Do perturbations to primary visual cortex impact visual working memory?

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#VV22

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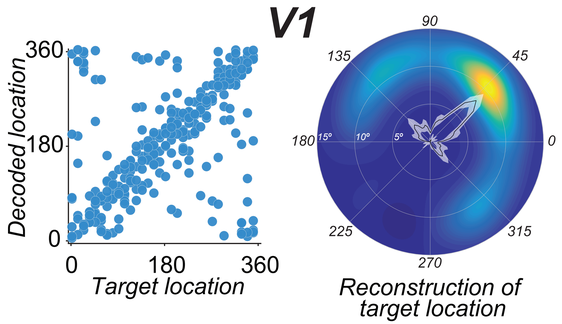
Let's connect!

Background



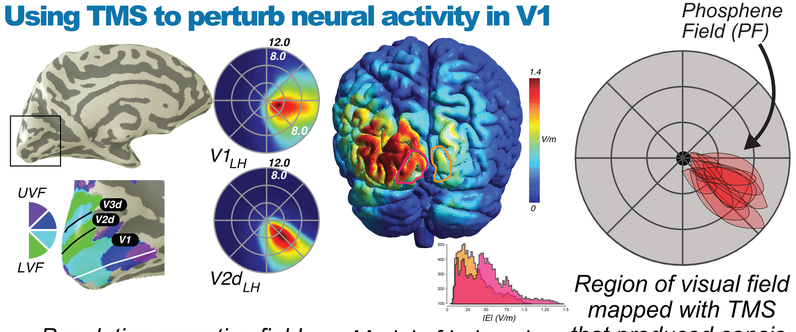
The content of visual WM can be decoded & reconstructed from patterns of activity in V1

Li, Sprague, Ma, Curtis, 2021 Neuron *Rahmati, Saber,Curtis, 2019 J Cog Neurosci*

Question

Is primary visual cortex actually necessary for working memory?

Using TMS to perturb neural activity in V1



Population receptive field (pRF) mapping to identify V1

Model of induced electric field from TMS to V1 target

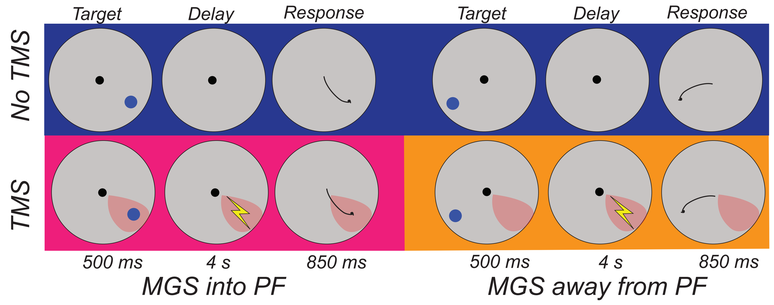
Region of visual field mapped with TMS that produced consistent phosphenes, which were used to place WM targets

Mackey, Winawer, Curtis, 2016 eLife *Thielscher, et al. 2015 IEEE EMBC*

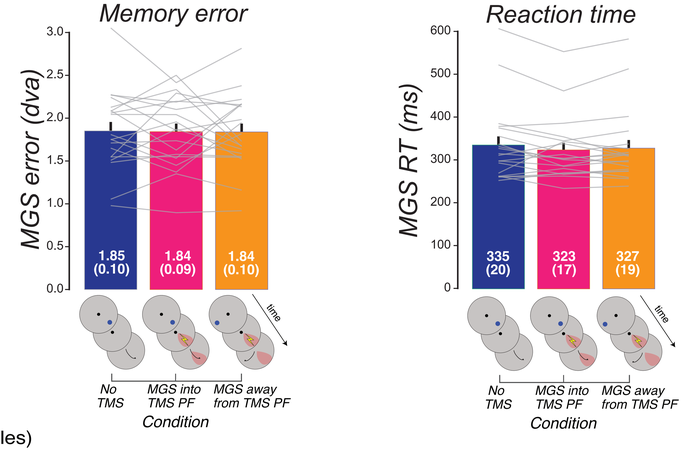
Highlights

Despite confirmed TMS perturbation of V1, visual WM behavior was uneffected.

Memory-Guided Saccade (MGS) Task

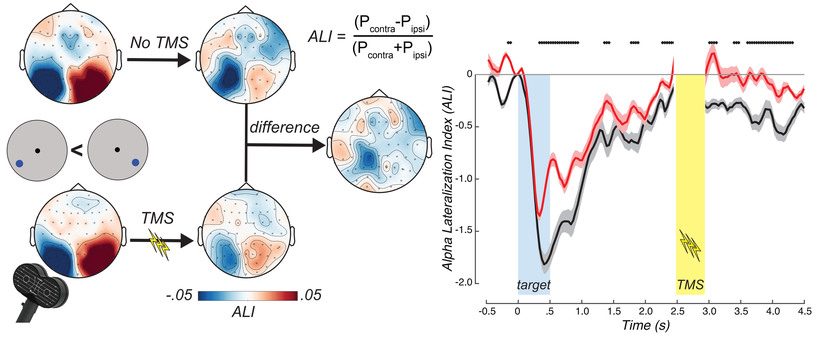


TMS to V1 does not impact WM performance



N = 20
(8 females)

TMS disrupts lateralization of alpha over occipital cortex



Alpha power desynchronizes in hemisphere contralateral to target.

TMS impacts this desychronization when applied to V1 during the delay.

Note however, that at the very end of the delay, the lateralization of alpha begins to reform.

Conclusions

Uncertainty about null effect offset by

a. *TMS evoked phosphenes in part of map containing WM targets*
b. *Model of TMS indicates large electric field evoked in V1*
c. *TMS disrupted EEG signature of WM*

How do we explain precise aspects of WM can be decoded from V1?

Perhaps V1 acts as a visual workspace for WM, if erased, the contents of memory can be rewritten. Assumes WM content stored outside of V1

Perhaps distributed nature of WM makes it resilient to perturbation

Support

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