# Causal parietal contributions to working memory and visual attention interactions

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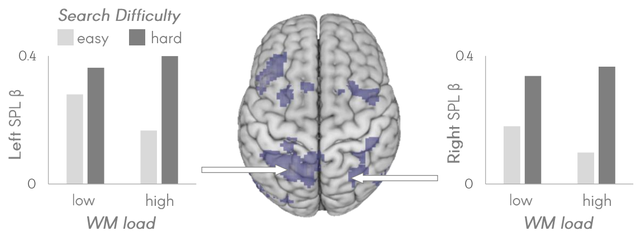
## WM and attention demands can impact one another

Working memory (WM) and visual attention load demands produce an interaction in distributed cortical regions [1]




Degree of neural interaction in superior parietal lobule (SPL) activation peaks relates to behavioral performance measures


And that relationship differs for left and right parietal regions

## Do left and right parietal cortex play distinct *causal* roles in dual-task WM-visual search performance?

Left and right hemispheric dominance have been displayed for working memory and visual attention processes respectively [2]

Left and right posterior parietal cortex make dissociable causal contributions to control over WM-visual search relationship [3]

## References

Kiyonaga A, Dowd EW, & Egner T. Neural representation of working memory content is modulated by visual attentional demand. *Submitted.*

Corballis PM (2003). Visuospatial processing and the right hemisphere interpreter. Brain and Cognition, 53, 171-176.

Kiyonaga A, Korb F, Lucas J, Soto D, & Egner T (2014). Dissociable causal roles for left and right parietal cortex in controlling attentional biases from working memory. *NeuroImage, 100,* 200-205

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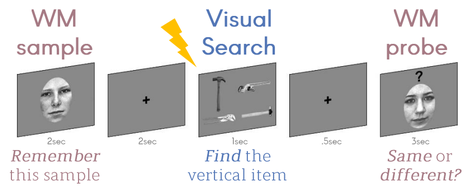
## Current Approach

Use TMS to perturb activity in left and right parietal regions that exhibit interaction between demands (plus vertex control site) to asses causal role of those regions in WM-visual attention interaction

Combine levels of WM and visual attention load in delayed match-to-sample task (n=13)

Deliver 5 pulses of ***online*** TMS at 10Hz during delay-spanning search task

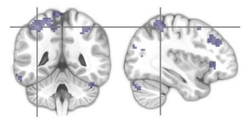
## Dual-Task Paradigm



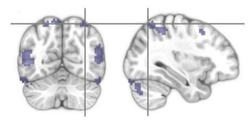


## TMS Targets

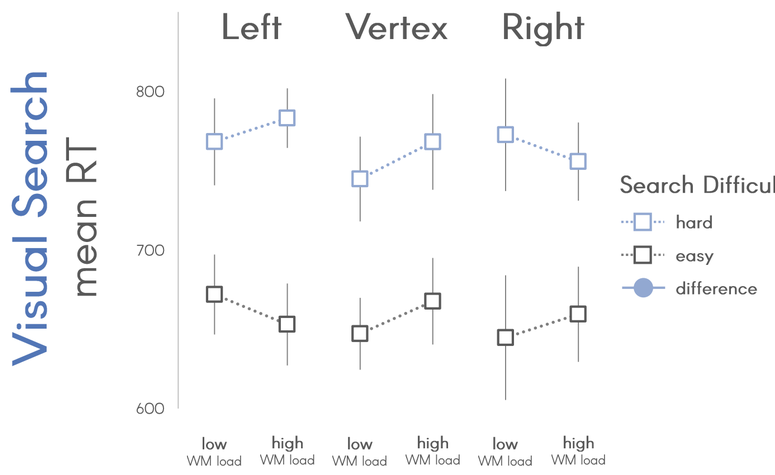
Left SPL -36, -46, 55

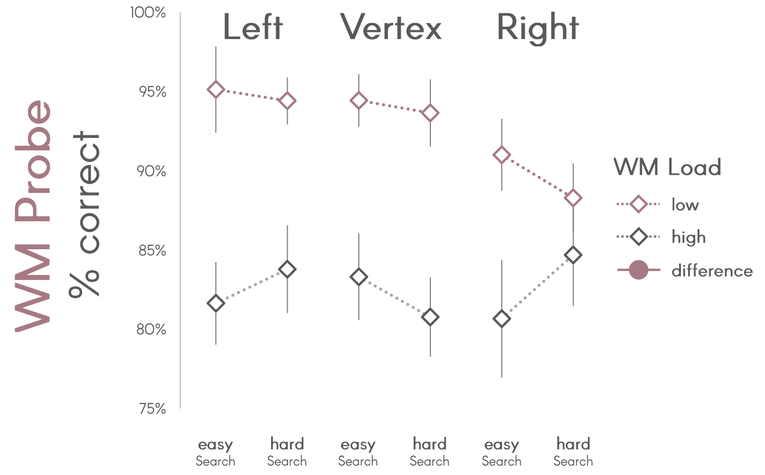


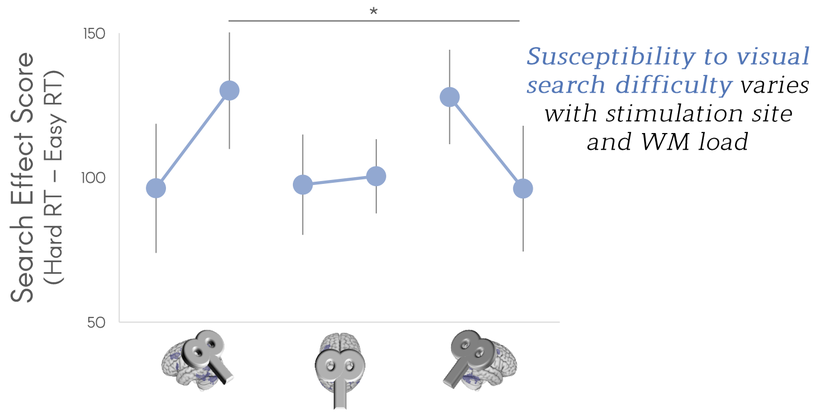
Right SPL 33, -64, 61



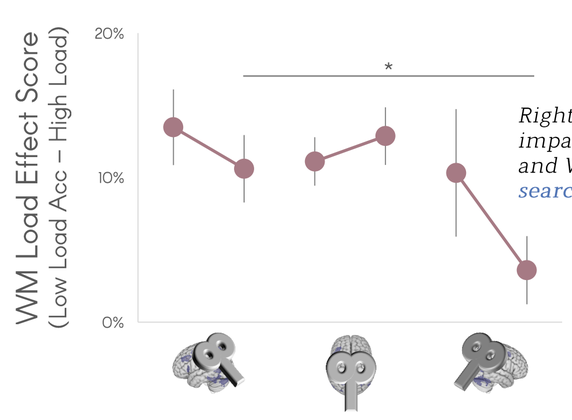
## Left and right parietal TMS differentially impact low and high demand conditions




*Susceptibility to visual search difficulty varies with stimulation site and WM load*




*Right parietal TMS impairs both search and WM when search is harder*

## Summary

Left parietal stimulation impacts search when WM demands are high (visual attention demands are low)

Right parietal impacts search when visual attention demands are high (WM demands are low)

***The combination of simultaneous load demands on WM and visual attention may shift the parietal mechanisms of task performance***