

REM sleep and Inferior Temporal Lobe Recapitulation Support Positive Memory Retrieval

Ryan M. Bottary¹, Sarah M. Kark¹, Ryan T. Daley¹, Jessica D. Payne² & Elizabeth Kensinger¹

¹Department of Psychology, Boston College

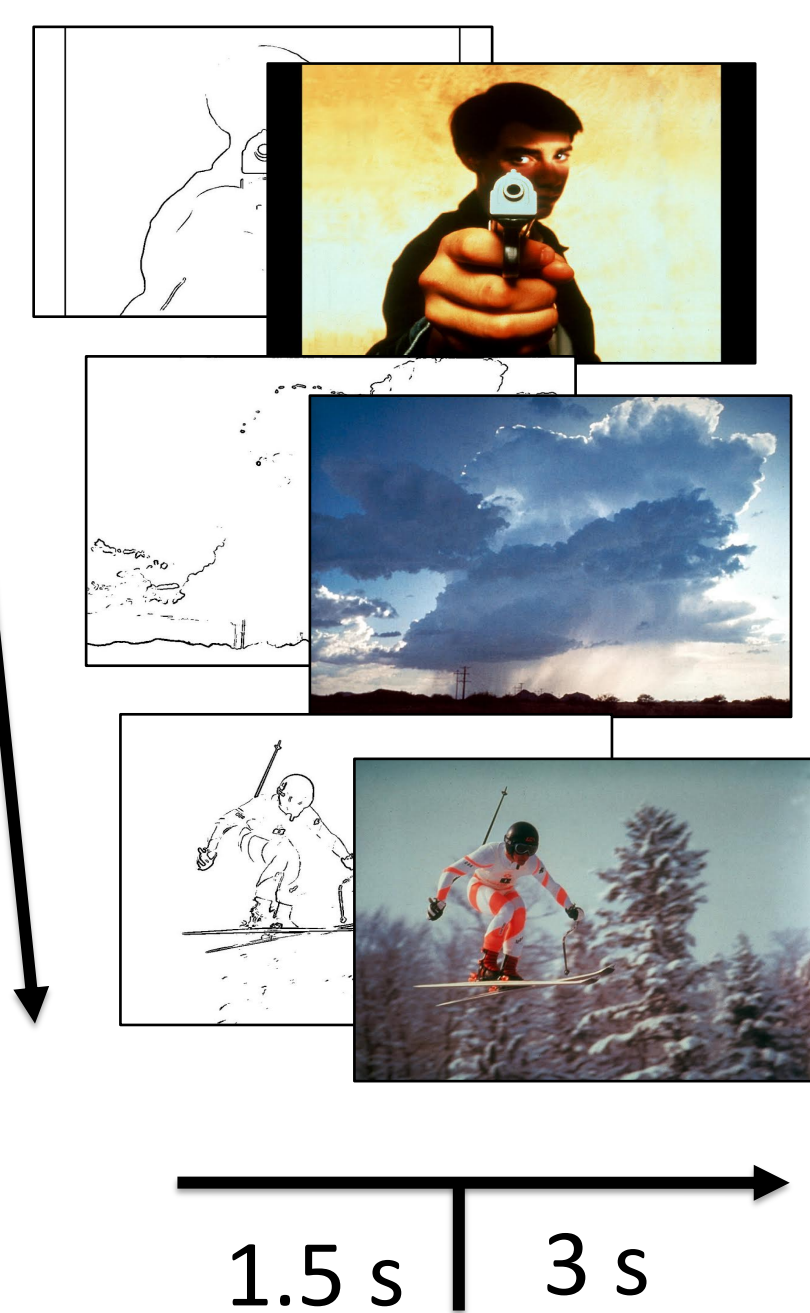
²Department of Psychology, University of Notre Dame

Correspondence: ryan.bottary@bc.edu

Methods Summary

At Encoding

22 healthy, good sleeping participants (mean age = 22±2.9 yrs; 10F, 12M) viewed 150 line drawings paired with their full color negative, neutral or positive picture during 3T fMRI scanning.

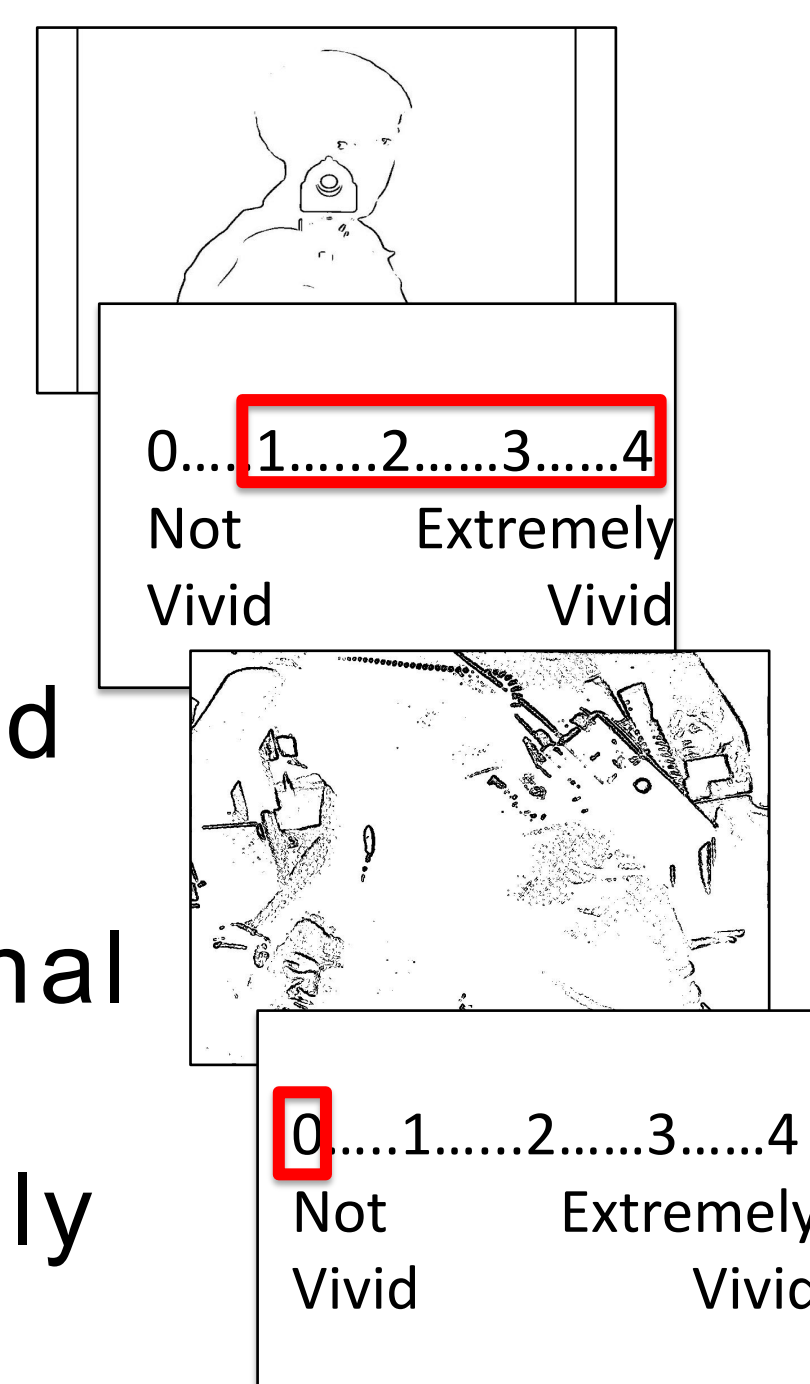


Post-encoding overnight sleep

was monitored with polysomnography and REM and NREM sleep stage percentages were determined using standard scoring criteria³.

Recognition

memory was tested 24 hrs after encoding by presenting 150 studied and 150 novel line drawings during fMRI. Participants rated the vividness of their memories for the original picture using a 0 (no memory) to 4 (extremely vivid memory) scale. Memory performance was measured with d' .

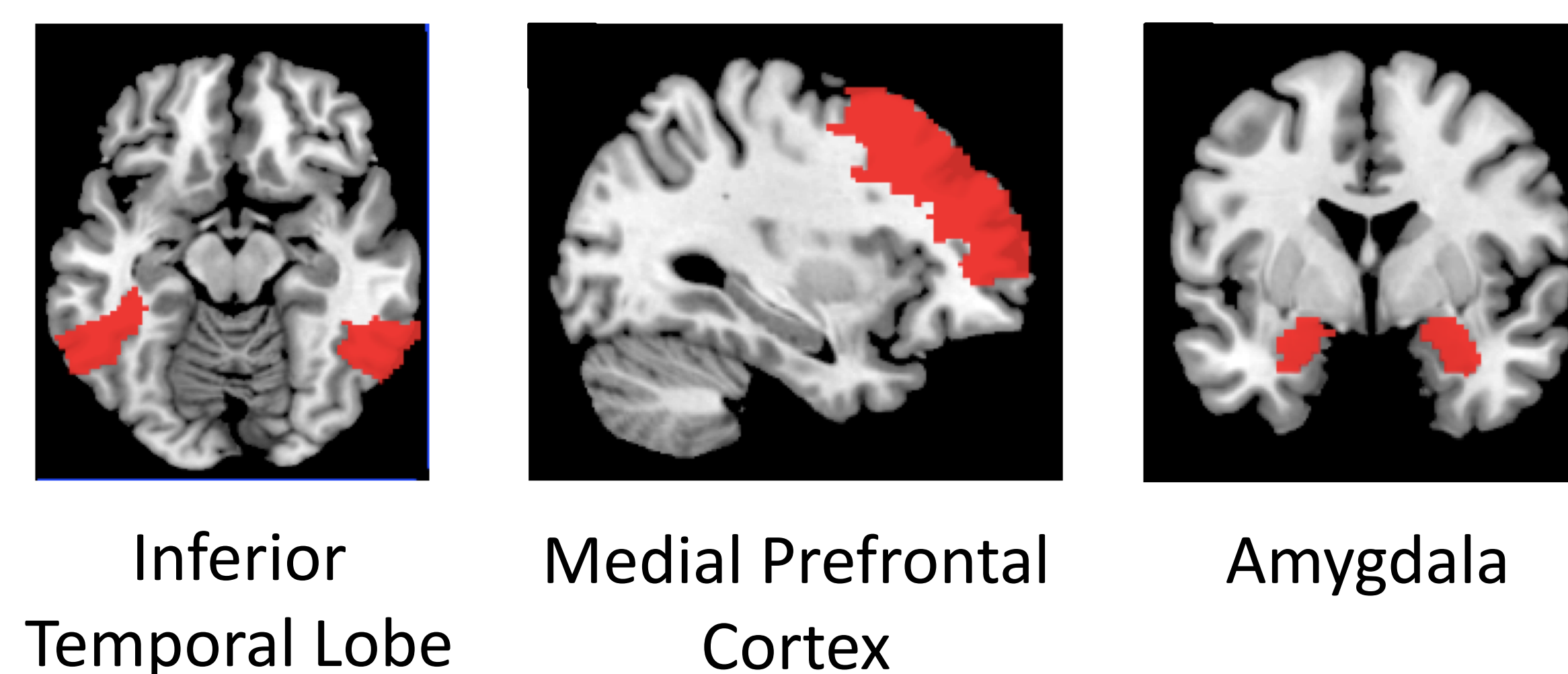


Recapitulation refers to the reinstatement of encoding brain activity during memory retrieval. Here, recapitulation was calculated as the percentage of encoding voxels that were also active during retrieval for subsequently remembered pictures. Overlap maps were created separately for negative, neutral and positive pictures.



Encoding **Retrieval** **Overlap**

Recapitulation of emotional content is strongest in ventral visual areas (e.g. inferior temporal lobe), the frontal lobe and the amygdala². Therefore, we focused on these regions in our analyses.



Introduction

Memory is biased toward retrieval of **emotional content** over neutral content, especially following sleep rich in **REM sleep**¹. Greater reinstatement of encoding brain activity during retrieval (i.e. **recapitulation**) is independently associated with emotional memory retrieval², yet the interaction between recapitulation and REM sleep remains unknown.

Here, we aimed to understand how REM sleep and emotional memory recapitulation interact to influence retrieval of emotional content.

Conclusions

REM sleep and inferior temporal lobe (ITL) recapitulation independently predicted retrieval of positive content.

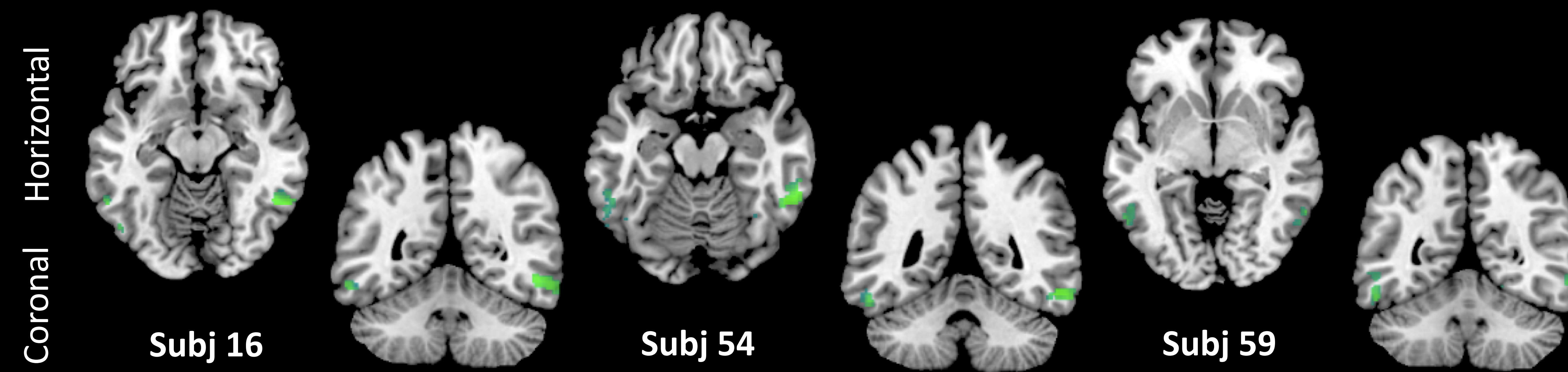
Though it remains unclear how memory is shaped by the interaction of sleep physiology and waking memory-associated recapitulation in the broad regions we used here.

Future analyses, including finer-grained analyses of sleep oscillatory activity and greater anatomical specificity, may help clarify this association.

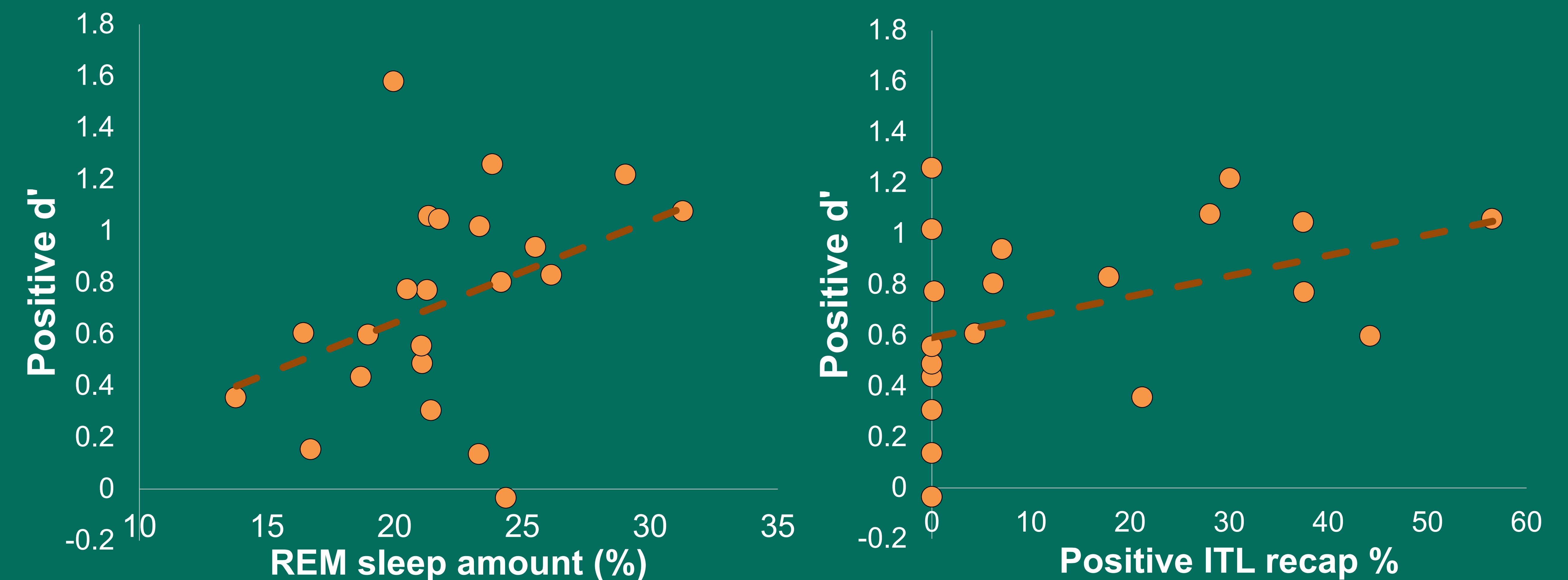
References 1.Nishida et al. 2009, *Cereb Cortex* | 2.Bowen & Kensinger 2018, *Cortex* | 3.Iber 2007, *AASM*

Results

Representative single-subject inferior temporal lobe (ITL) recapitulation maps during positive memory retrieval



Multiple linear regression showed that positive memory performance (d') was predicted by REM sleep and recapitulation (recap%) in the ITL



Regression Equations:

Pos $d' = 0.681 + 3.971$ (REM%) + 0.008 (ITL Recap%)

Neg $d' = n.s.$

Neu $d' = n.s.$