Modeling the Structure of the Visual Working Memory Resource Limits

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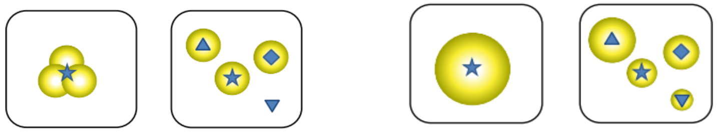
Background

- Visual working memory (WM): limited online sensory infomation[1].
- Debates on its structure of limit[2]:



Discrete-resource models
Limited slots (capacity)
Mixture Model

Continuous-resource models
No slot limit (precision ~ resource)
Variable Precision (VP) Model

- Parietal cortex lesions impair WM precision[3].

Question

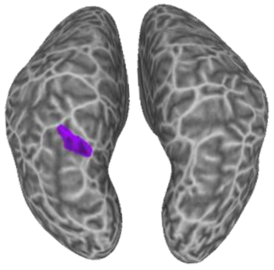
What's the nature of WM resource limit?
- Hypo: no slot (capacity) limit

How interrupting parietal neural activity affects WM?
- Hypo: the resource overall, not its consistency

Method

Population Receptive Field Mapping

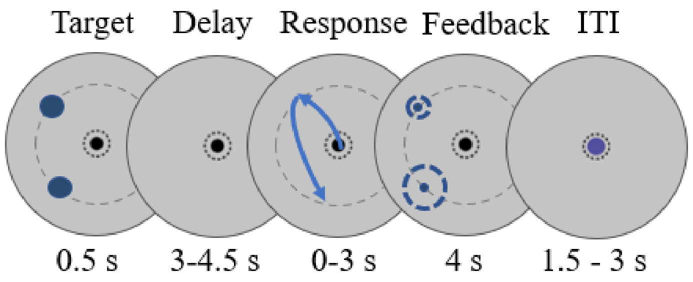
- Link visual field to cortical position that evokes the largest response
- Siemens Allegra 3T scanner.
- **Parietal Cortex: IPS2** etc.



Method

Participants: 20 (10 males and females) subjects

Task: Memory guide saccade (MGS) task:



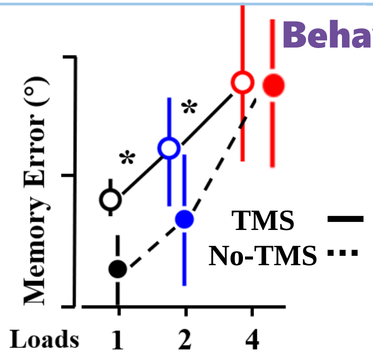
Independent Variable:

- WM loads (target number, 1, 2, or 4)
- Transcranial magnetic stimulation (TMS) or not.

Dependent Variable: Error (° in angle)

TMS: 1 train of 7 20Hz pulses during the delay.

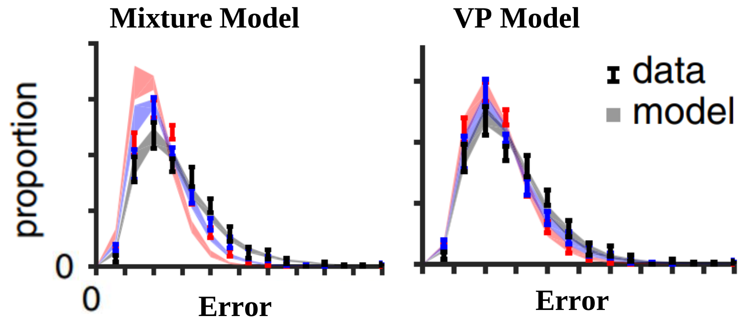
Behavioral Result



2 x 3 RM ANOVA

- TMS impair memory, $p < .05$
- WM loads increase error, $p < .05$
- Interaction, $p < .05$.

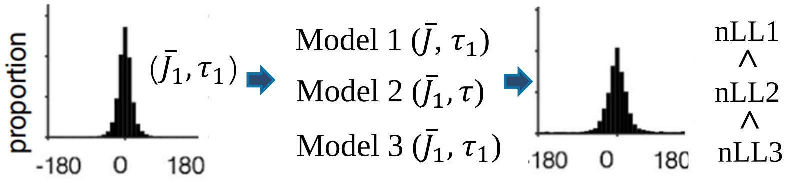
Test Slot Limit[4]



Lower BIC, AIC, nLL, better fitting:

- VP outperforms Mixture Model (aggregate)
- VP outperforms All-guessing Model (separate response on load 4)

Test Param Subject to Parietal Impairment[5]



$\bar{J}$ is more subject to parietal neual interruption than τ

Reference

[1]Baddeley (2003). https://doi.org/10.1038/nrn1201
[2]Ma et al. (2014). https://doi.org/10.1038/nn.3655
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