memories:

Scene evidence during face interruption will correlate with subsequent recognition priming.

Hippocampal and prefrontal regions may mediate binding across interruptions (e.g., DuBrow & Davachi, 2015)

2. High conflict interruptions will induce competition between contexts:

Scene evidence will be suppressed for high-conflict versus low-conflict face trials despite more perceptual scene information.

High-conflict blocks may show greater anti-correlation between independent face and scene classifiers that may be mediated by interactions between the ACC and category-selective regions.

This approach may help address how we can track multiple concurrent trains of thought in multitasking environments.

References

Chan, Applegate, Morton, Polyn & Norman (2017). Lingering representations of stimuli influence recall organization. Neuropsychologia.

DuBrow & Davachi (2013). The influence of context boundaries on memory for the sequential order of events. JEP General.

DuBrow & Davachi (2016). Temporal binding within and across events. NBL&M.

Polyn, Norman & Kahana (2009). Task Context and Organization in free recall. Neuropsychologia.

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