

Reinstated episodic context guides visual exploration during scene recognition

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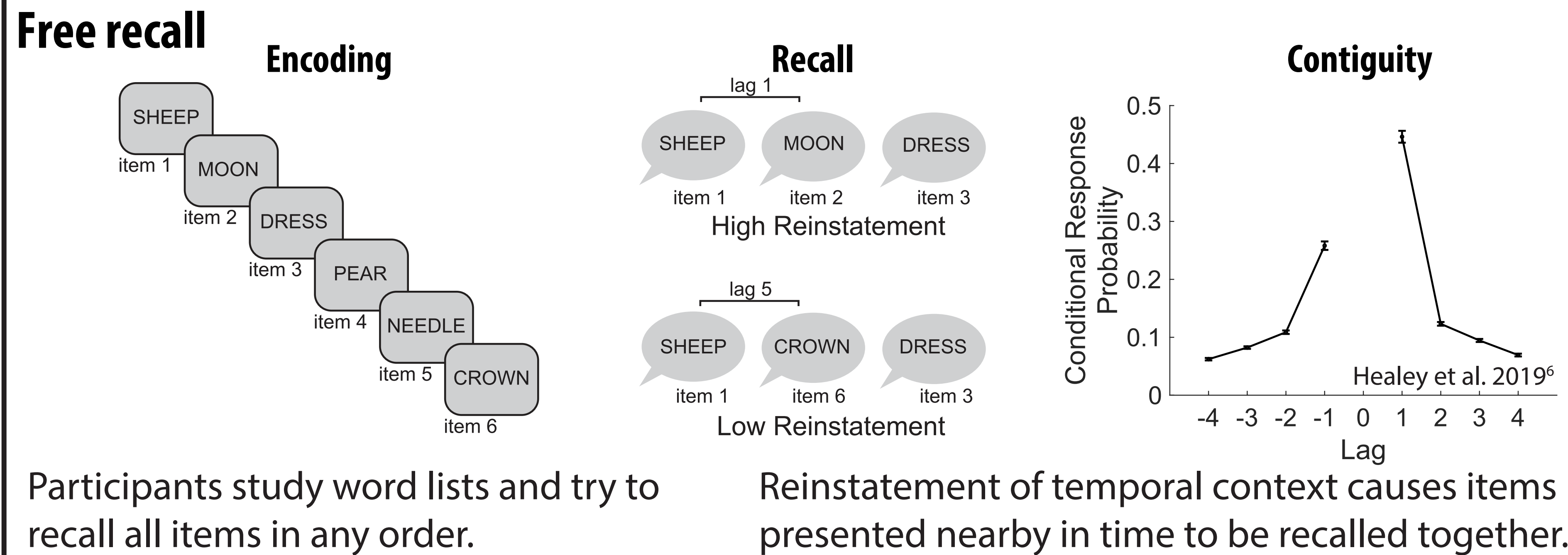


Introduction

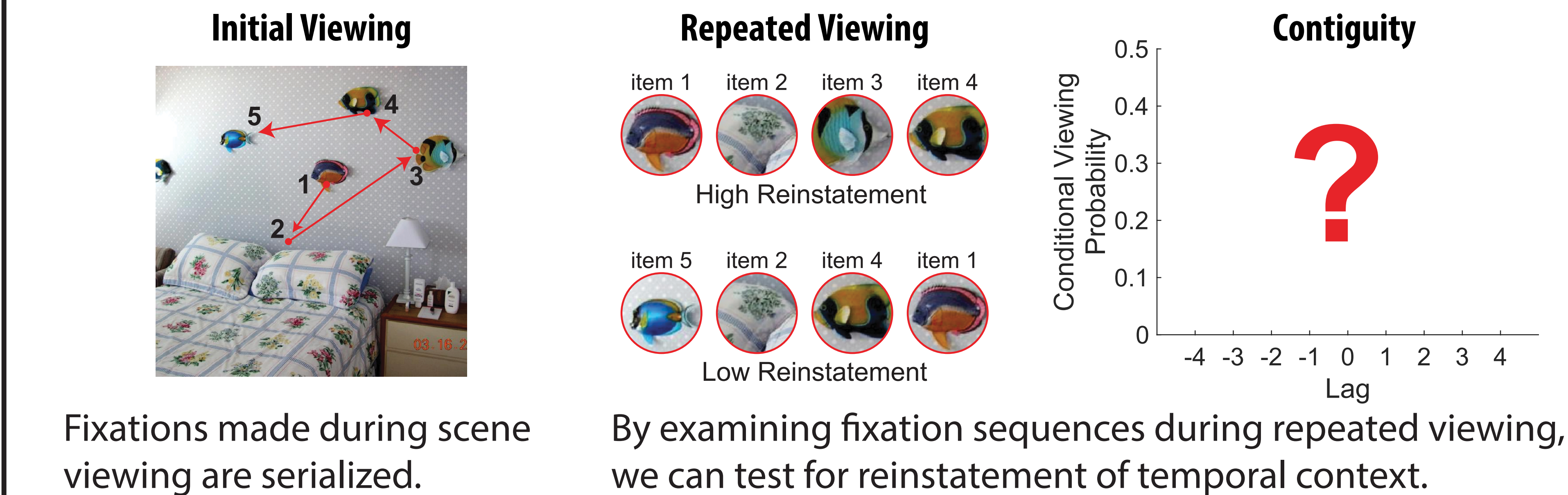
Cognitive models of episodic memory posit that reinstatement of temporal context organizes our memories in time¹⁻². However, it is unclear if these models can explain ecological memory behaviors, such as eye movements made during scene encoding and retrieval. In three datasets involving recognition and free viewing of scenes³⁻⁵, we tested whether sequences of eye movements followed the predictions of retrieved-context models of episodic memory.

Does retrieved temporal context guide eye movements during scene recognition?

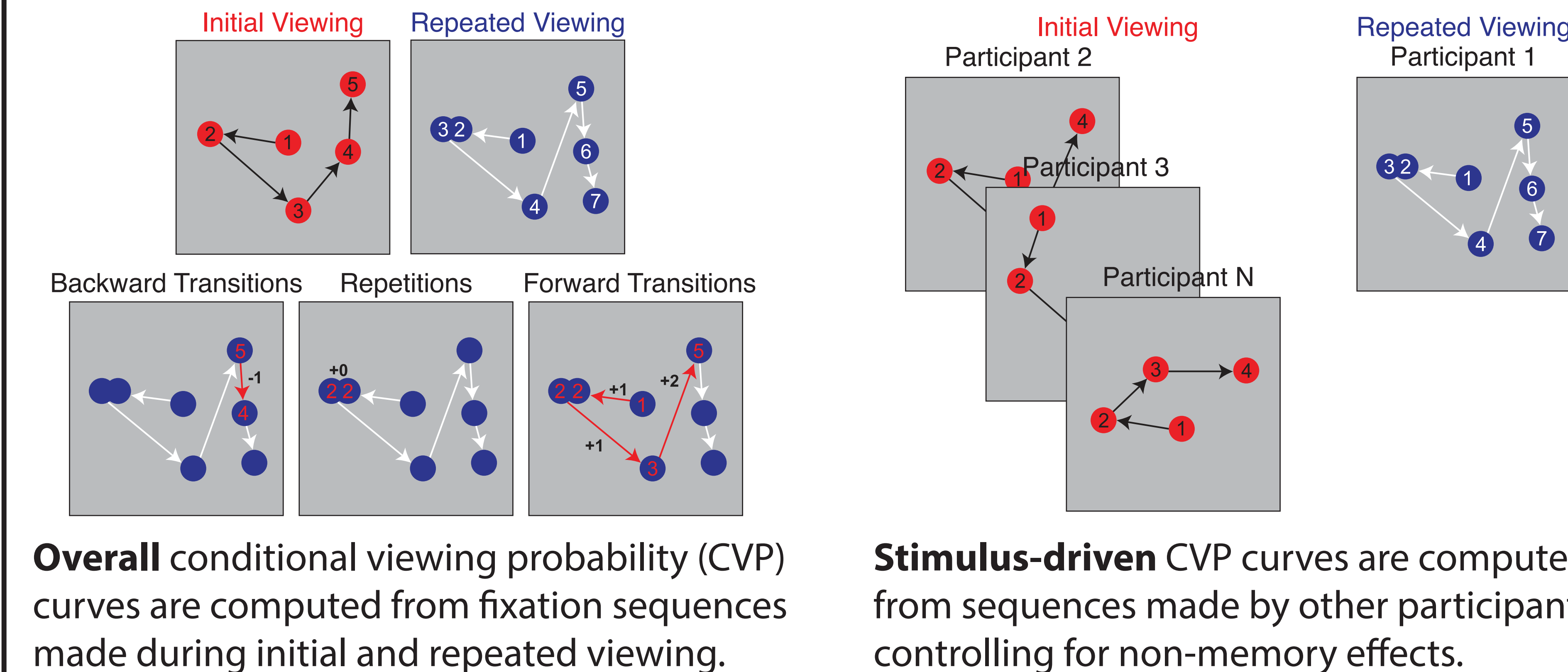
Temporal contiguity in episodic recall and free viewing



Free viewing of repeated scenes

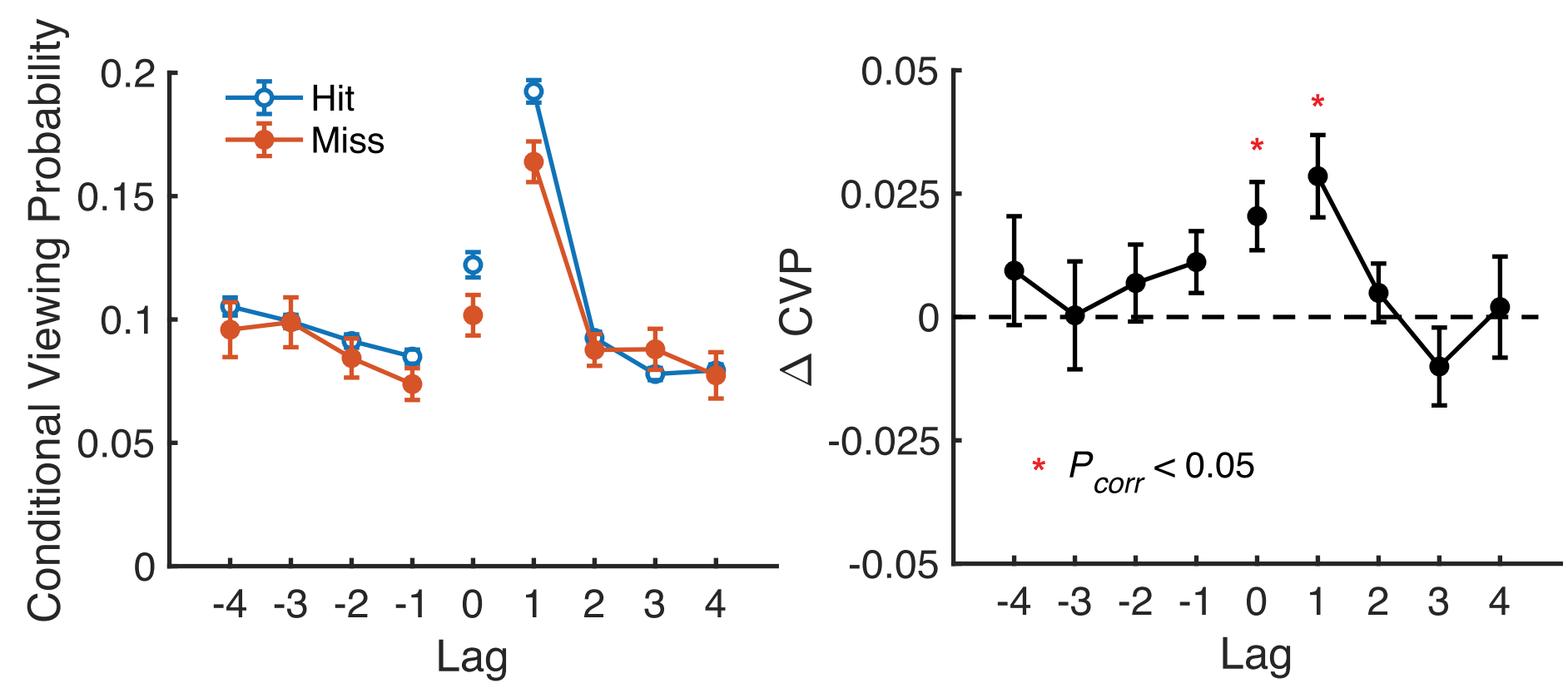
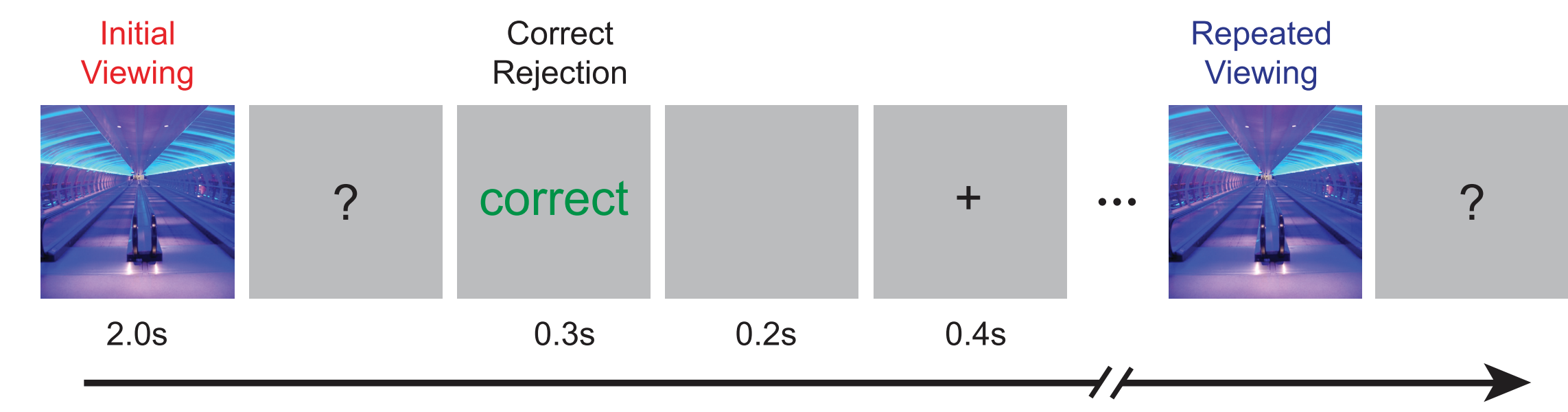


Controlling for stimulus-driven viewing effects

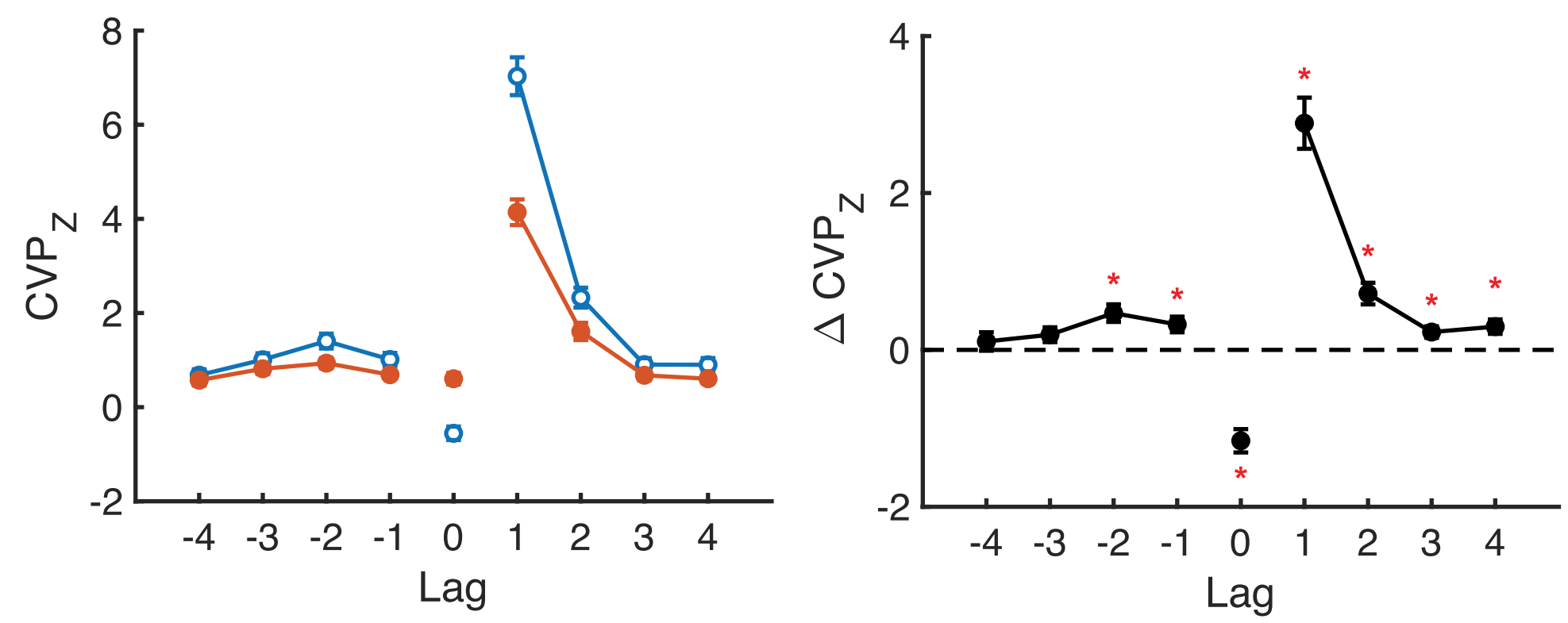


Scanpath reinstatement supports scene recognition

Study 1: Bylinskii et al. 2015³



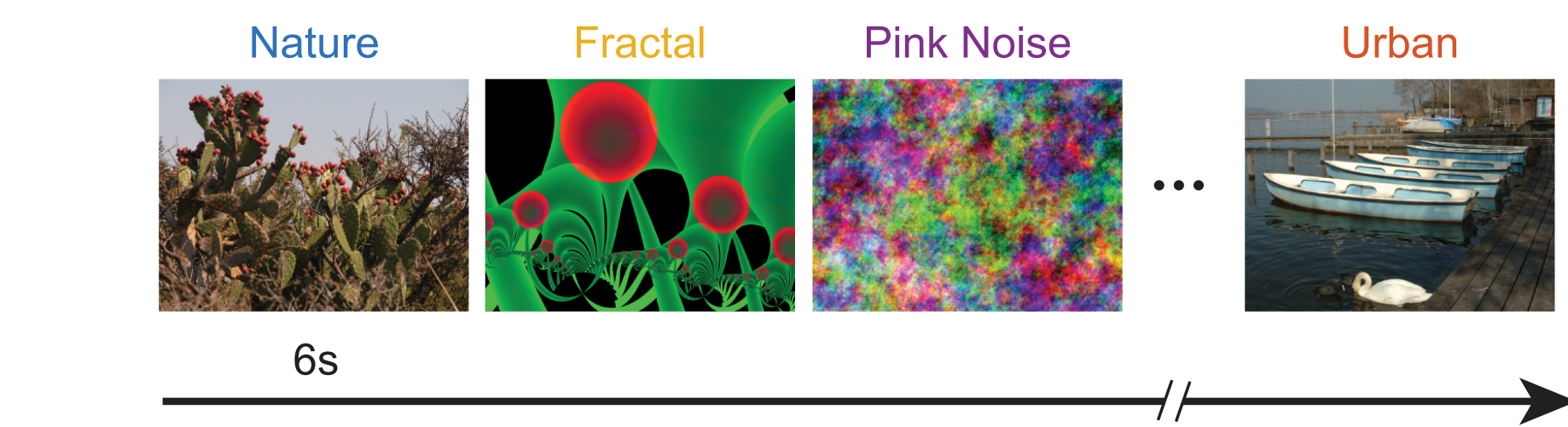
Overall conditional viewing probability (CVP) curves reveal a contiguity effect with forward asymmetry. Repetitions (lag 0) and scanpath reinstatement (lag +1) were more frequent during successful recognition.



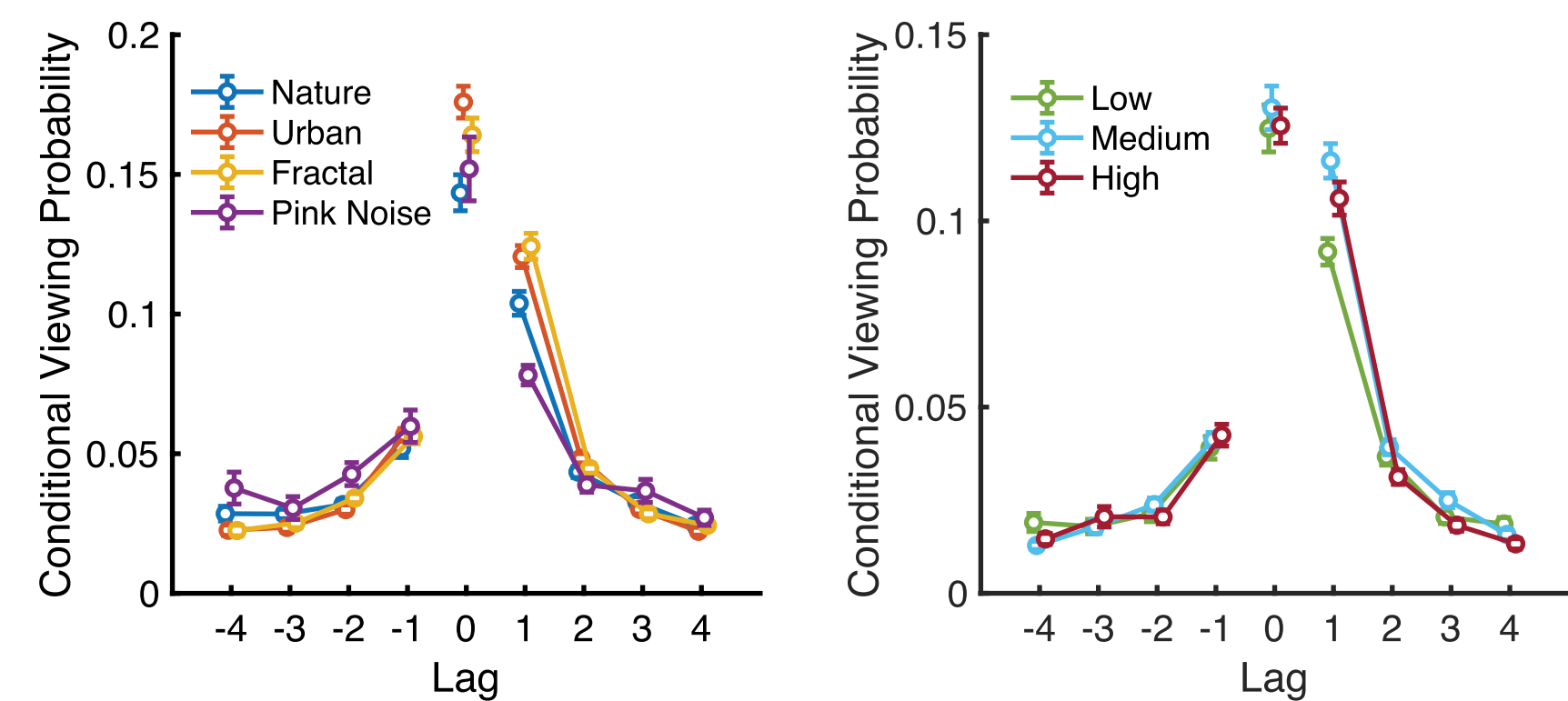
These effects persist after controlling for stimulus-driven viewing. Repetitions were more likely when viewing a novel location, producing a negative memory effect.

Scanpath reinstatement is content invariant

Study 2: Kaspar and König 2011⁴



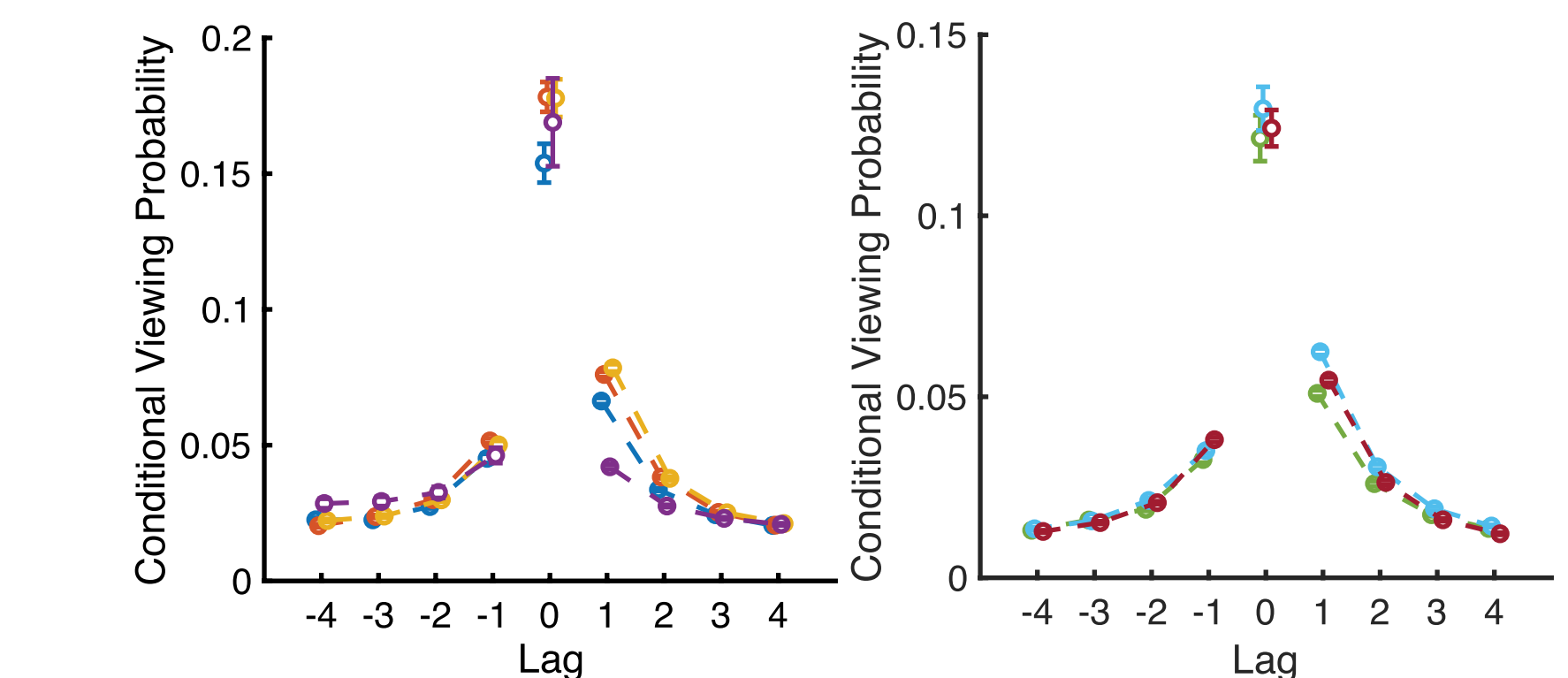
• According to retrieved-context theory, pre-experimental knowledge of stimuli produces the forward asymmetry.



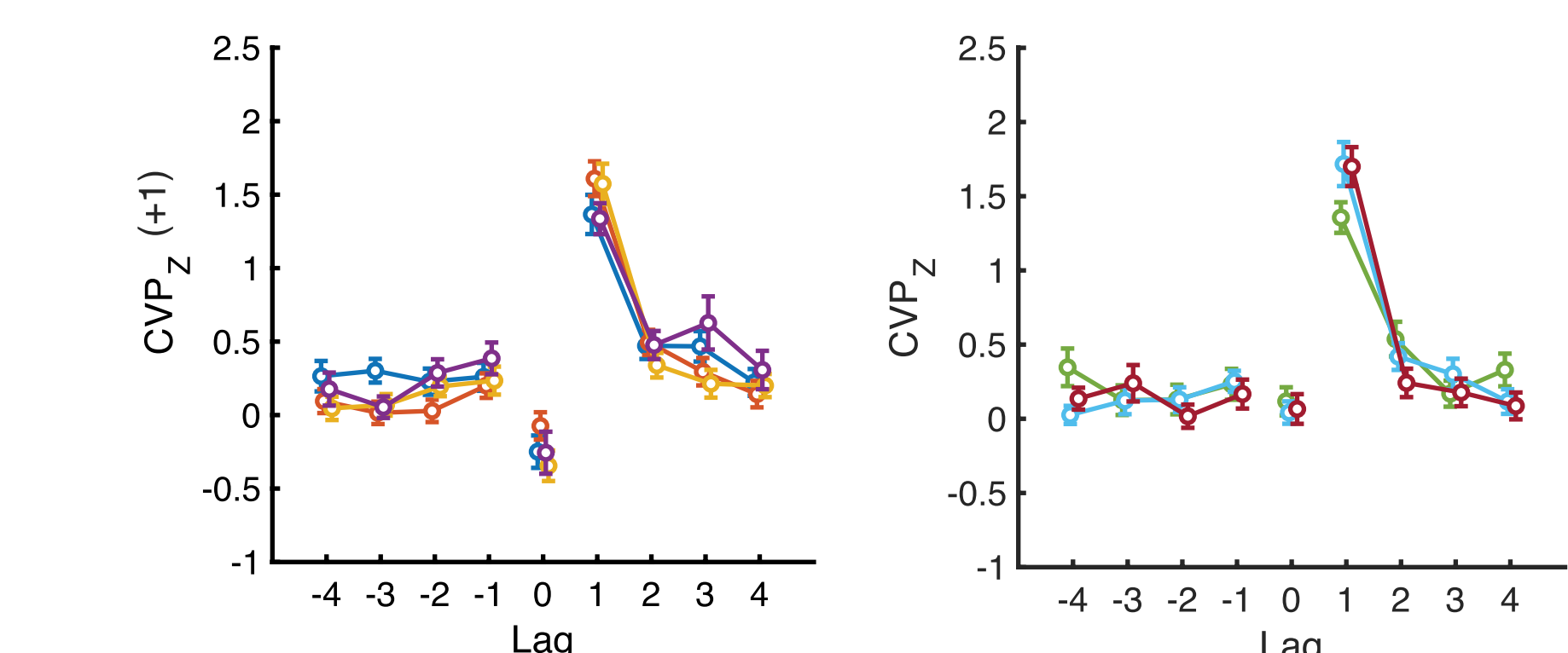
• Does scanpath reinstatement differ based on scene content?

Across both studies, **overall** CVP curves reveal robust contiguity effects, with forward asymmetry.

Study 3: Kaspar and König 2011⁵



Stimulus-driven CVP curves show category differences in contiguity and forward asymmetry can explain without memory.

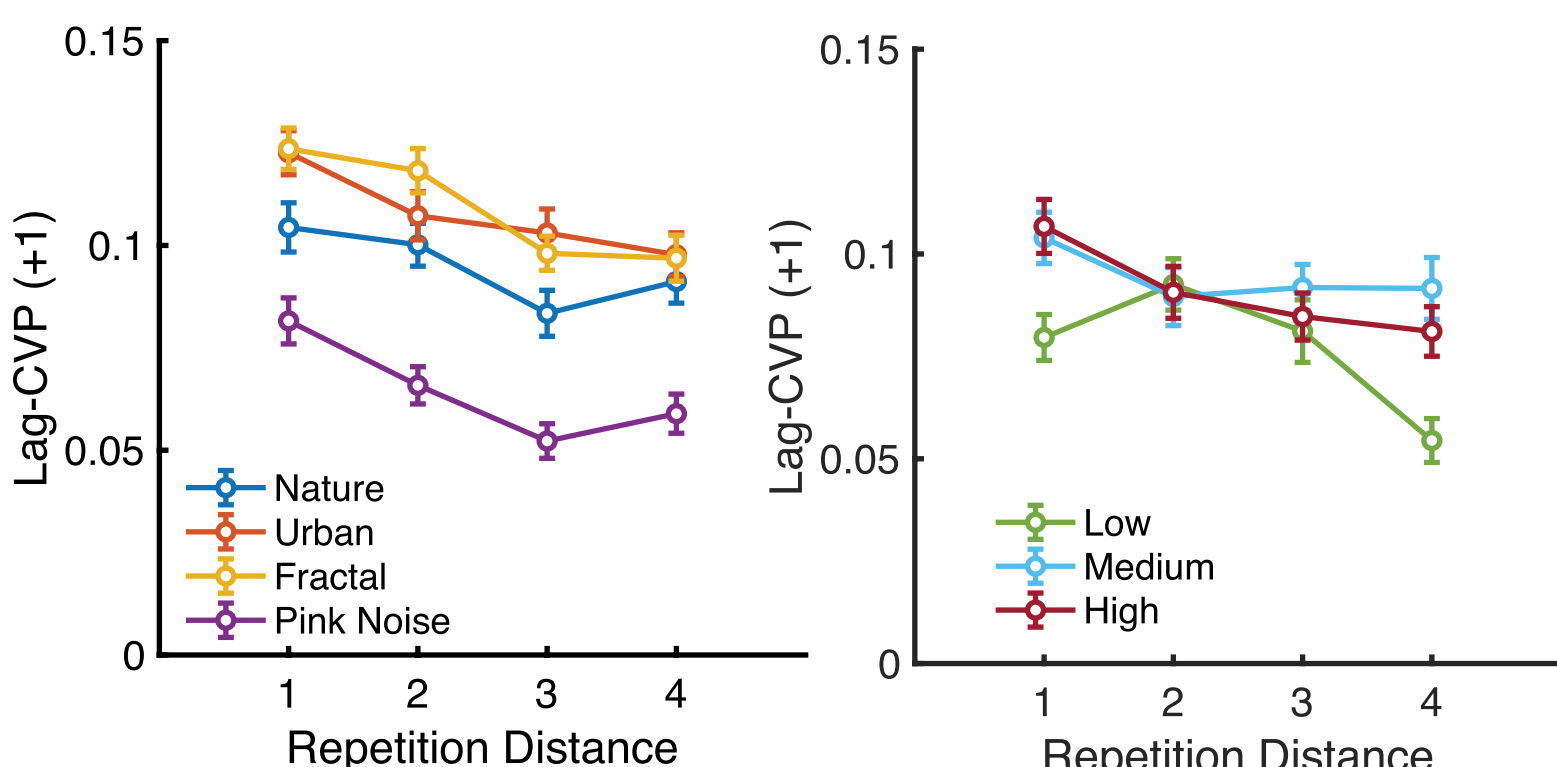
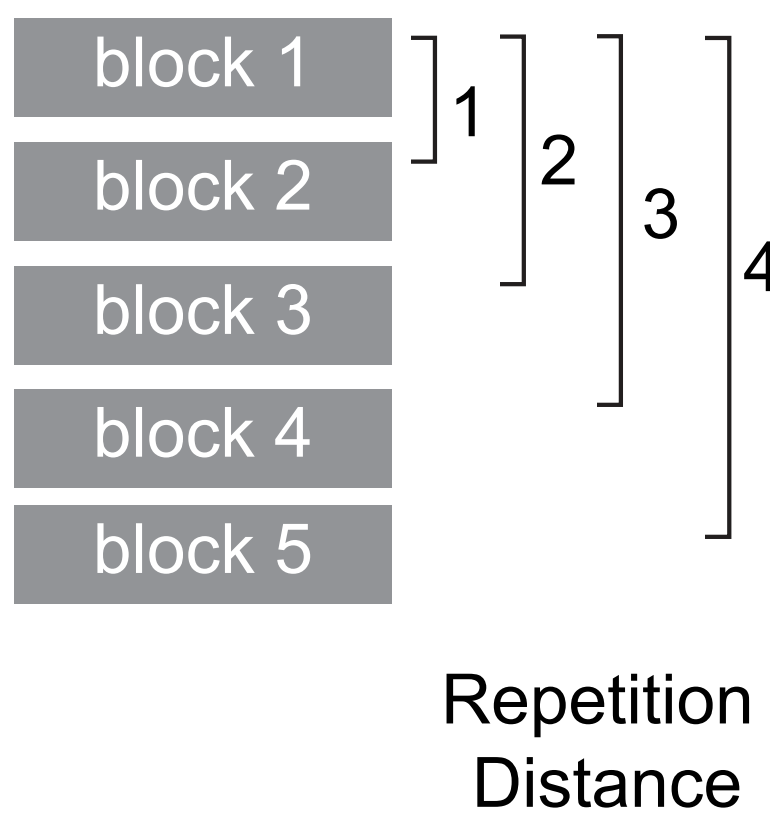


Robust scanpath reinstatement (+1 lags) remains after accounting for stimulus-driven effects, with no observable category differences.

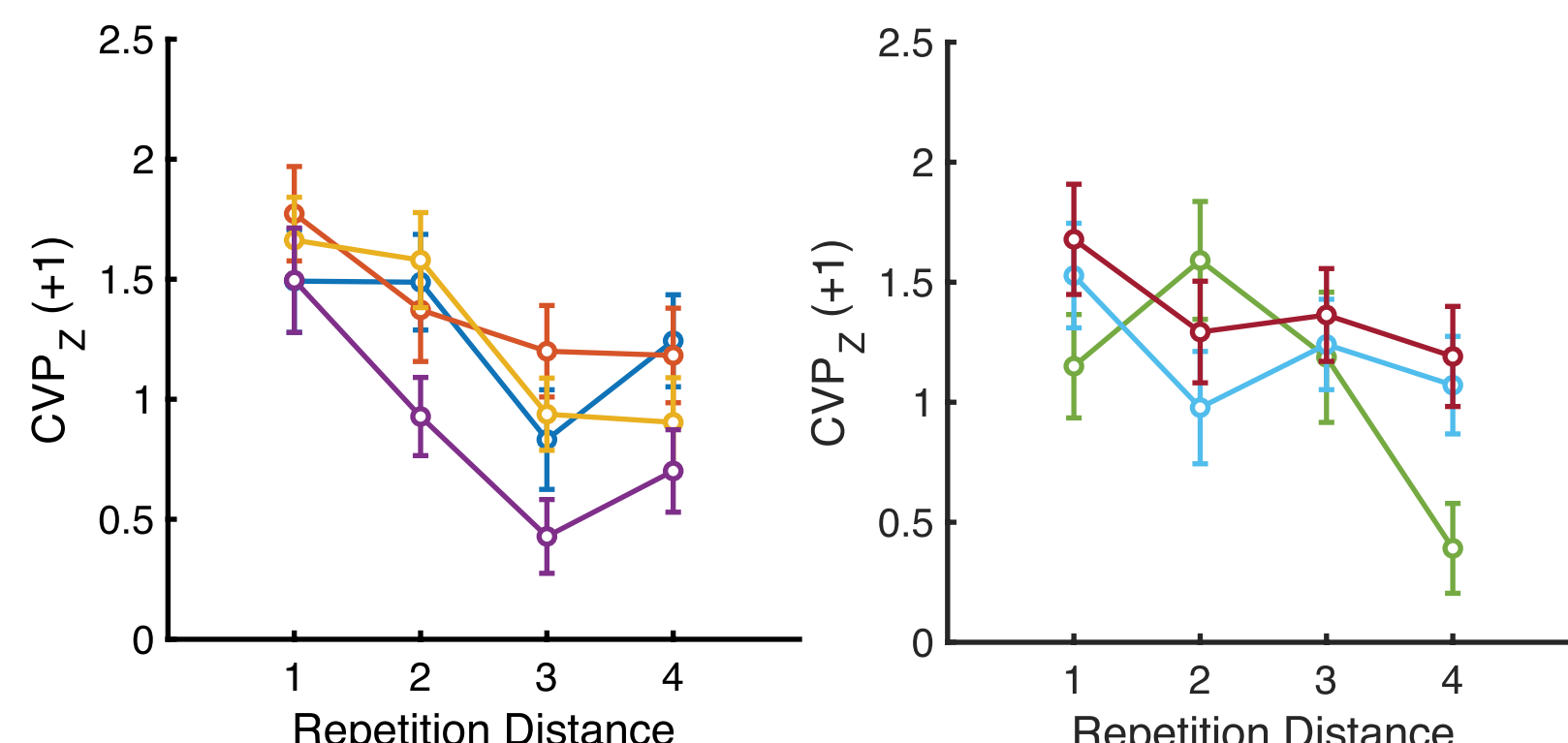
Scanpath reinstatement exhibits long-term recency

• Retrieved-context theory predicts scanpaths from recent episodes should be reinstated more frequently.

• Are scanpaths from recent blocks more often reinstated?



Delay between episodes decreases **overall** scanpath reinstatement.



This effect persists after accounting for stimulus-driven viewing effects.

Conclusions

- Temporal context may support scene recognition by guiding the gaze along encoded scanpaths
- Scanpath reinstatement shares many features with episodic recall, suggesting a common neural and cognitive basis
- Tracking eye movements allows us to observe contiguity effects at rapid timescales during ecologically valid, exploratory behaviors

References

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