ERS Predicts Memory Vividness and Precision in Different Brain Regions

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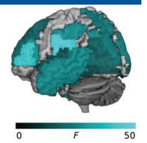
Background

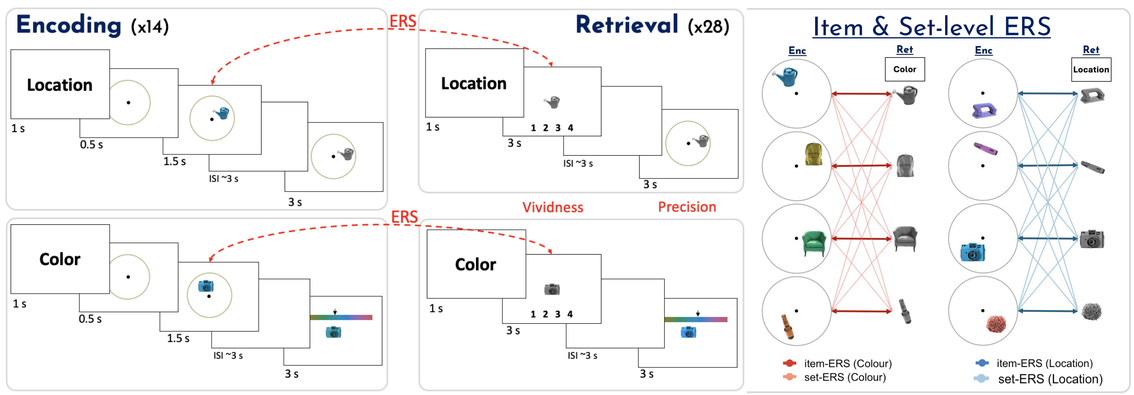


- Encoding-Retrieval Similarity (ERS) in frontal and parietal regions are often indicated to predict memory success
- However, all the previous studies used recognition memory test, without probing the contribution of neural reinstatement to different attributes of memory

Research Question

- How does trial-by-trial neural reinstatement probe different attributes of memory such as vividness and precision?
- Is this effect general or distinct across different target memory features such as colour and location?

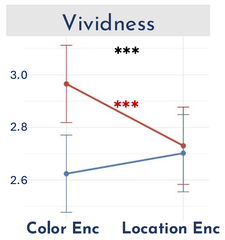
Methods



- Subject N=40, n_Trial = 336
- Item and set-level ERS calculated within block (12 blocks in total)
- Set-level ERS calculated as the mean of similarity between the retrieval trial of one item and the encoding trials of all other items (of same condition & memory quality)

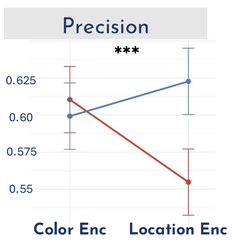
Results (item-Specific ERS ∝ Memory quality in different attributes)

Behavioural results

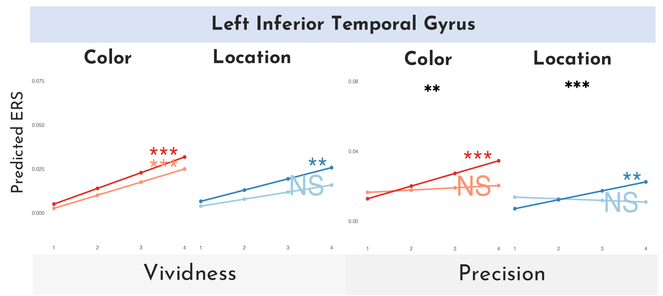


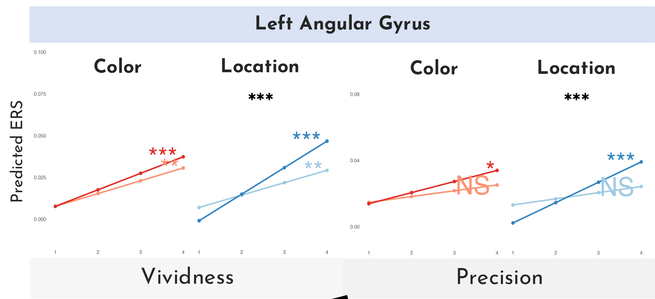
***: Task match between Enc & Ret impacts vividness and precision

***: Colour memory has higher vividness than location memory



*Precision calculated as $e^{-Error*\pi/180}$. This converts error between 0 to 180° to precision between 1 and 0





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Significant Memory × ERS-level interaction for this Attribute & Feature

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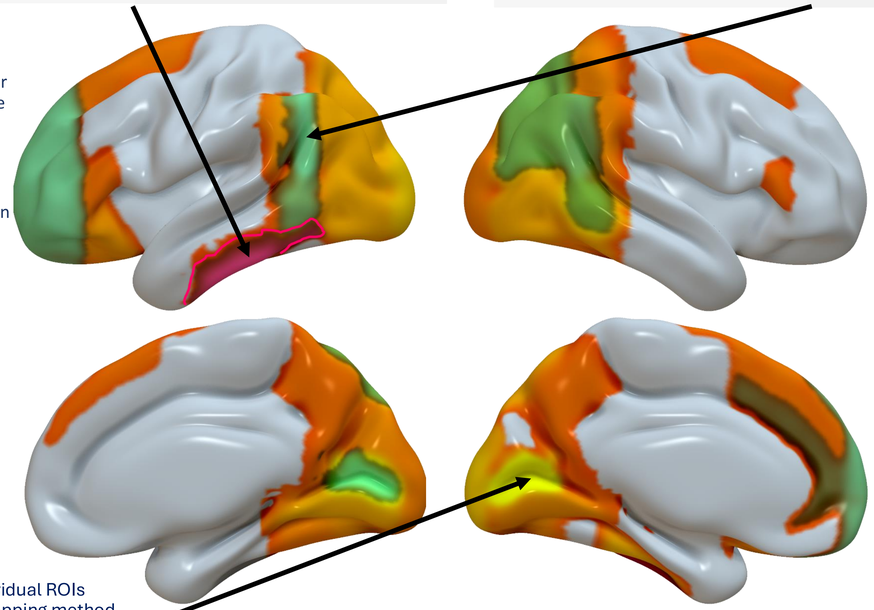
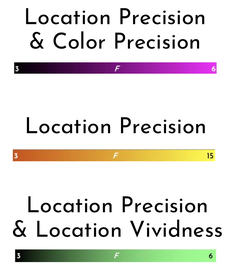
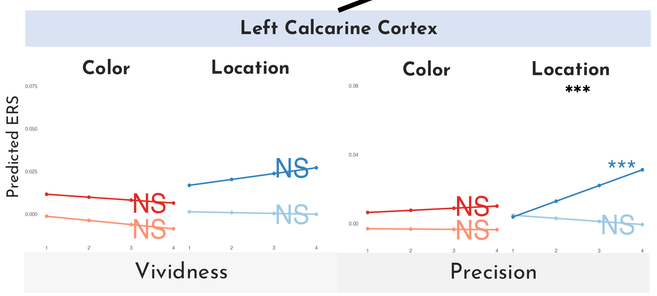
Significant effect of item- or set-level ERS on memory of color or location





*Significance for individual ROIs estimated by bootstrapping method



Conclusion

- The relation between item-specific neural reinstatement and memory performance differs depending on stimulus feature (color vs. location) and memory measure (vividness vs. precision)
- Item-ERS effects on memory that were specific for location were found in several regions, but the only item-ERS effect on memory for color was not specific for color. Further research on the specificity of color is warranted

References
Ritchey, M., Wing, E. A., LaBar, K. S., & Cabeza, R. (2013). Neural similarity between encoding and retrieval is related to memory via hippocampal interactions. *Cerebral cortex*, *23*(12), 2818-2828.
Wing, E. A., Ritchey, M., & Cabeza, R. (2015). Reinstatement of individual past events revealed by the similarity of distributed activation patterns during encoding and retrieval. *Journal of cognitive neuroscience*, *27*(4), 679-691.

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