The role of neural reinstatement in memory decision-making & evaluation

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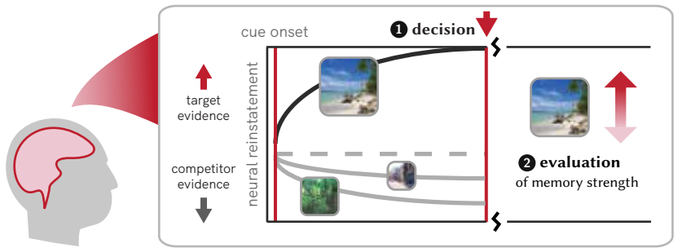
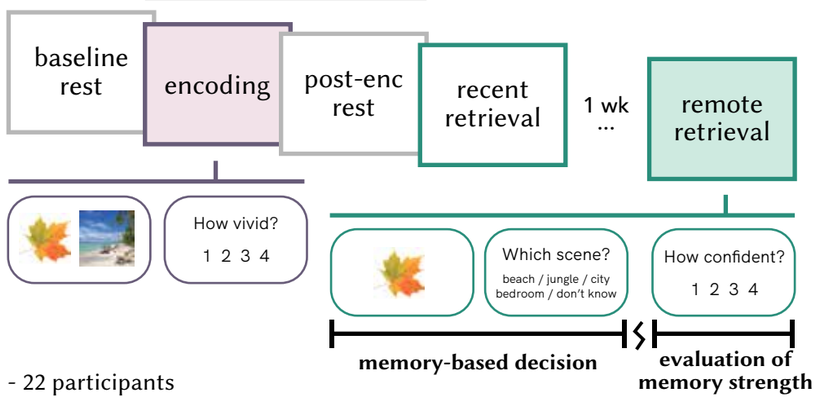
introduction

- We must often make decisions about what we remember, e.g., which events we've experienced, or how confident we are in their accuracy
- In the domain of perceptual decision-making, past research has characterized the decision process as one of evidence accumulation.[1,2]
- Here we test the notion that neural reinstatement — a well-established marker of memory success[3-5] — may serve as evidence for targeted memory representations, which are then used to make memory-based decisions.[6]

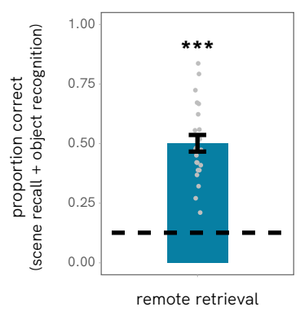


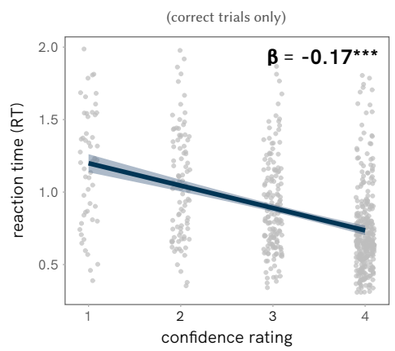
task design & behavior

[paradigm previously published in Tompary & Davachi (2017)[7], *Neuron*]

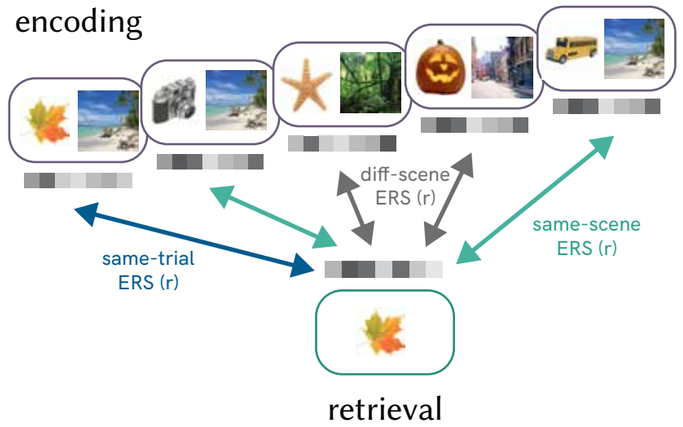


- 22 participants
- 64 object-scene pairs (per retrieval timepoint)
- objects paired with 1 of 4 scenes: *beach*, *city*, *jungle*, or *bedroom*



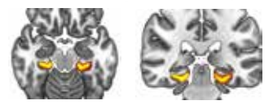


encoding-retrieval similarity (ERS)



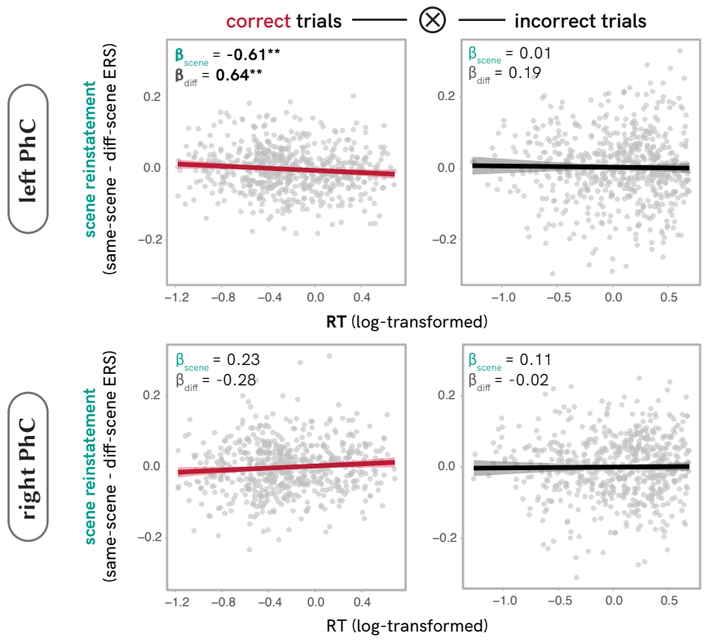
scene reinstatement:
(same-scene ERS) - (diff-scene ERS)

parahippocampal cortex (PhC)[9]



reinstatement & decision speed

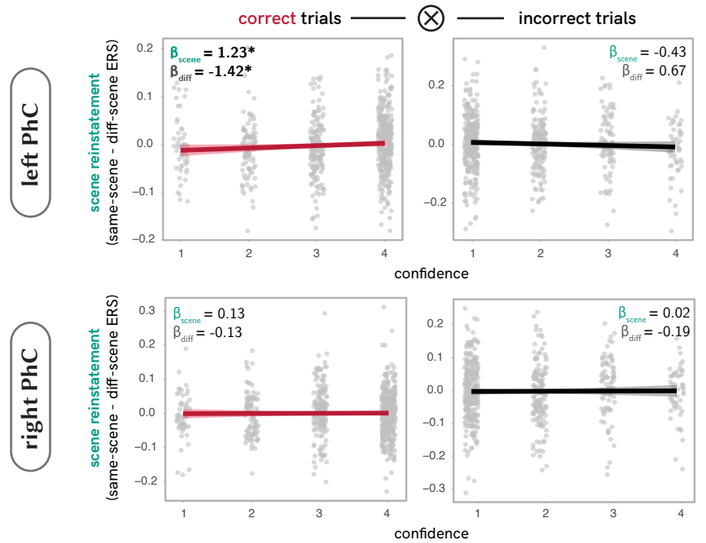
Faster recall decisions are associated with **greater same-scene ERS** and **reduced diff-scene ERS** in **left PhC.**†



† β-values from linear mixed-effects models with same-trial, same-scene, & diff-scene ERS predicting behavior, w/a random intercept for each subject; significance assessed using model comparisons

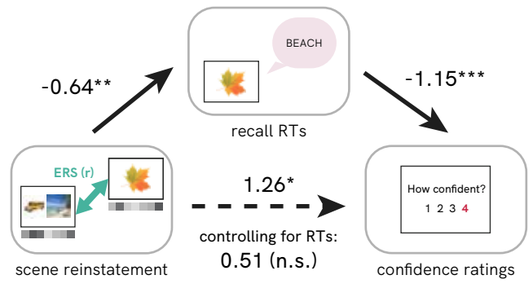
reinstatement & decision confidence

Greater confidence in recall decisions is also associated with **greater same-scene ERS** and **reduced diff-scene ERS** in **left PhC.**†



mediation analysis

Reaction time mediates the relationship between scene reinstatement in left PhC and memory confidence (ACME = 0.74, p = 0.005).‡



‡ mediation tested via bootstrapping w/10,000 iterations; values represent unstandardized β-coefficients

conclusions

- Stronger reinstatement of targeted scene representations (relative to competing, incorrect scenes) is linked to both the speed of recall decisions and the subjective strength of those retrieved memories.
- Reinstatement may exert its influence on confidence via facilitation of faster memory decisions, consistent with the idea that people use the ease/fluency of retrieval as a source of internal feedback about the strength of their memories.

REFERENCES: (1) Smith & Ratcliff (2004), Trends in Neurosciences. (2) Gold & Shadlen (2007), Annual Review of Neuroscience. (3) Staresina et al. (2012), J Neuro. (4) Wing et al. (2015), JOCN. (5) Kuhl & Chun (2014), J Neuro. (6) Ratcliff (1978), Psychological Review. (7) Tompary & Davachi (2017), Neuron. (8) Kriegeskorte et al. (2008) Frontiers in Systems Neuroscience. (9) Ritchey et al. (2015), eLife

***p < 0.001; **p < 0.01; *p < 0.05