

# Preparation for upcoming attentional states in the hippocampus and medial prefrontal cortex



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## Introduction

### Explicitly Instructed



"Look for a person."

### Memory-guided



"Uhm... Just don't die!"

Hippocampal (HPC) activity levels are higher *prior* to attentional guidance for memory-guided vs. explicitly instructed attention (Stokes et al., 2012).

HPC activity patterns represent *current* attentional states (Aly & Turk-Browne, 2016a,b).

HPC and medial prefrontal cortex (mPFC) interact for memory-guided behaviors (Shapiro et al., 2014).

**Hypothesis: HPC and mPFC use memory to prepare for upcoming attentional states.**

## Procedure

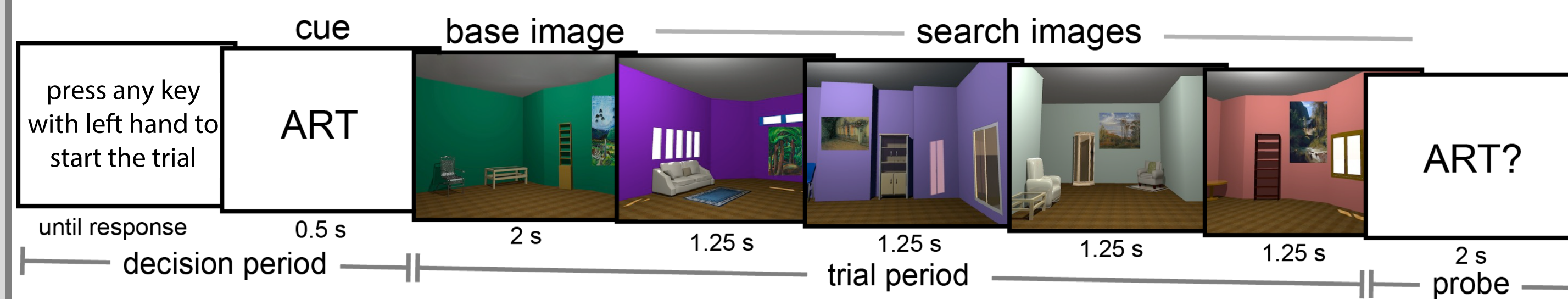
### Phase 1: Learn stay/switch cues



### Phase 2: Attention task

#### Explicitly Instructed Attention

Attentional state is randomly assigned on each trial



#### Memory-Guided Attention

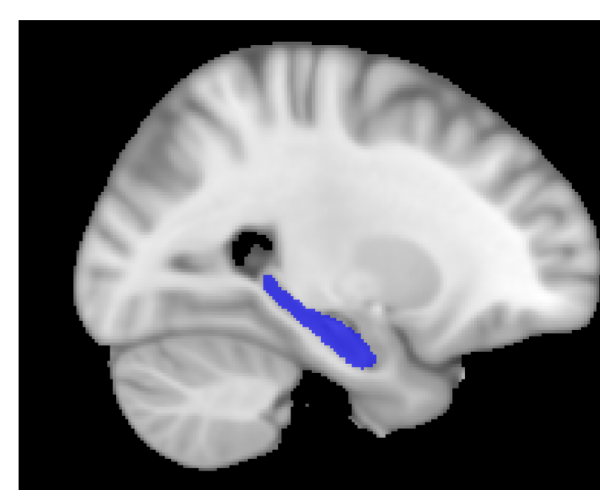
Attentional state is selected based on learned stay/switch cues



## MRI Acquisition and ROIs

TR: 1.5 s  
Vox. size: 2 mm iso  
TE: 30 ms  
Phase enc. dir.: P>>A  
Accel. Factor: 3  
# of slices: 69

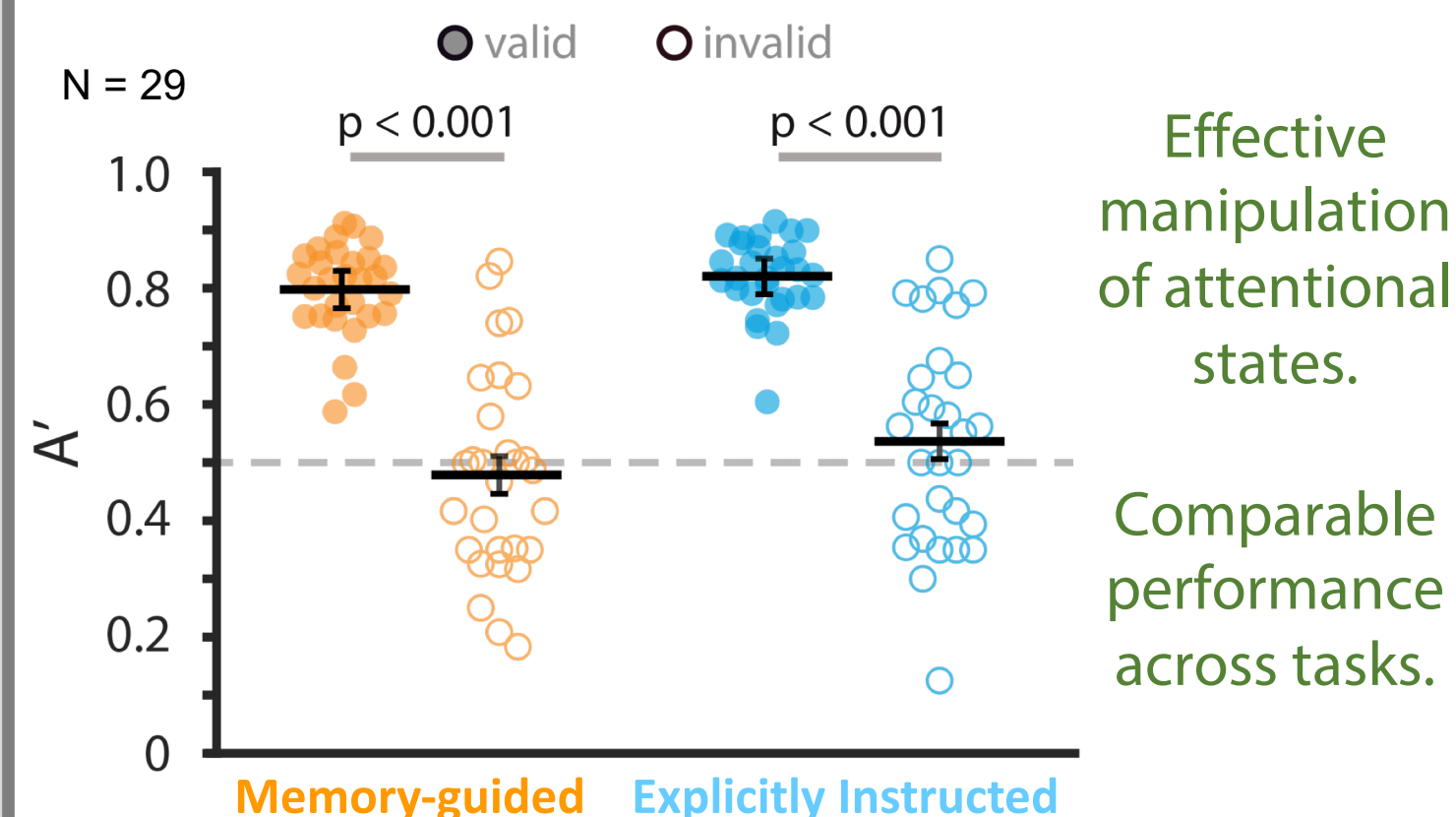
### HPC



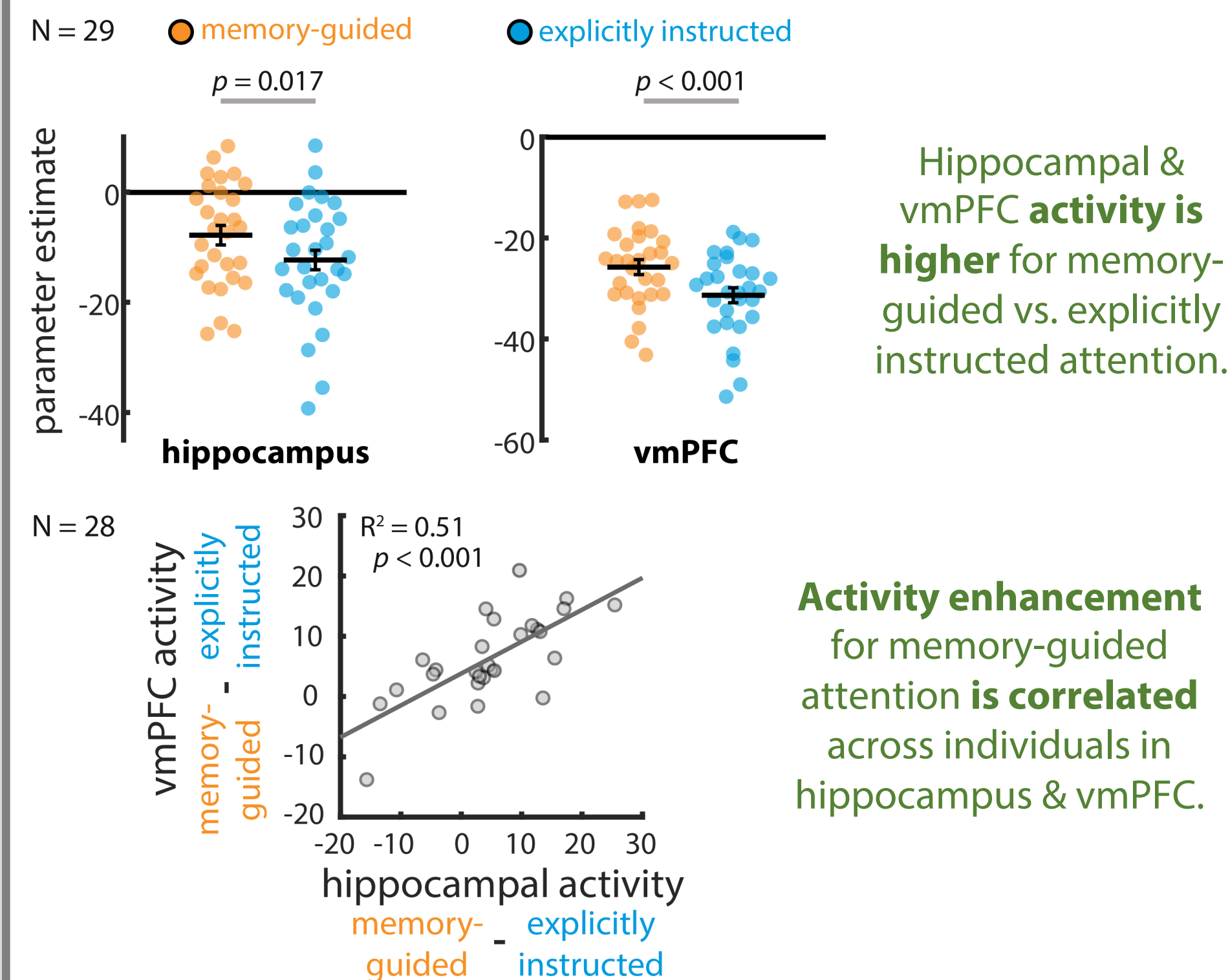
### vmPFC



## Behavioral Results

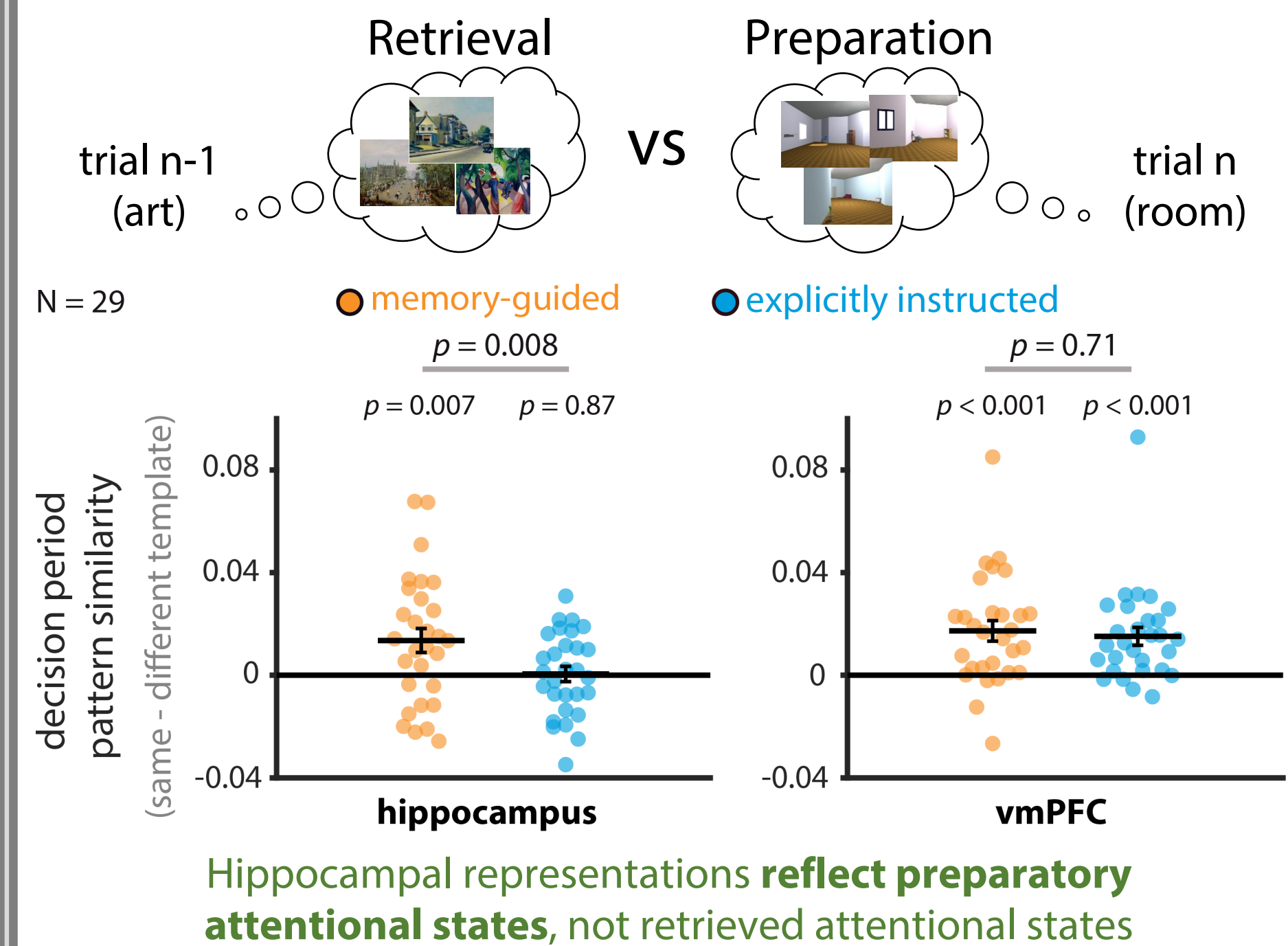


## Activity enhancement for memory-guided attention

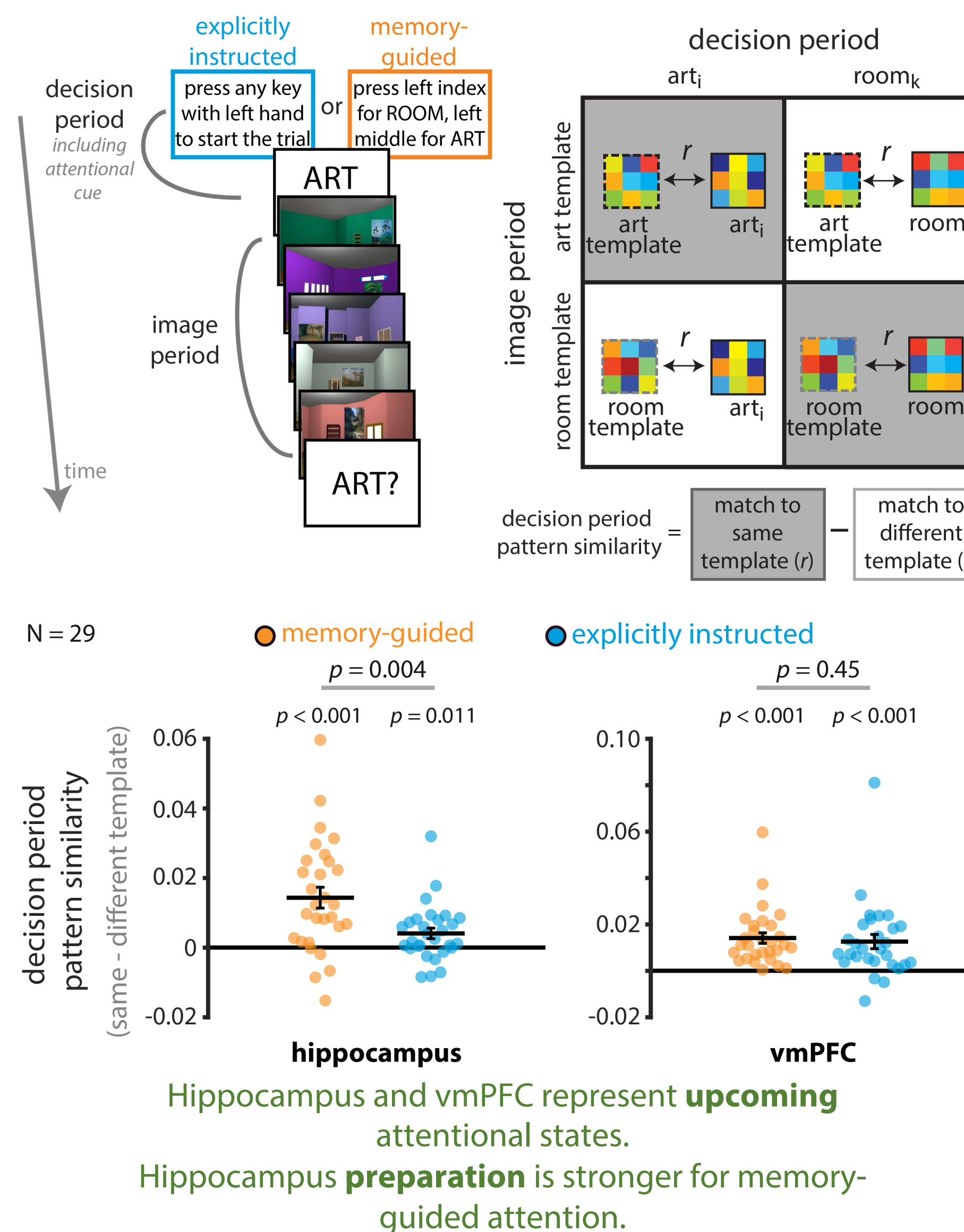


## Retrieval or preparation?

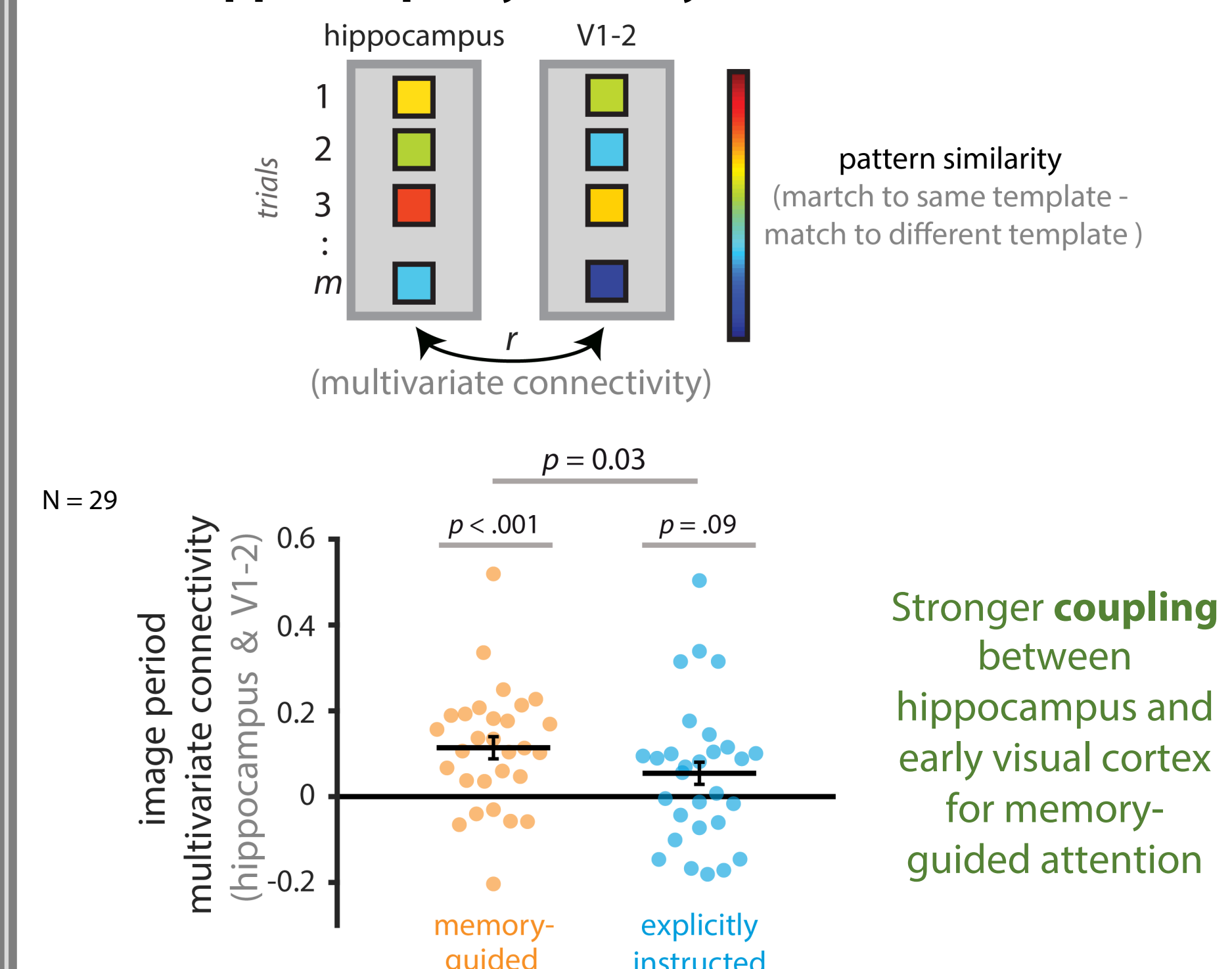
**Question:** Do HPC patterns reflect retrieval from the previous trial?  
**Test:** Analyze only the trials that followed a switch cue.



## Representation of upcoming states



## Hippocampal synchrony with visual cortex



## Conclusions

vmPFC and hippocampal activity is enhanced when attention is guided by memories compared to when explicitly instructed. These enhancements are correlated across individuals. Hippocampus and vmPFC prepare for *upcoming* attentional states. In hippocampus, this preparation is stronger for memory-guided attention. Hippocampal representations correlate with those in early visual cortex during memory-guided attentional guidance.