Spectral biomarkers of item repetition Poster #78

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Introduction

- Scalp EEG studies have found reliable spectral biomarkers of memory encoding
- During list learning, later-remembered items have higher theta (3-6Hz), lower beta (10-20Hz), and higher HFA (>30Hz) power than later forgotten items (Sederberg 2006; Long & Kahana 2013)
- Repeating items in a list is one of the strongest predictors of subsequent memory, greatly increasing the probability that the item will later be recalled (Siegel & Kahana 2014)
- However, the neural features of item repetition in association with memory encoding remain unknown

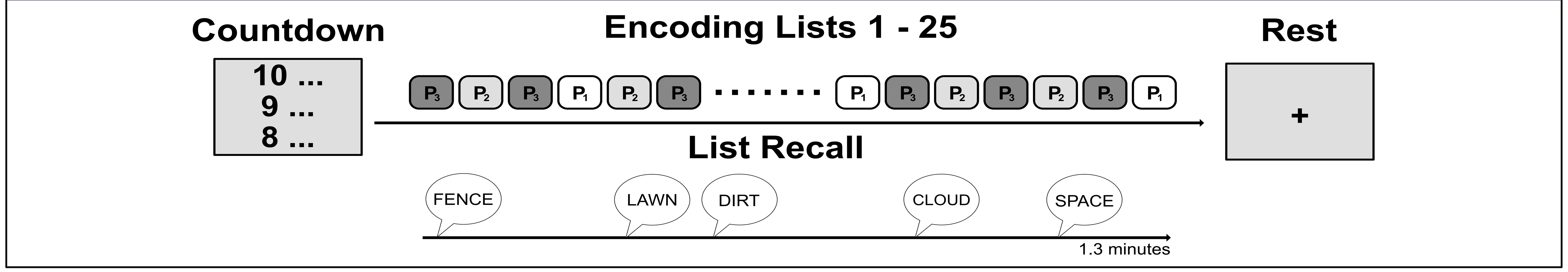
Motivating Question

Do neural markers of successful encoding differ between novel and repeated items?

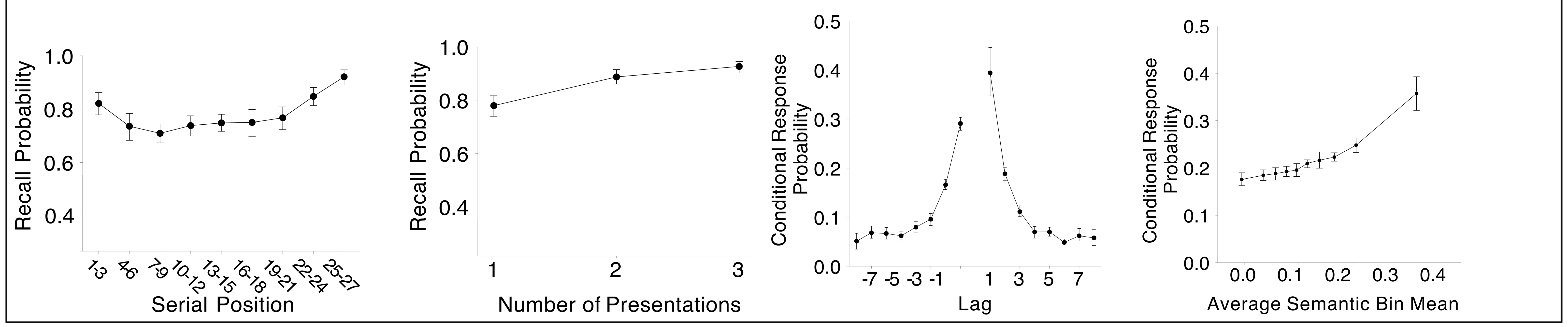
Methods

- 7 participants (age 18-35) each completed 10 sessions of a verbal learning task in which items were repeated 1, 2, or 3 times
- Each item shown for 1600ms with a variable ISI (750-1000 ms). 27 items/list (12 unique), and 25 lists/session
- Word presentation intervals were followed by a 45s free recall period, with a short distractor in between
- Scalp EEG collected concurrently with behavior
- Spectral decomposition of timeseries EEG using 24 Morlet wavelets, log-spaced from 3-161Hz

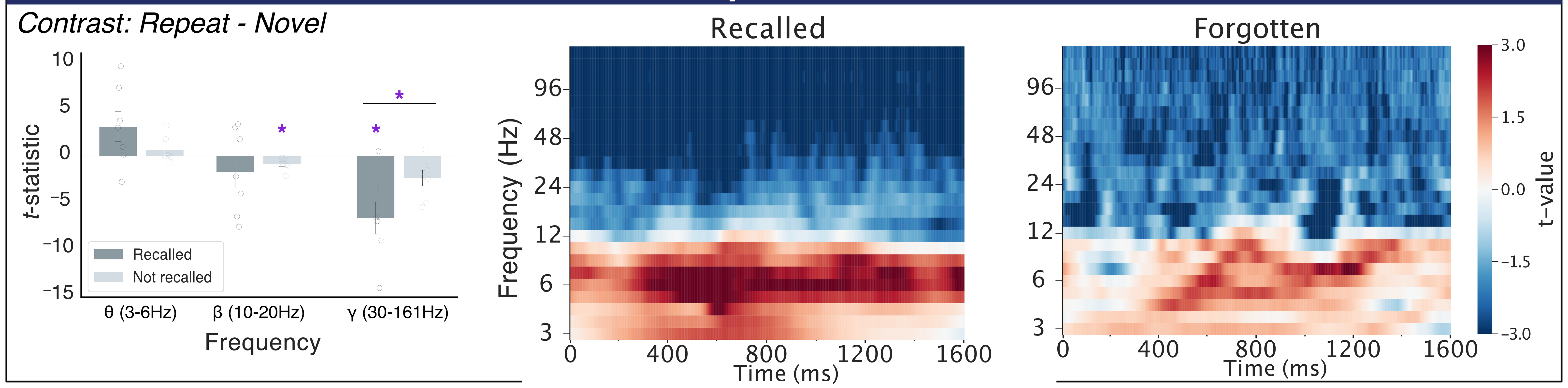
Paradigm



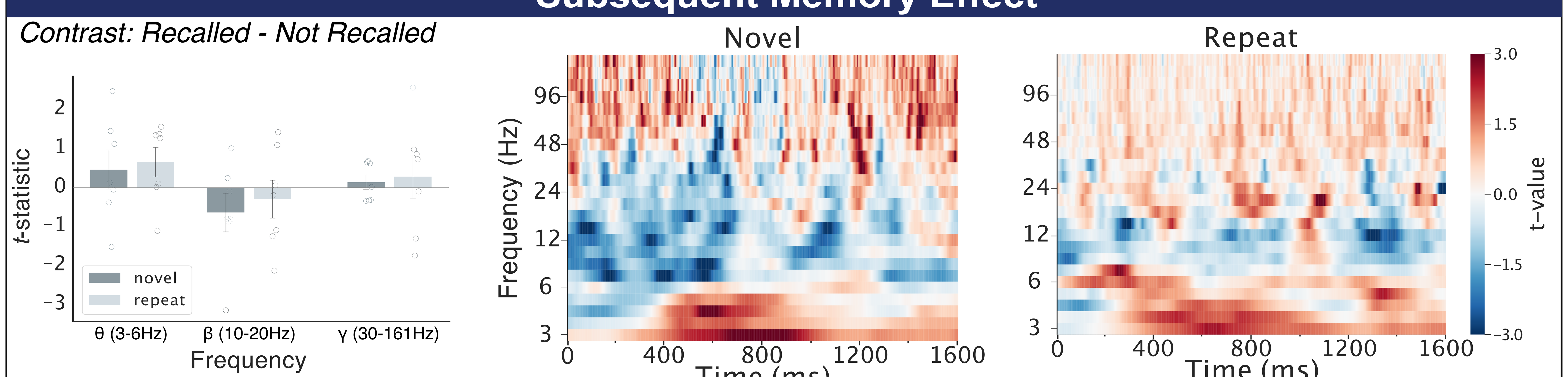
Behavioral Performance



Item Repetition Effect



Subsequent Memory Effect



* $P < 0.05$, FDR-corr.

Conclusions

- Repeated items are associated with lower HFA power than novel items, especially for items that are later recalled
- Possible differences between novel and repeated items at lower frequencies as well, but more data is needed to draw stronger conclusions
- Qualitatively similar spectral features of successful encoding for novel and repeat items: increased theta, decreased beta, and increased HFA power for items that are later recalled vs. forgotten

Future Questions

1. **Can we distinguish between items presented once vs. twice based on neural features at the time of retrieval?**
2. **Can classifiers trained on neural activity during encoding help determine how many times an item should be presented to optimize its chances of later retrieval while minimizing the number of repetitions?**

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