

Background and Motivation

- Evidence shows that medial temporal lobe (MTL) theta band power relates to both semantic and temporal organization of recalled memories (Solomon et al., 2019).
- However, the role of MTL theta in explicit categorical organization of memories, and the potential interaction between categorical clustering and temporal clustering of retrieval, has not yet been examined.
- Specifically, how does MTL theta relate to retrieval of items in the same category (semantically similar), while controlling for the items' similar temporal contexts?**

Methods - Categorized Free Recall Task

- We used a categorical free recall task performed by patients with epilepsy with implanted electrodes



- Specifically we marked transitions between successively recalled words, and measured **theta (4-8 Hz) power in the MTL in the 1 second preceding vocalization of both recalled words.**

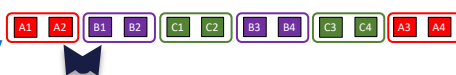
Adjacent Same-Category



Non-adjacent Same-Category



Adjacent Different-Category

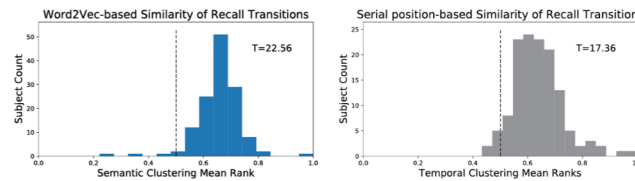


Non-adjacent Different-Category

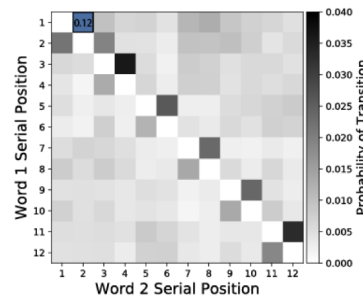


Semantic and Temporal Clustering of Retrieval

Subjects recall words together that are semantically and temporally similar

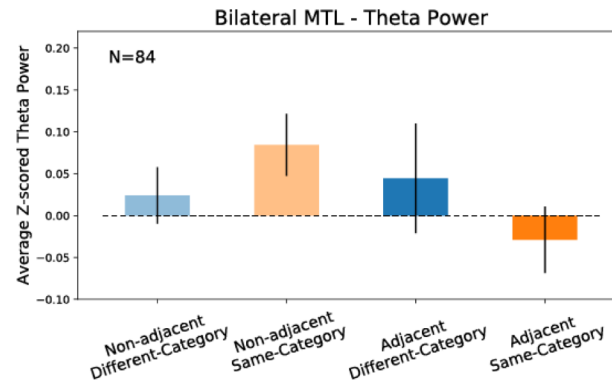


Serial Positions of Transitions



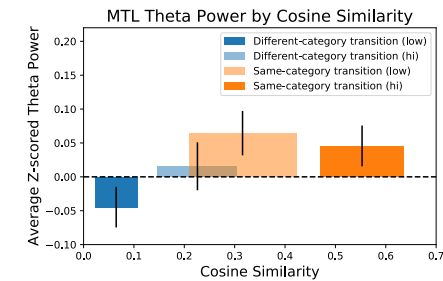
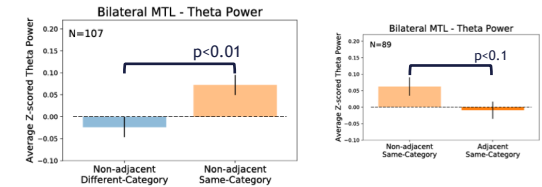
Category pairs are recalled together, more often in the forward direction

Theta Power Preceding Different Transition Types



Theta Power Increases before Non-adjacent Same-Category Transitions

Theta power in the MTL is greater prior to same-category transitions, but only for non-adjacently encoded words



Summary

- Theta band power in the MTL increases before retrieval of semantically similar words, relative to words that are from different categories.
 - However, this effect is not observed for same-category words that were encoded in adjacent serial positions.
- These results suggest two hypotheses:
 - Semantic category-related context is coded in part by MTL theta oscillations
 - Same-category words encoded consecutively are retrieved during recall as a single memorandum rather than two separate items.

References

Solomon, E. A., Lega, B. C., Sperling, M. R., & Kahana, M. J. (2019). Hippocampal theta codes for distances in semantic and temporal spaces. *Proceedings of the National Academy of Sciences of the United States of America*, 116(48), 24343–24352.