



Angular gyrus and precuneus jointly support memory vividness during retrieval

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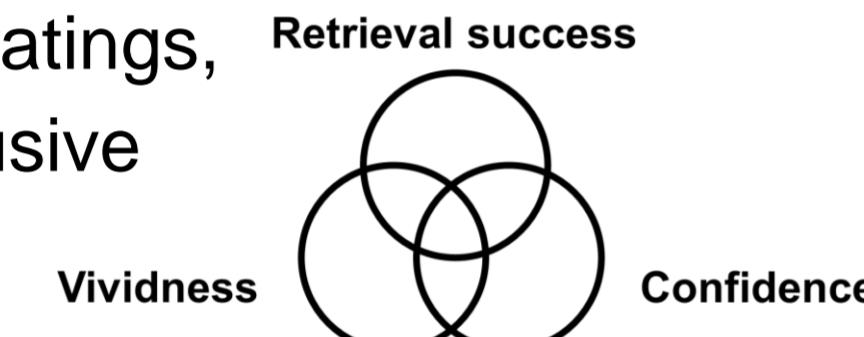
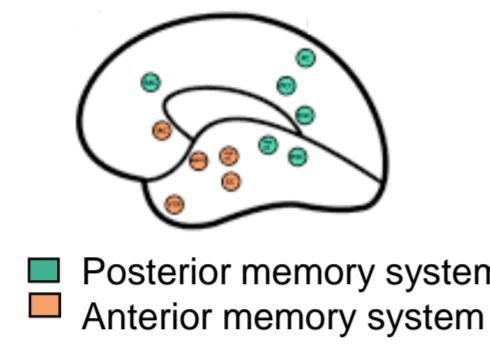
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Introduction

- Posterior memory system contributes to episodic memory and recollection
- Previous researches have implicated the posterior parietal cortex, especially **angular gyrus** and **precuneus**, in subjective aspects of memory processes (Richter et al., 2016; Ye et al., 2018; Wynn et al., 2018)
- The relationship between two subjective mnemonic experience, namely vividness and confidence ratings, remains inconclusive
- Here we test whether confidence ratings is dependent on self-sensed vividness during retrieval and how angular gyrus is involved in subjective components of memory retrieval using repetitive transcranial magnetic stimulation (rTMS)
- Meta-d'/d'** (**meta-efficiency**) -- how well is confidence rating in tracking memory performance
- Vivid-d'/d'** (**vivid-efficiency**) -- how well is vividness rating in predicting memory performance



Hypotheses

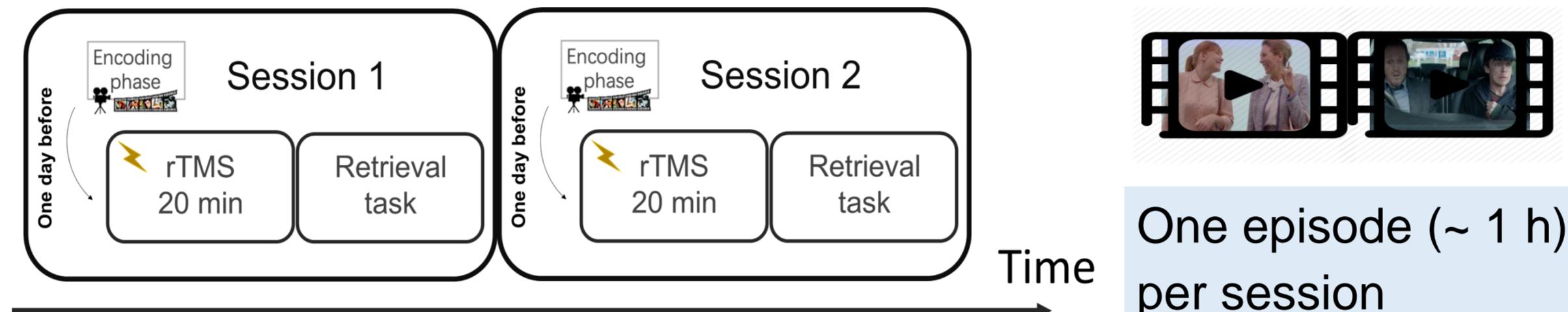
- The relationship between vividness ratings and confidence ratings is dissociable;
- Angular gyrus plays a role in the vividness component during retrieval.

References

- Richter FR, Cooper RA, Bays PM, Simons JS (2016) Distinct neural mechanisms underlie the success, precision, and vividness of episodic memory. *eLife* 5:e18260.
- Ye Q, Zou F, Lau H, Yu Y, Kwok SC (2018) Causal evidence for mnemonic metacognition in human precuneus. *J Neurosci* 38:6379–6387
- Wynn SC, Hendriks MPH, Daselaar SM, Kessels RPC, Schutter DJLG (2018) The posterior parietal cortex and subjectively perceived confidence during memory retrieval. *Learn. Mem.* 25: 382–389

Experimental design

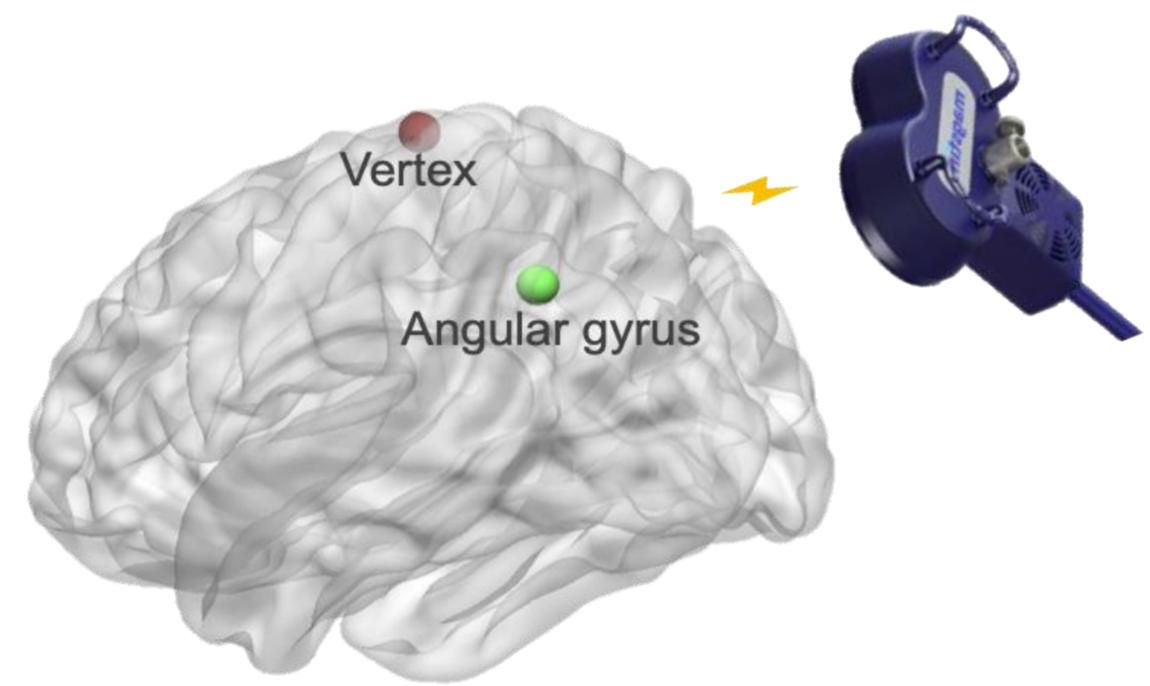
Overview



Encoding



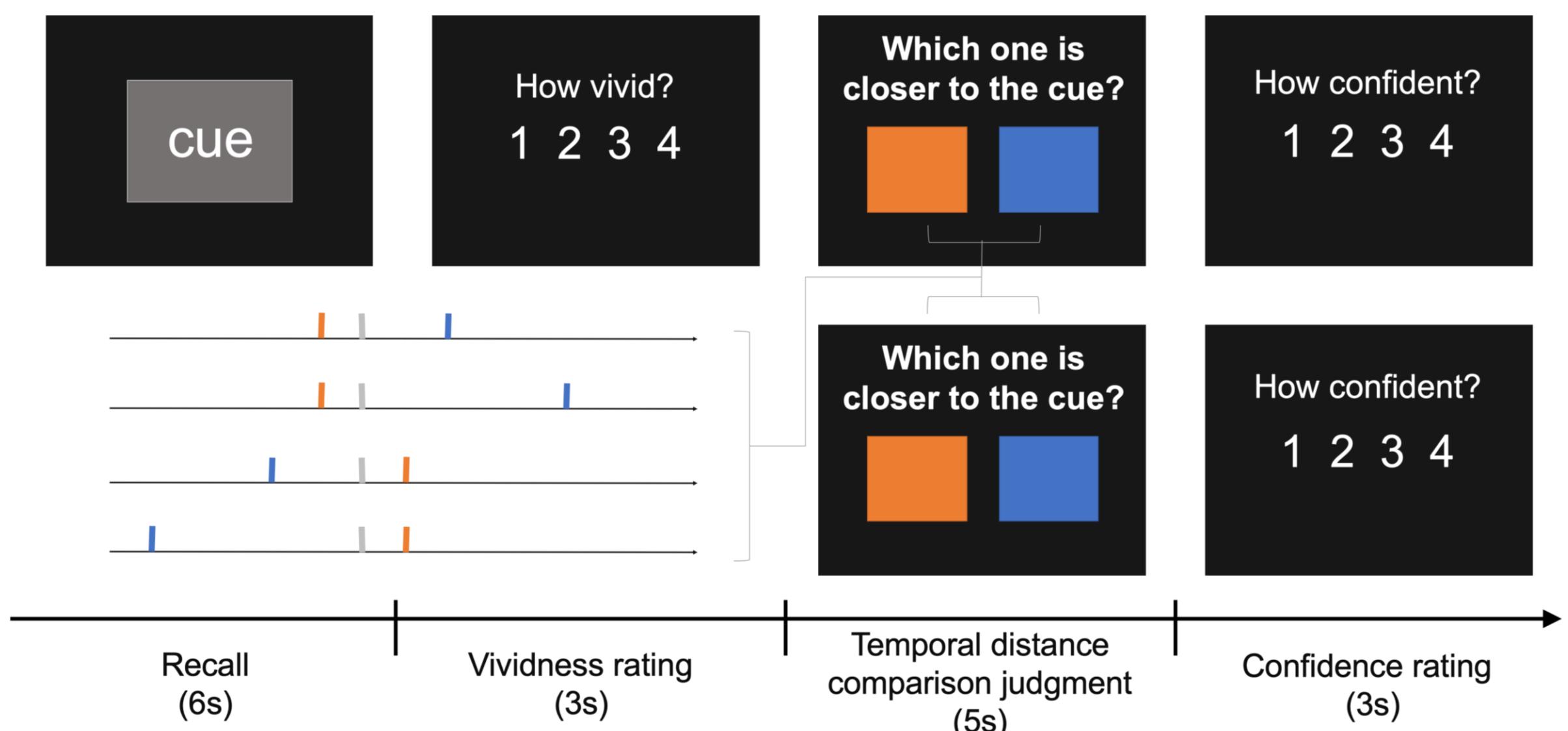
One episode (~ 1 h)
per session



TMS protocol

- 1Hz, 20-min rTMS (1200 pulses in total) at 110% of active motor threshold
- Angular gyrus (AnG) MNI coordinates: x=-43, y=-66, z=38

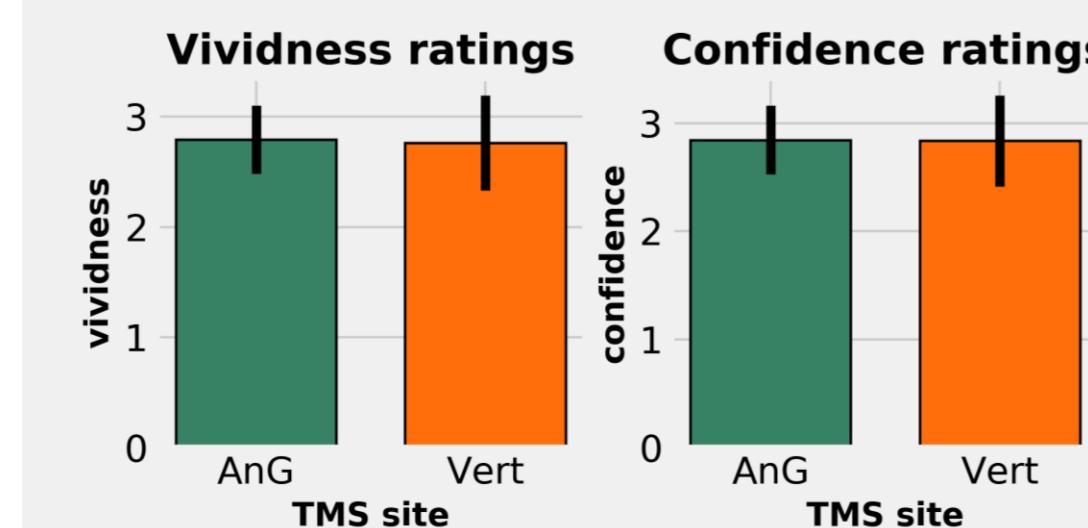
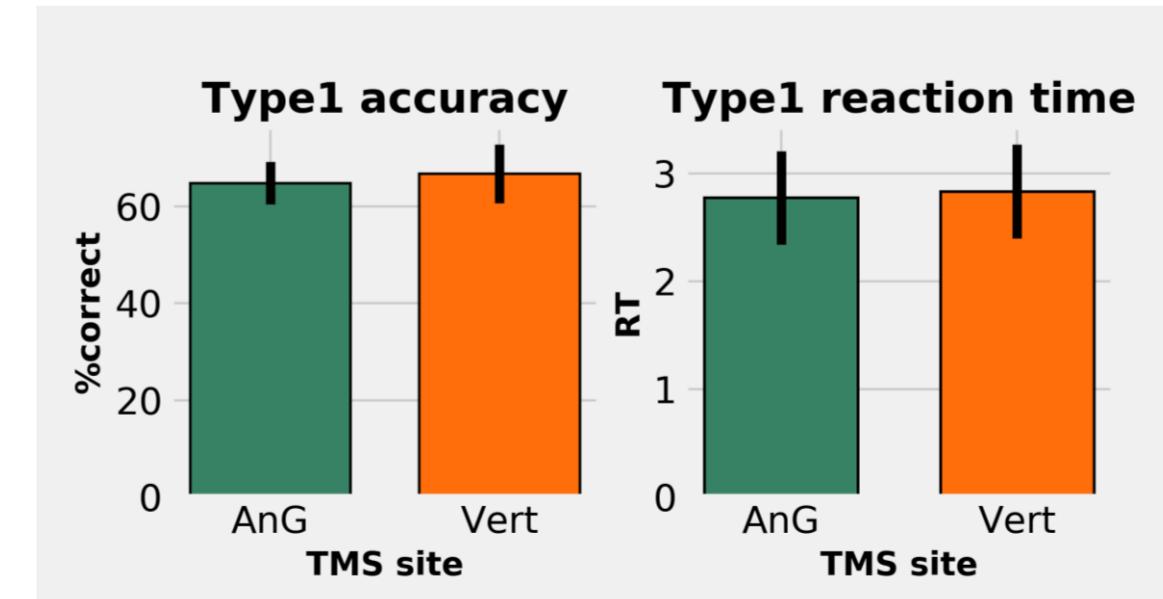
Retrieval task



Basic performance

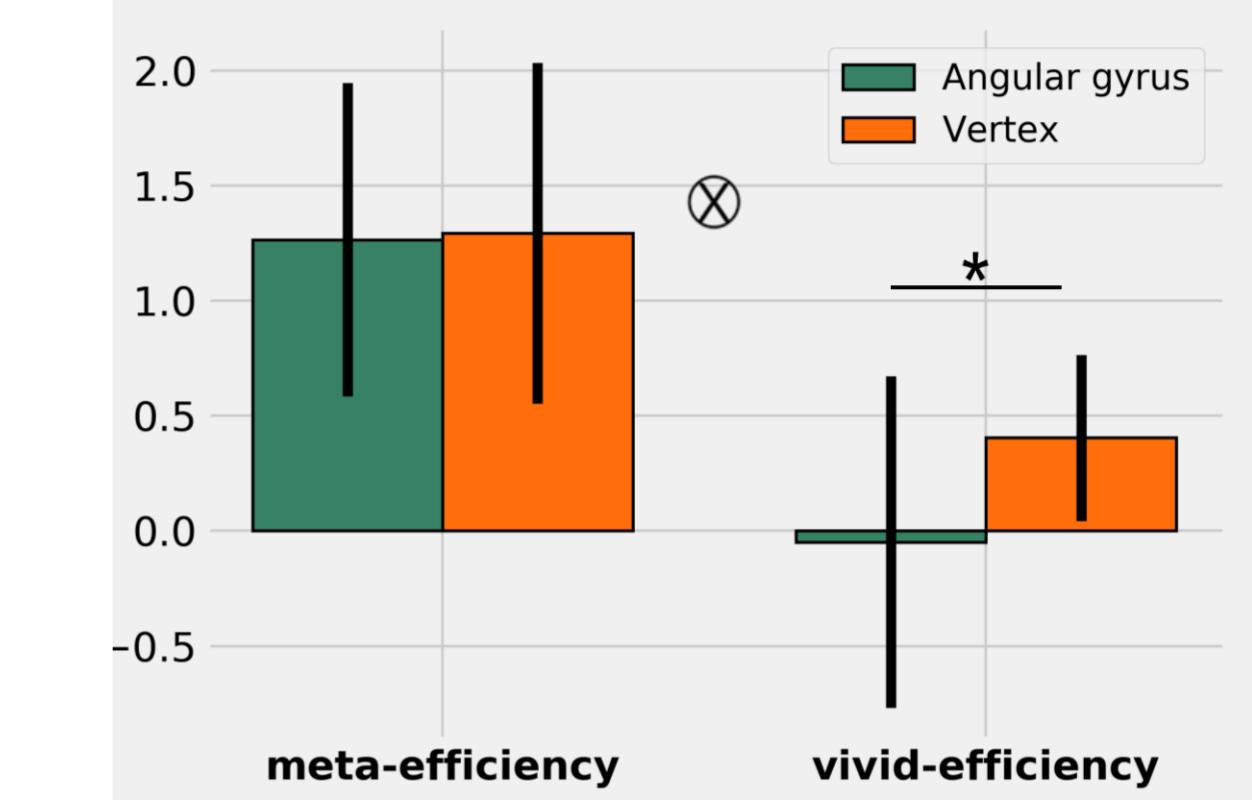
20 healthy young adults tested (11 females, 9 males)

Memory task (type1) accuracy and reaction time were not affected by TMS
 ➤ AnG: Accuracy=64.86%; RT=2.77;
 ➤ Vert: Accuracy=66.81%; RT= 2.84

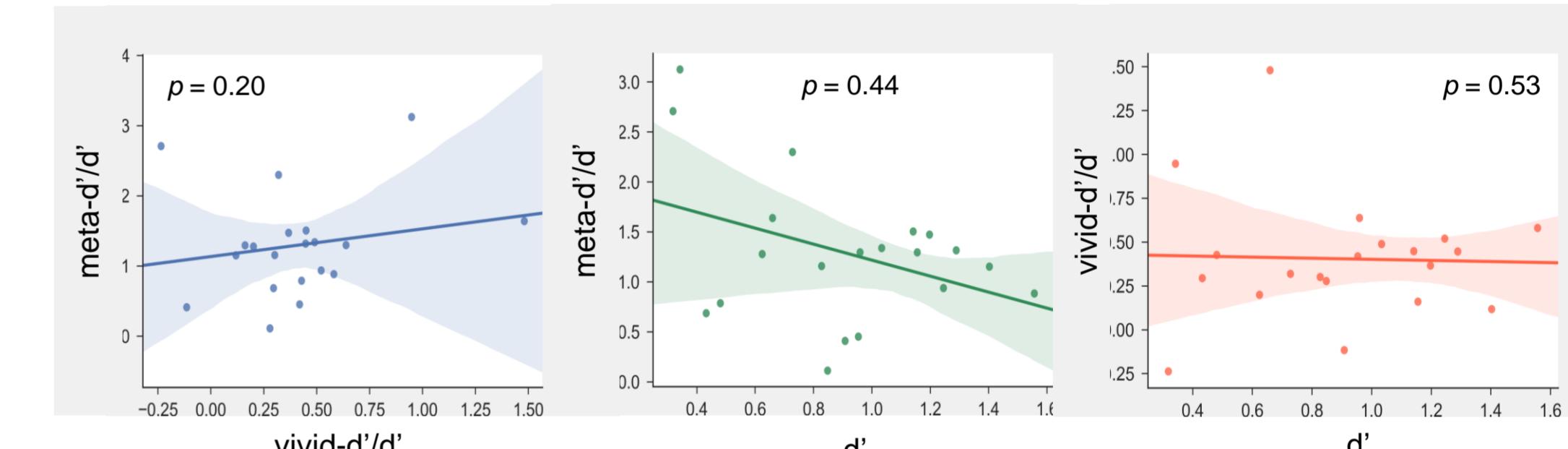


Mean levels of vividness and confidence ratings were intact after TMS
 ➤ AnG: vivid=2.79; RT=2.85;
 ➤ Vert: vivid=2.76; RT= 2.84

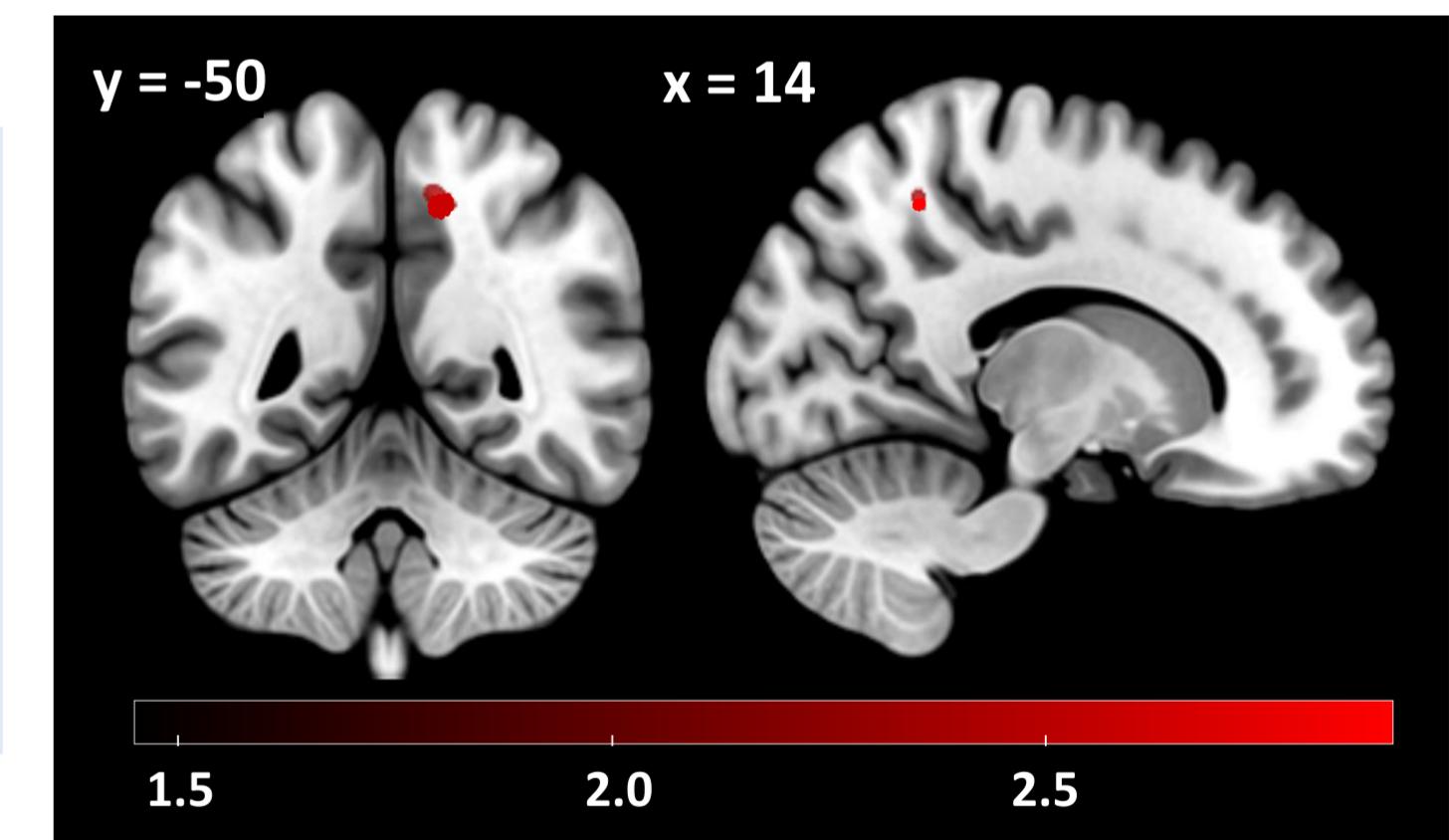
Results



Inhibition to AnG significantly reduces the efficiency of vividness ratings, albeit without affecting meta-efficiency



Relationship between three measures of retrieval performance

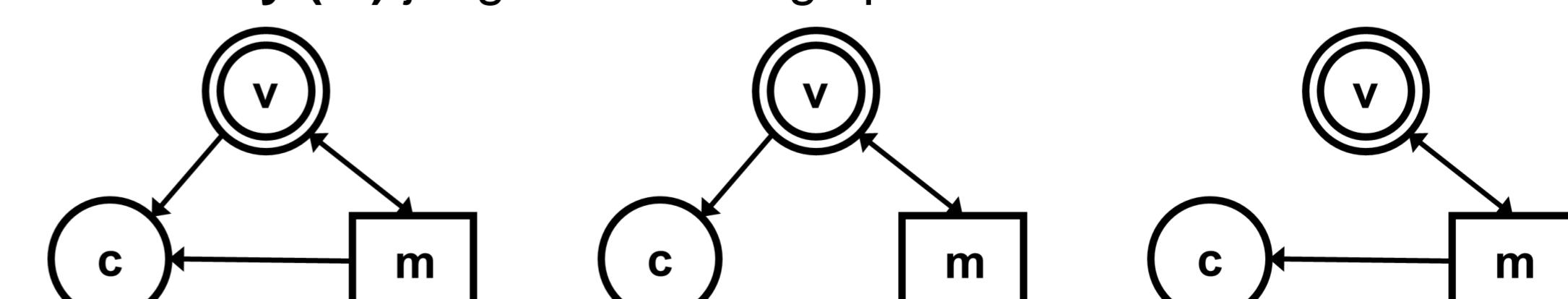


Gray matter density correlates with vividness efficiency in the precuneus ($x=14$, $y=-50$, $z=51$)

$p < .05$, FWE corrected at the cluster level

Discussion

- Sub-regions of posterior memory network jointly support subjective evaluation of our memory quality
- There is a dissociation between vividness and confidence ratings
- Three potential models for **vividness (v)**, **confidence (c)** and **memory (m)** judgments during episodic retrieval:



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