The neural correlates of temporal and semantic clustering during retrieval

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Introduction

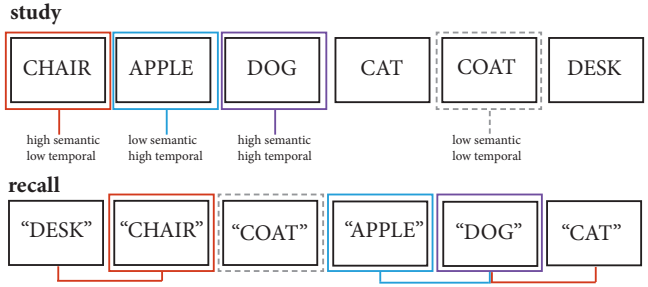
Organizational processes correlate with successful recall (Tulving, 1962; Thompson, 1972)

Temporal clustering: consecutive recall of nearby study items (Kahana, 2006)

Semantic clustering: consecutive recall of items related in meaning (Bousfield, 1953)

How do neural mechanisms of temporal and semantic clustering relate to those associated with recall success? What mechanisms are shared/different between temporal and semantic clustering?

Methods



Free recall task where words vary in temporal and semantic relatedness

Temporal relatedness determined by lag (difference in serial position)

High temporal: lag = 1, Low temporal: lag > 2

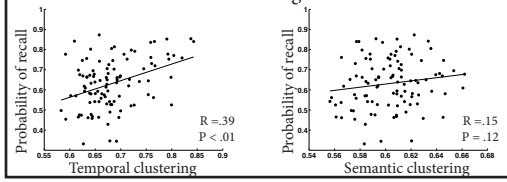
Semantic relatedness determined by word association score (Nelson et al., 2004)

High semantic: WAS > .4, Low semantic: WAS < .4

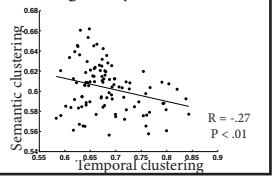
EEG Methods: 102 participants | 7 sessions | 16 lists per session | 16 words per list | Scalp EEG, 129 electrodes

Behavioral results

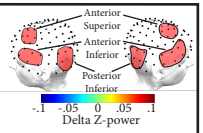
Probability of recall positively correlated with temporal clustering



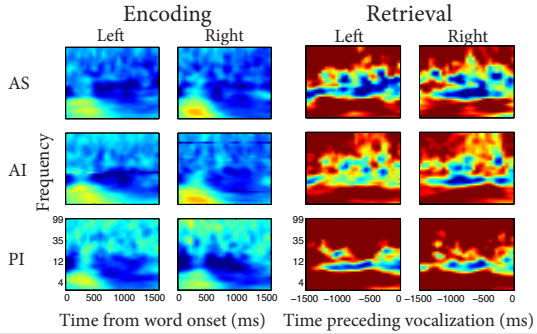
Temporal and semantic clustering are negatively correlated



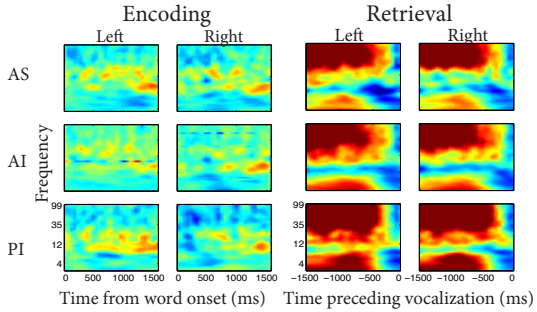
EEG Oscillatory Power



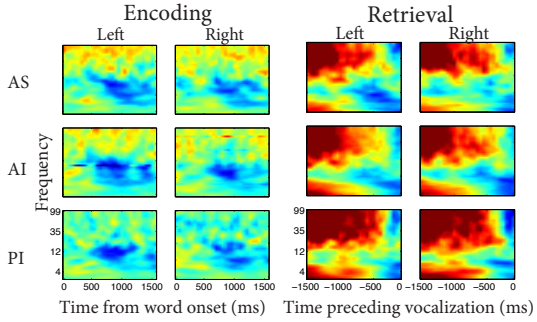
Recalled - failure to recall



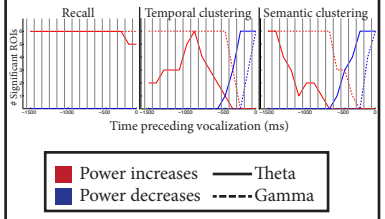
High - Low Temporal Clustering



High - Low Semantic Clustering



Retrieval dynamics



Summary

- Encoding and retrieval mechanisms differ across all three measurements

Recalled - failure to recall

- Encoding: power decreases across frequencies
- Retrieval: greater low and high frequency power prior to vocalization

High - low temporal clustering

- Encoding: theta power decreases, alpha power increases
- Retrieval: early power increases; pre-vocalization power decreases

High - low semantic clustering

- Encoding: low frequency power decreases
- Retrieval: early power increases; pre-vocalization power decreases which begin earlier than temporal

References

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Nelson, DL & McEvoy, CL (2004) The University of South Florida free association, rhyme and word fragment norms. Beh. Res. Methods 36 (3): 402-407

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