

BACKGROUND

- Recall sequences reveal the organization of episodic memories
- Well established temporal contiguity effect
KAHANA, 1996
- Analogous spatial contiguity effect
MILLER ET AL., 2013
- The MTL has been implicated in spatial representations and retrieval of contextual information
EICHENBAUM ET AL., 2012, MOSER ET AL., 2008

What is the neural signature of spatial context retrieval in the MTL?

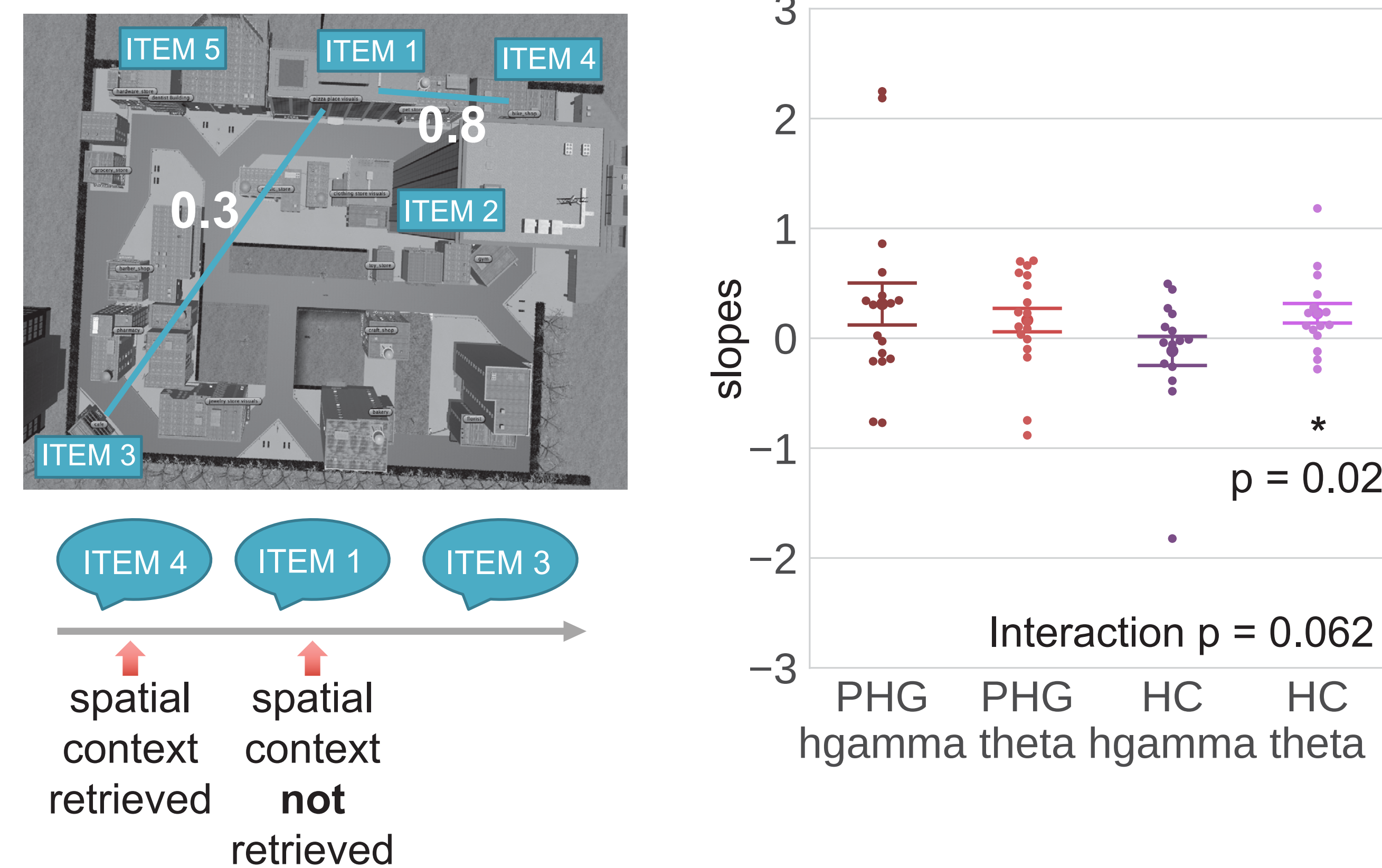
METHODS



- Spatial free recall task with encoding phase in a virtual town
- Intracranial EEG data from 23 patients with medication-resistant epilepsy implanted with subdural strip and depth electrodes
- Bipolar referencing scheme
- Morlet wavelet convolution, log-transform, z-score
- ROIs: hippocampus (HC) and parahippocampal gyrus (PHG)
- FOIs: theta (3-8Hz), high gamma (70-100Hz)

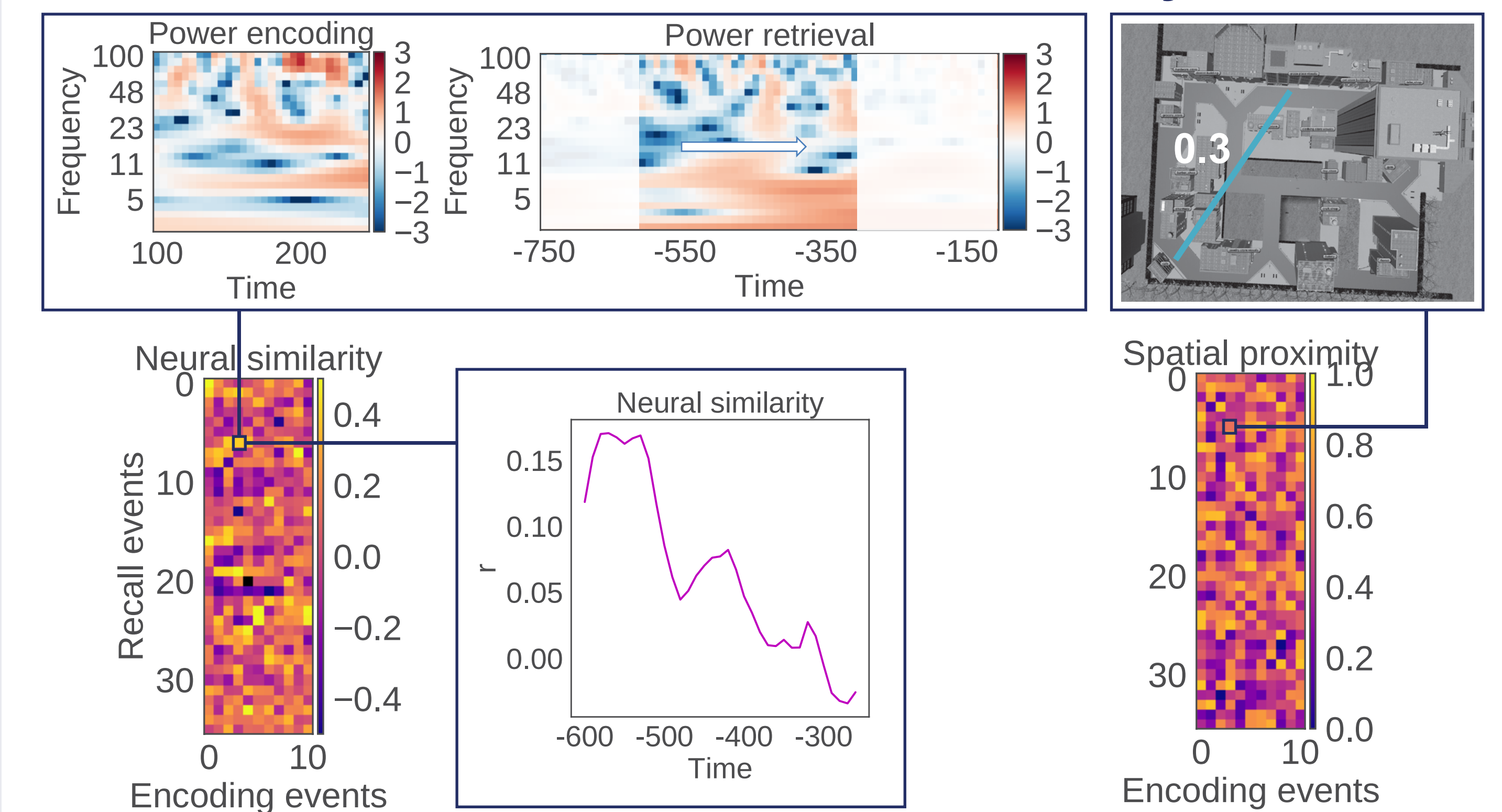


Spectral power during recall as a function of spatial proximity

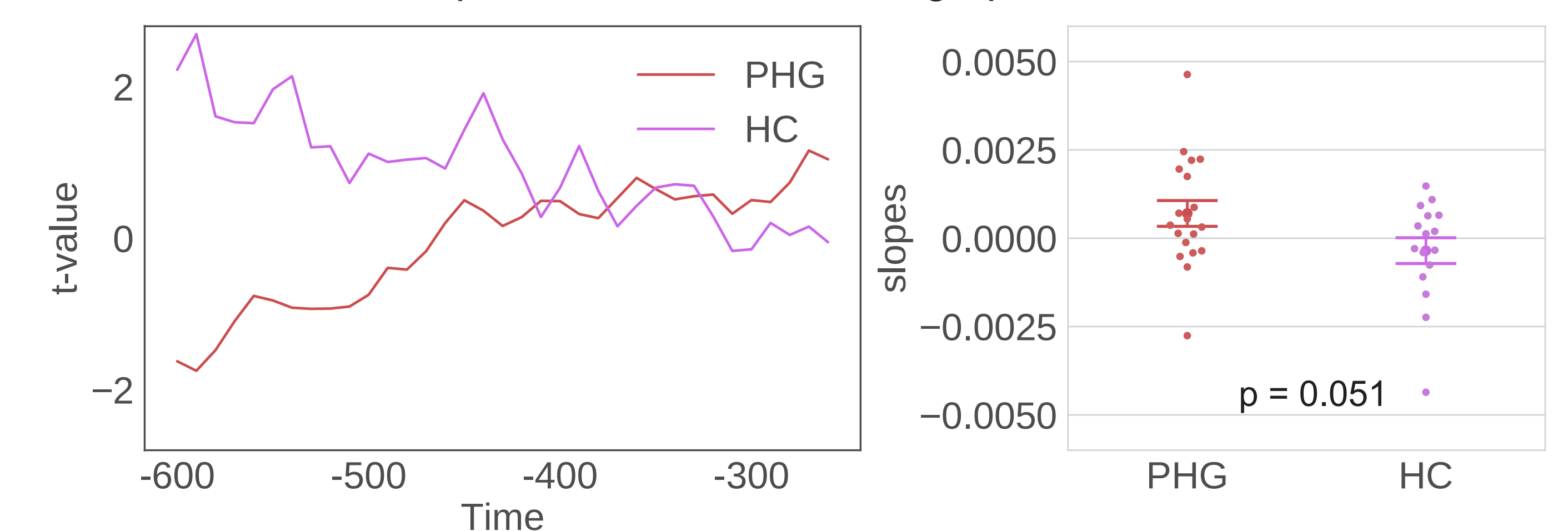


ANALYSES & RESULTS

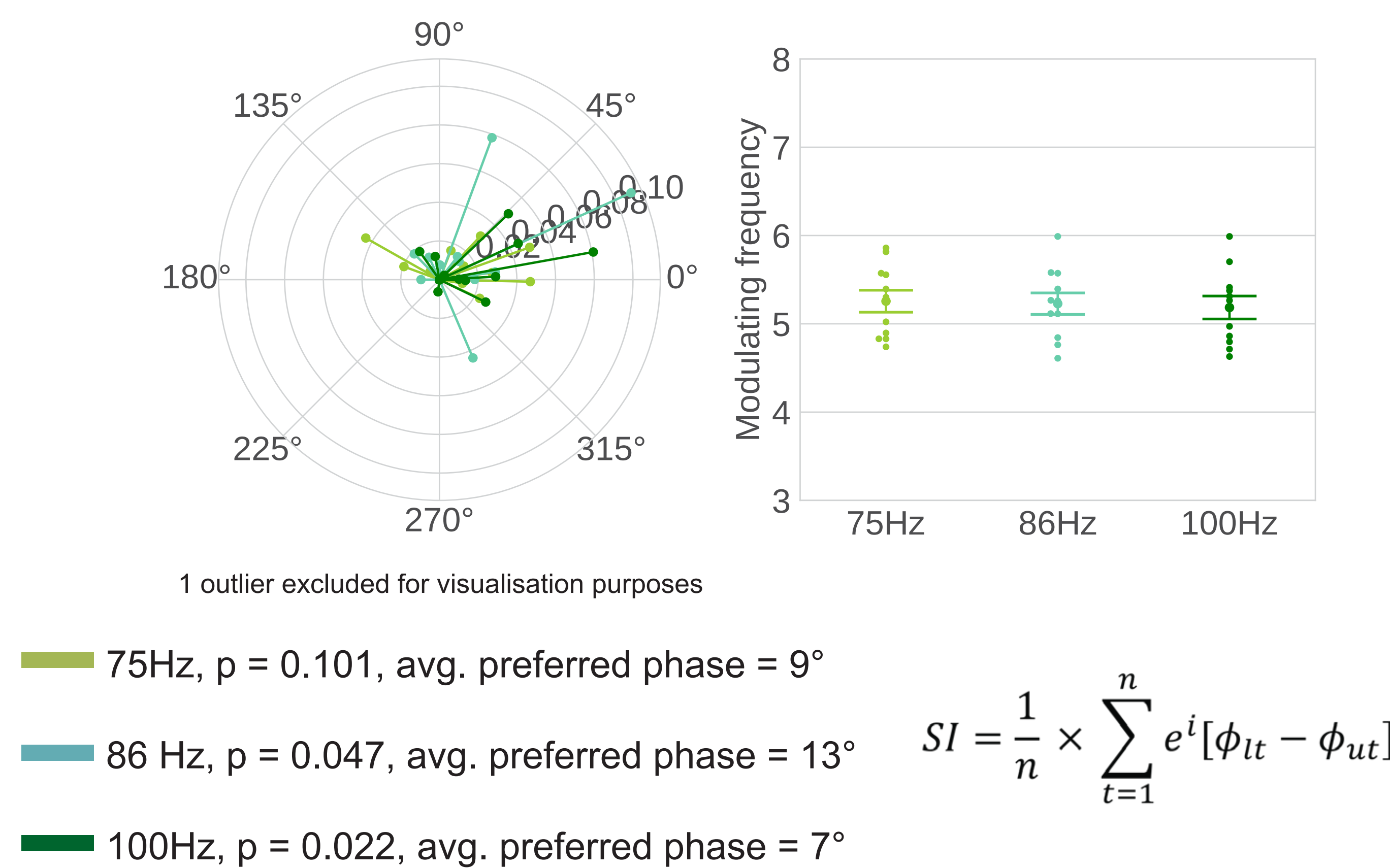
Encoding-retrieval similarity as a function of spatial proximity



Spatial information leading up to recall



Theta-phase to gamma-amplitude coupling between HC and PHG during recall



- Cross frequency coupling measured as the consistency of phase values of the high frequency power envelope and the low frequency filtered signal (synchronization index, SI) COHEN ET AL., 2008
- Significance determined using a permutation procedure based on shifting the two phase time series

$$SI = \frac{1}{n} \times \sum_{t=1}^n e^i [\phi_{lt} - \phi_{ut}]$$

SUMMARY & CONCLUSIONS

- Retrieval of spatial context information is accompanied by an increase in hippocampal theta power
- Distinct temporal profiles of spatial context reinstatement in HC and PHG: Spatial information numerically increases in the PHG and decreases in the HC leading up to recall
- Theta-gamma coupling as a potential mechanism for inter-regional information transfer during recall

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