

Introduction

- Memory retrieval requires several distinct processes
- Spectral decomposition of recognition memory data shows that theta power dissociates for correctly recognized old items and correctly rejected new items Nyhus & Curran, 2010
- Much of the current literature reports stimulus-locked neural effects Nyhus & Curran, 2010, Addante et al 2012

Question

How does neural activity change when a memory judgment is made?

Hypothesis

- Theta power will dissociate for correctly identified old items (hits) and correctly rejected new items (CRs) around the point of memory judgment

Recognition task design

Study Phase

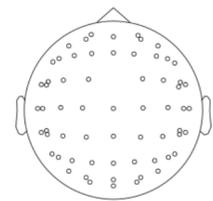


Test Phase



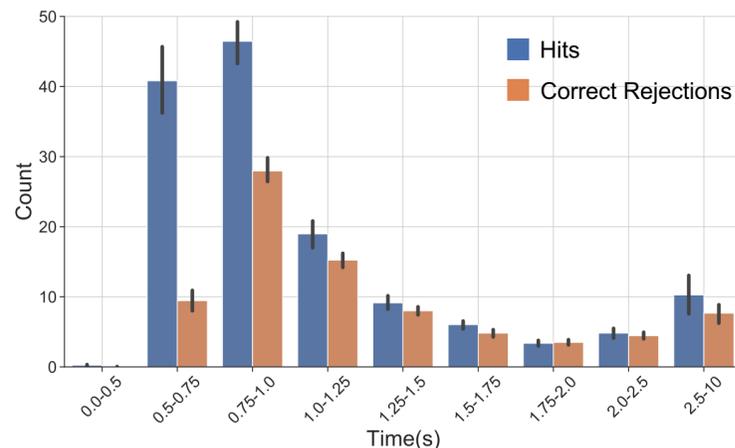
■ Hits ■ Correct Rejections

Study: 16 trials/run
12 runs
2000 ms/word
Test: 96 novel words,
self-paced
63 electrodes
46 frequencies
38 subjects



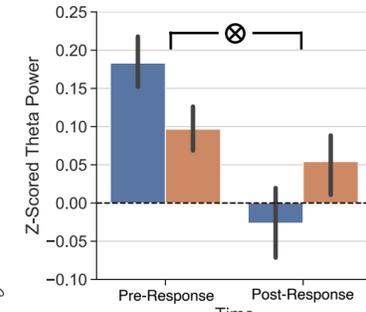
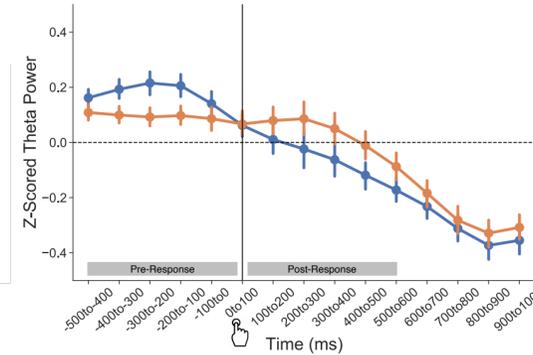
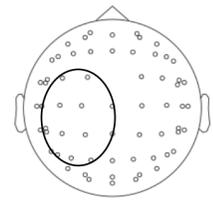
Reaction times for hits and correct rejections

- Participants have the highest number of responses between .5-1s after stimulus onset
- Responses are on average faster for hits than CRs

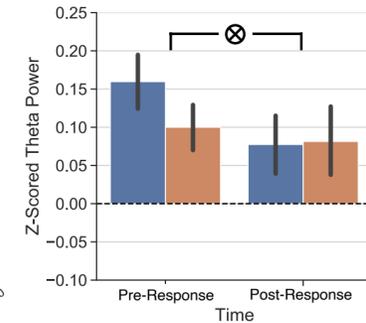
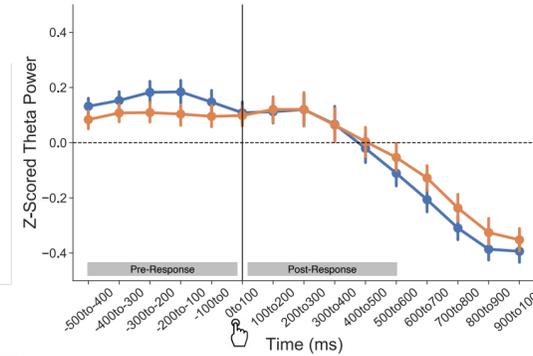
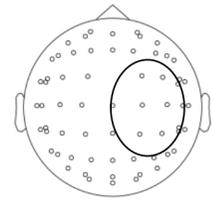


Response-locked theta power for hits and correct rejections

Left Central

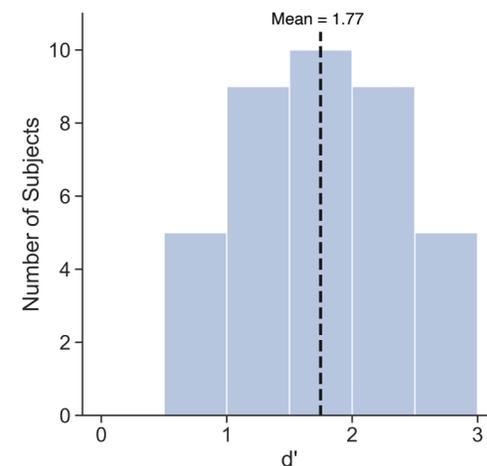


Right Central



- Pre-response, left central theta power is greater for hits than CRs, but this dissociation reverses when the memory judgement is made such that post-response theta is greater for CRs relative to hits
- Post-response, right central theta power does not dissociate hits and CRs

Participants' recognition ability



- Participants can successfully discriminate between previously studied (old) items and new items

Summary

- Due to the high number of responses made between .5-1 second, response-locked neural correlates likely contribute to many of the established stimulus-locked effects
- Memory judgments have distinct neural correlates, in which the dissociation in theta power between hits and CRs reverses at the point of decision
- Based on work in the field of cognitive control, the theta power reversal suggests a feedback mechanism which is greater for hits than CRs Cavanagh & Frank, 2014

Future directions and open questions

- Does theta reversal persist for different types of stimuli?
- Is there an intrinsic feedback mechanism for recognition (is successful recognition intrinsically rewarding), which leads to a decrease in theta power for hits relative to CRs?
- How do neural states elicited by memory decisions impact ongoing behavior and neural activity? How long do these states persist?

References

- Addante, R.J., Ranganath, & C., Yonelinas, A.P. (2012). Examining ERP correlates of recognition memory: Evidence of accuracy source recognition without recollection. *NeuroImage*. 62(1), 439-450.
- Cavanagh, J.F. & Frank, M.J. (2014). Frontal theta as a mechanism of cognitive control. *Trends in cognitive sciences*, 18(8), 414-421.
- Nyhus, E. & Curran, T. (2010). Functional role of gamma and theta oscillations in episodic memory. *Neuroscience and Biobehavioral Reviews*, 34, 1023-1035.