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Introduction

➢ Previous fMRI studies of episodic retrieval have consistently revealed memory-related 'activation' in the posterior parietal cortex[1,2] (PPC).

➢ The PPC has a central role in the construction and application of situational models[3] (i.e., spatial context, temporal context).
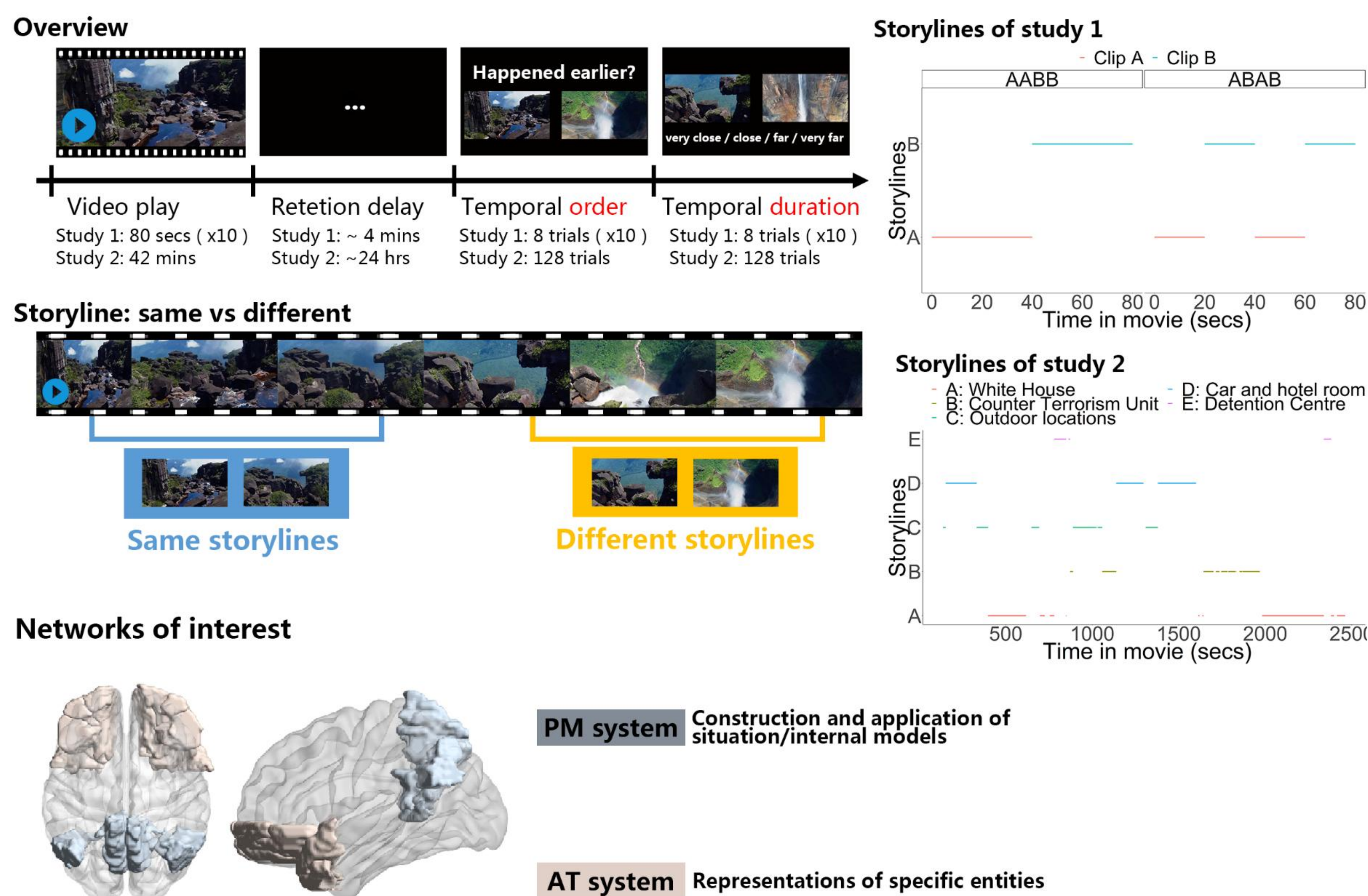
Goals

➢ Use "**across-tasks**" decoding[4] to identify neural correlates underlying episodic context memory.

➢ Test whether such contextual representation holds across retention period, material and load with 2 studies.
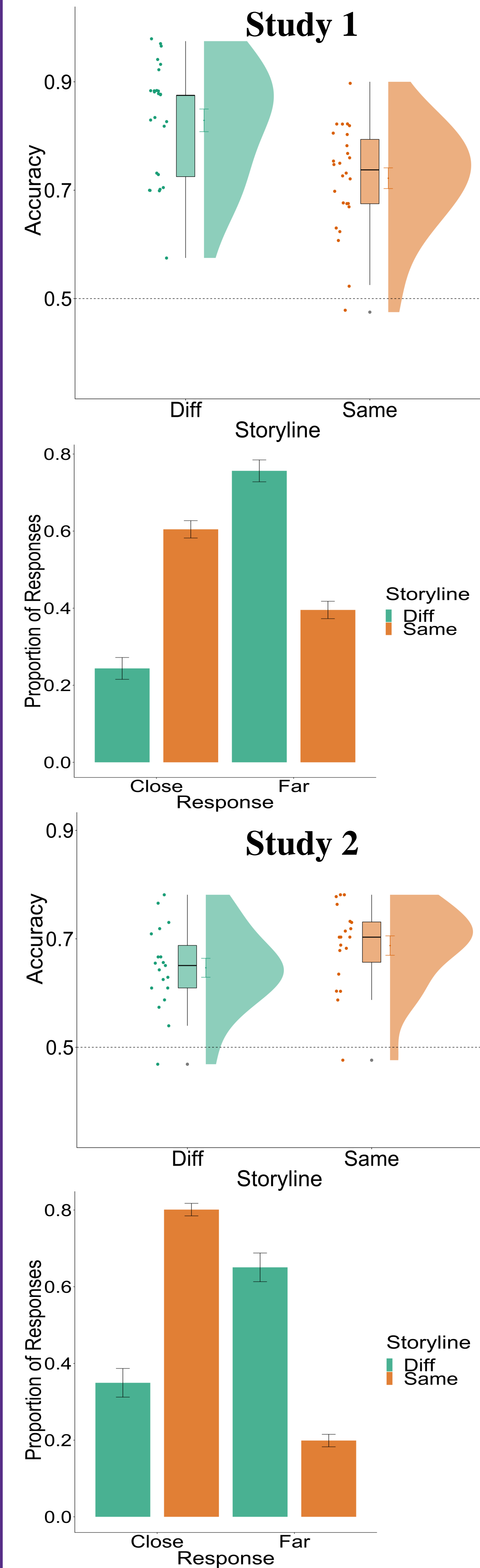
Materials & Methods

● Subjects watched TV-episode first, and after a break (Study 1: 4-minute short-retention delay, n = 26; Study 2: 24-hour long-retention delay, n = 19), completed the two tasks during fMRI.

- **Temporal order judgment**: subjects were presented with two frames of either same- or different-storylines from the episode, and required to choose the frame that happened earlier.
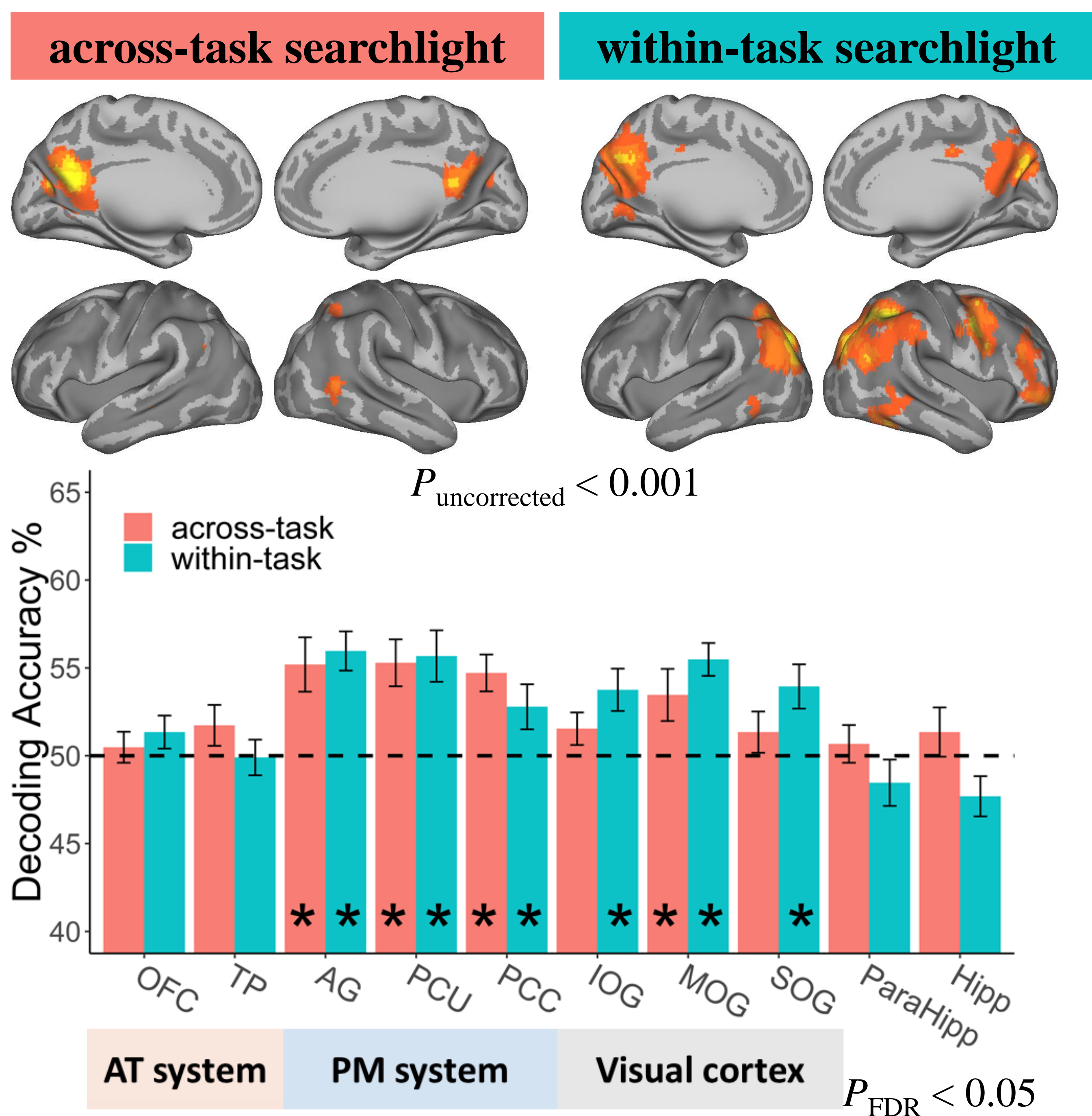
- **Temporal duration estimation**: subjects were required to indicate how far apart in time the two frames were: "very near", "near", "far", "very far".
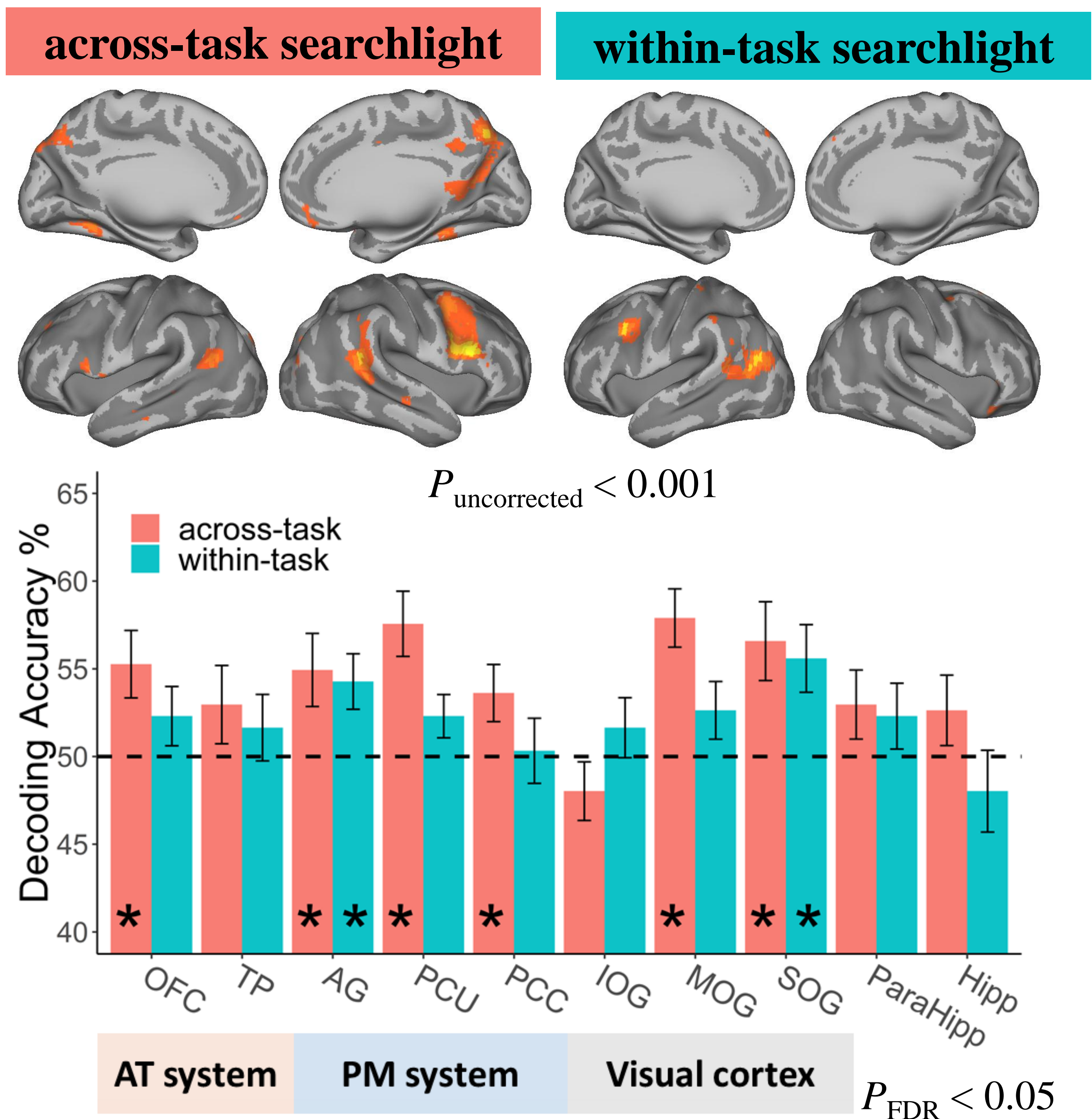

Overview

Video play — Study 1: 80 secs (x10) — Study 2: 42 mins
Retention delay — Study 1: ~ 4 mins — Study 2: ~24 hrs
Temporal order — Study 1: 8 trials (x10) — Study 2: 128 trials
Temporal duration — Study 1: 8 trials (x10) — Study 2: 128 trials

Storyline: same vs different

Same storylines / Different storylines

Networks of interest

PM system — Construction and application of situation/internal models

AT system — Representations of specific entities

Storylines of study 1 — Clip A · Clip B — AABB — ABAB

Storylines of study 2 — A: White House B: Counter Terrorism Unit C: Outdoor locations D: Car and hotel room E: Detention Centre

Behavior

Study 1

Study 2

Study 1: Parietal cortices in PM system (but less AT system) supports episodic context memory

across-task searchlight — **within-task searchlight**

$P_{uncorrected} < 0.001$

Decoding Accuracy % — across-task / within-task

OFC, TP, AG, PCU, PCC, IOG, MOG, SOG, ParaHipp, Hipp

AT system | PM system | Visual cortex

$P_{FDR} < 0.05$

Study 2: Some of these cortices are similarly coding for episodic context memory after longer retention period

across-task searchlight — **within-task searchlight**

$P_{uncorrected} < 0.001$

Decoding Accuracy % — across-task / within-task

OFC, TP, AG, PCU, PCC, IOG, MOG, SOG, ParaHipp, Hipp

AT system | PM system | Visual cortex

$P_{FDR} < 0.05$

Overlap between two studies (across-tasks decoding)

L PCU, L PCC, R PCU, R PCC, AG, R IFG, R STG

$P_{uncorrected} < 0.005$, Cluster size >= 20

Discussion & Conclusion

➢ Involvements of PM and AT in context abstraction are dissociable.

➢ Revealed a distributed context-based neural pattern in PM.

➢ PM representation is time-independent.

References

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3. Ranganath, C., & Ritchey, M. (2012). Two cortical systems for memory-guided behaviour.

4. Hebart, M. N., Görgen, K., & Haynes, J. D. (2015). The Decoding Toolbox (TDT): a versatile software package for multivariate analyses of functional imaging data.