



Prospection in Working Memory

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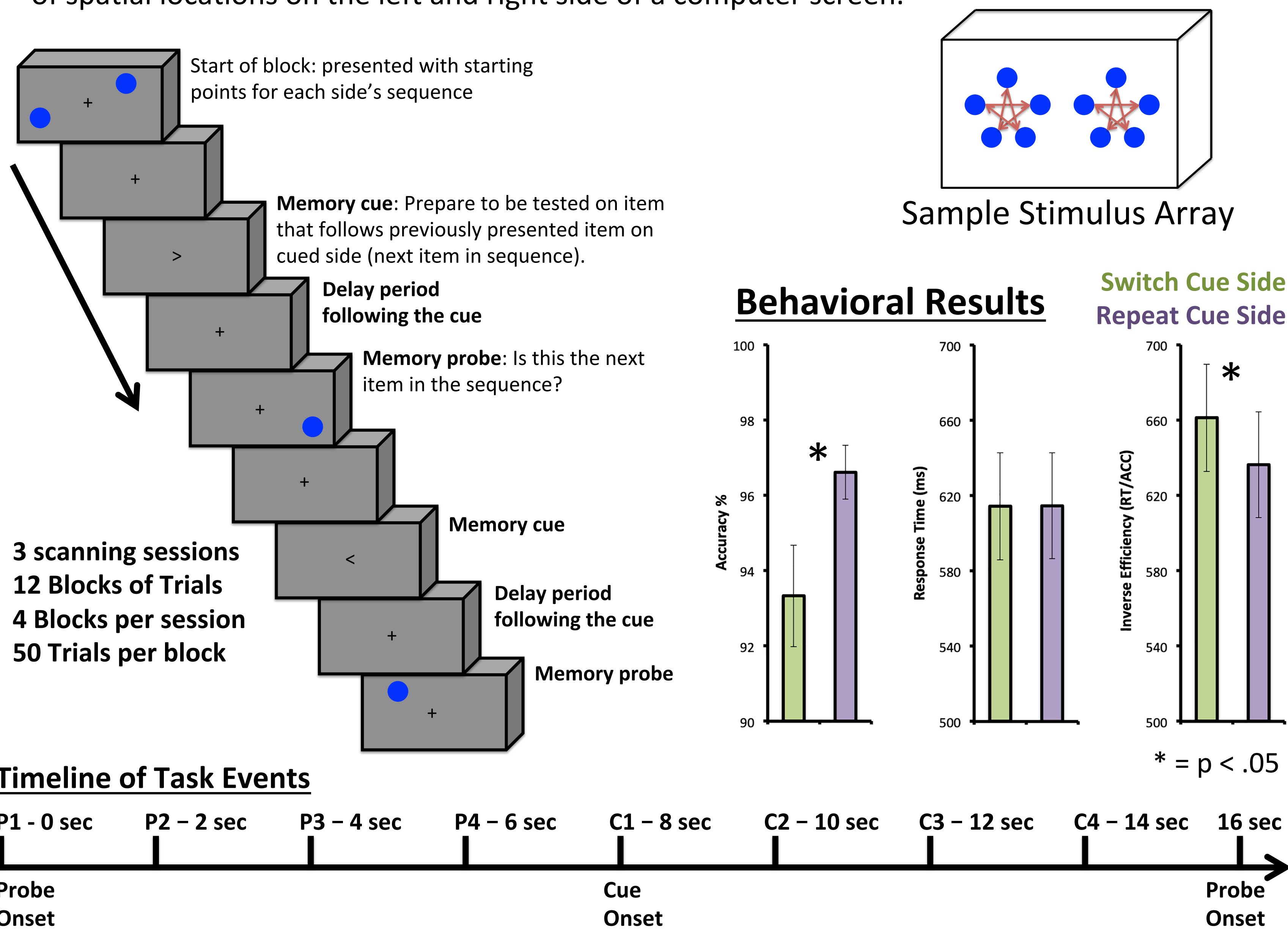
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Prospective Nature of Working Memory

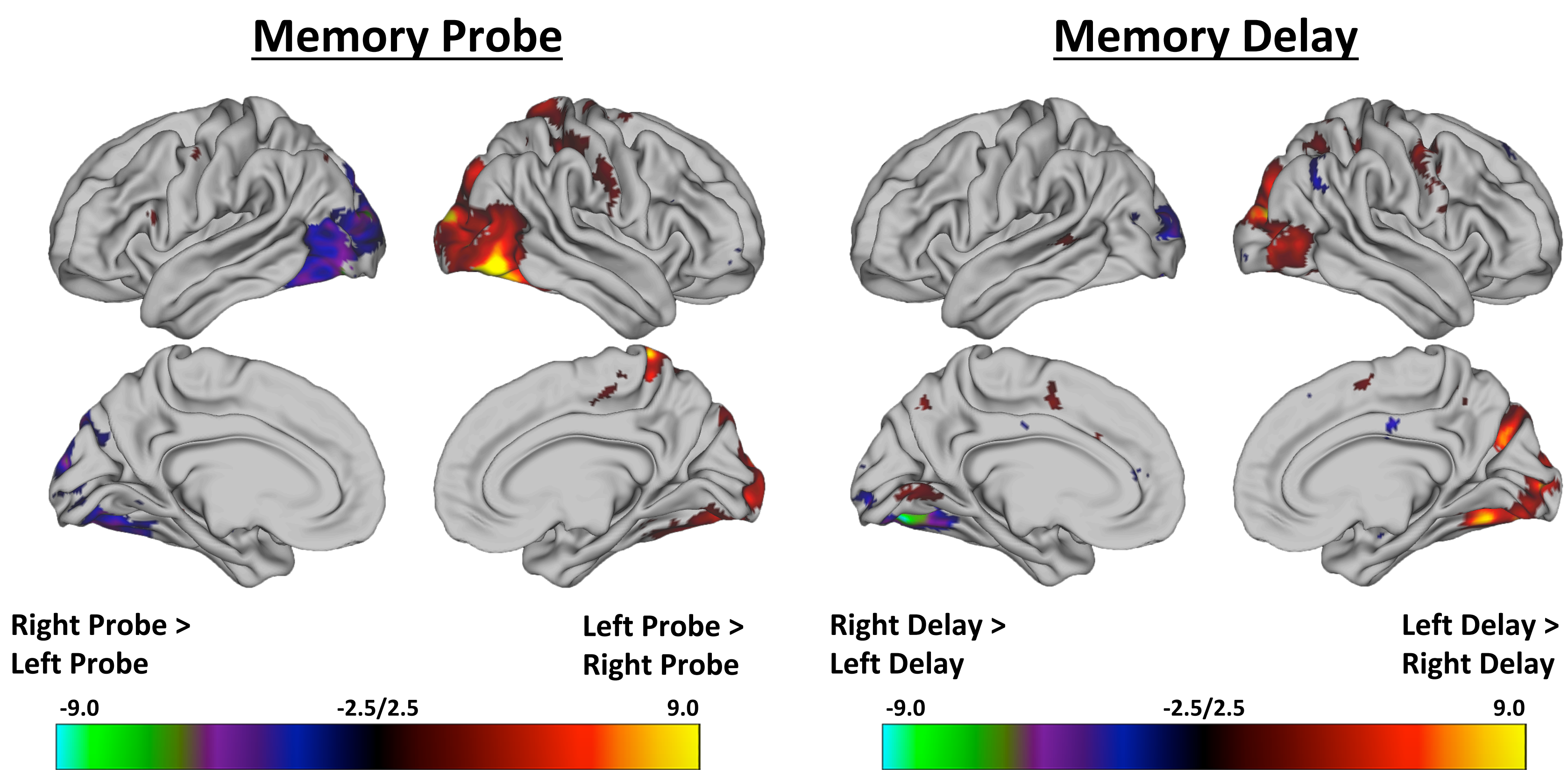
Working memory research mainly focuses on memory for items we've encountered in the past; however, working memory also helps us to prepare for the future. We investigated how neural representations of items encountered in the past are changed into representations that can guide future thoughts and actions.

Methods (N=14)

Participants were scanned with fMRI while being asked to simultaneously follow a sequence of spatial locations on the left and right side of a computer screen.



Memory Probe and Delay-related Activation



Conclusions

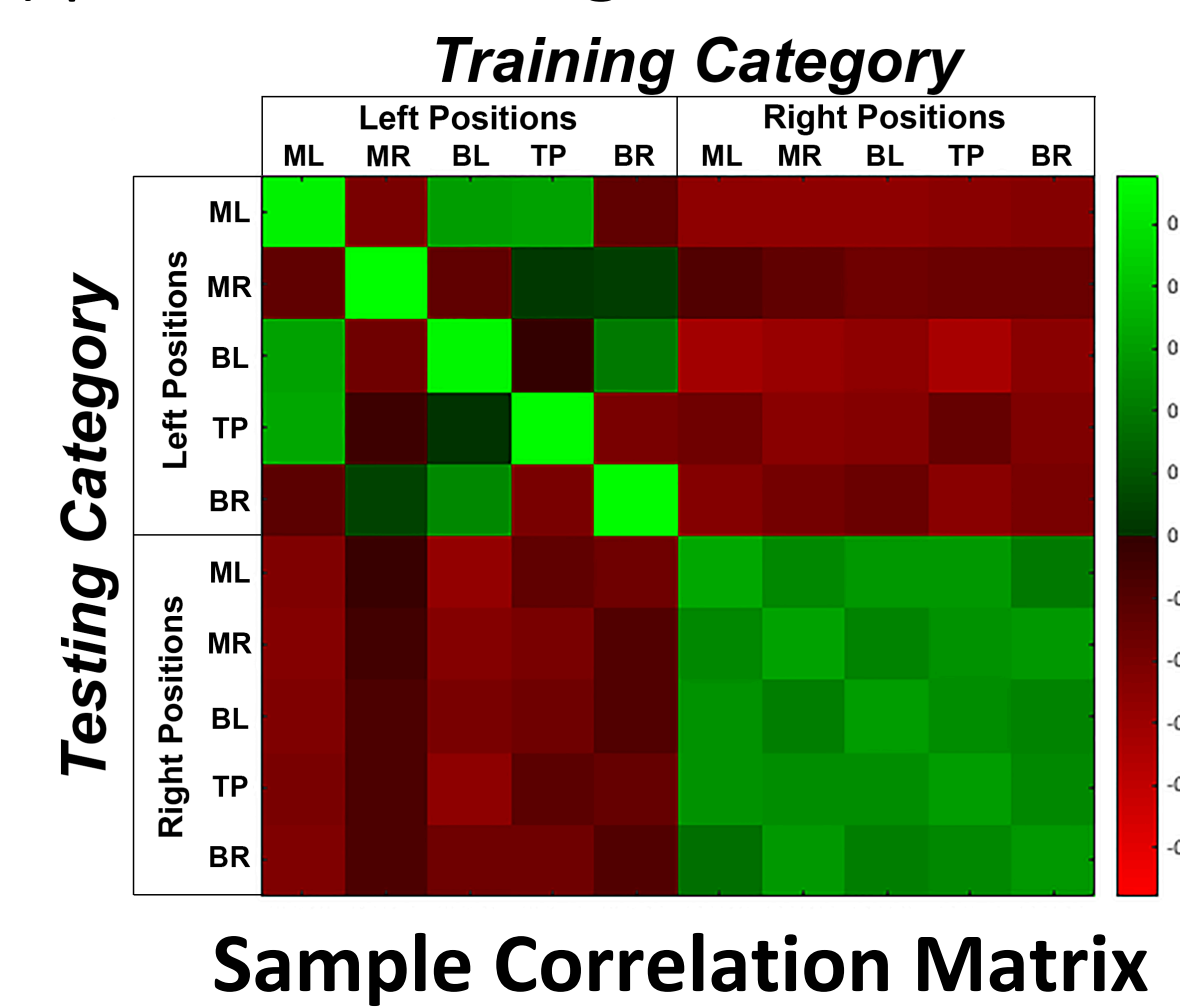
Representations in visual cortex and IPS transitioned away from representing the probe stimulus and moved towards a representation of the future (i.e., the next item in the sequence).

Uncued representations transition to represent the following item in the sequence before being stored in a seemingly silent-state.

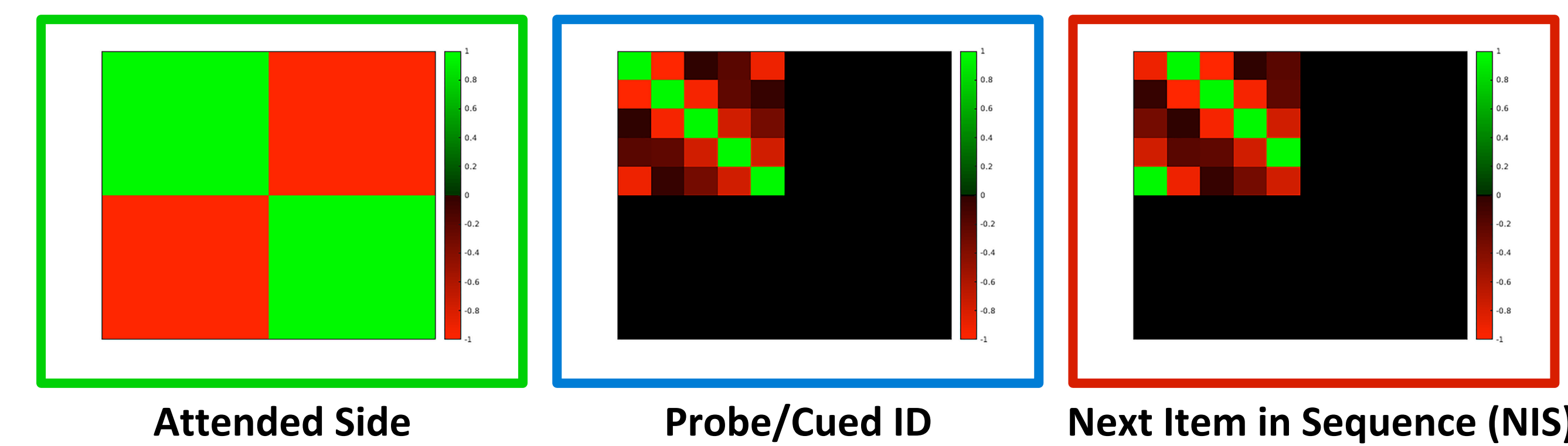
Working memory "works" to prospectively guide thoughts and actions.

Representational Similarity Analysis

Average response to each probe identity during the peak response to the probe (P2+P3) was correlated with average response to each stimulus in each tested time (TR) period. **Resulting correlation matrix entered into a regression analysis with templates of activation.**



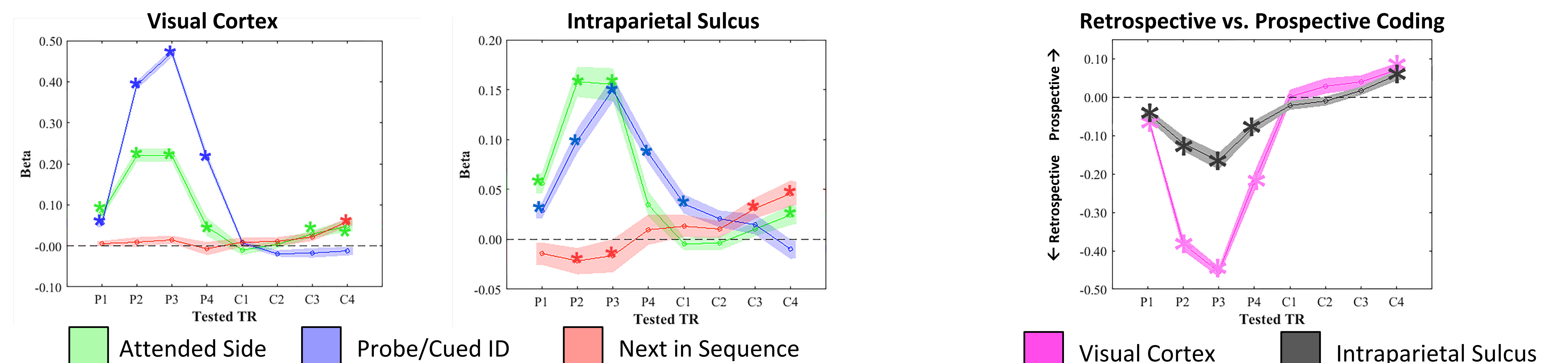
Sample templates below depict those that would be used to analyze activation within an area within the right hemisphere.



** Visual angle between stimuli was incorporated into the ID and NIS regressors to account for similarities in activation due to distance between stimuli.

Representations Shift from Past to Future

Participants are cued by the memory cue on each trial to prepare to be tested on the item that follows the previously-presented probe on the cued side's sequence (i.e., next in sequence). If working memory is responsible for guiding future thoughts and actions, then its representations should be tuned to represent the upcoming probe.



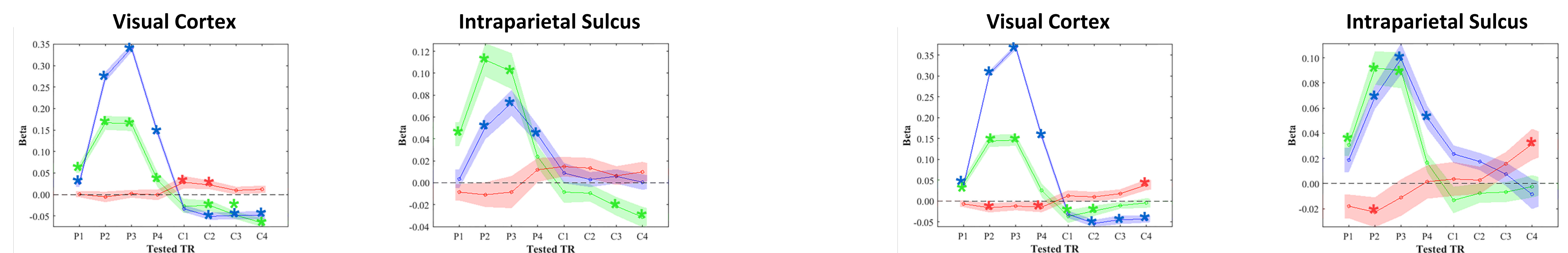
During the delay period in both Visual Cortex and IPS, the representation on the corresponding cued-side ramps up to represent the next item in sequence in preparation for the upcoming memory probe. * = p < .05 corrected

Future Expectations Guide Timing of Memory Transformations

Including a sequence on each side of the screen allowed for the investigation of the fate of **currently-irrelevant uncued items**. When cue points to opposite side of the previously-presented probe (i.e. Switch Trials), representation corresponding to the uncued side of the screen is currently-irrelevant.

Switch Trials: cue points to **OPPOSITE** side of previously presented probe item.

Repeat Trials: cue points to **SAME** side of previously presented probe item.



Following switch cues, uncued representations represent the next item in their corresponding sequence before becoming "activity-silent".