

# Stimulation-Based Control of Working Memory Computations

**Submission ID** 3000184  
**Submission Type** Poster  
**Topic** Cognitive Science  
**Status** Submitted  
**Submitter** Simon Davis  
**Affiliation** Duke University

## SUBMISSION DETAILS

**Presentation Type** Either Poster or Oral Presentation

**Presentation Abstract Summary** The ability to modulate brain activity using targeted neurostimulation is increasingly being employed as a means of enhancing working memory performance. While working memory is typically operationalized as increasing load, numerous computationally complex processes underlie even simple working memory operations like alphabetization. Understanding these computations is essential to understanding how and why brain stimulations protocols succeed. Furthermore, these processes rely on distributed networks performing discrete but interrelated functions. Here we use the network science concept of controllability, which refers to the ability of a single region to shift a global network into a novel brain state. We found that the controllability of the stimulation site predicted the benefit of subsequent online transcranial magnetic stimulation (TMS) during an alphabetization-based working memory task. Second, we found other cortical regions showing increases in activity with increasing computational complexity (number of sorting operations on letter array, distance between letters). Left PFC and right superior parietal cortex also showed increasing functional connectivity with increasing computational complexity, suggesting that increasing computational complexity in the behavioral domain manifests as a more distributed cortical network. Such a model-based approach helps to provide a rational basis for selecting reliable targets in TMS protocols for research and therapy.

**Paper Upload (PDF)** [DavisSW\\_CCN\\_Society\\_Conference\\_abstract.pdf](#)

## Co-author Information

\* Presenting Author

First Name	Last Name	Affiliation	E-mail
Simon *	Davis *	Duke University	simon.davis@duke.edu
Courtney	Crowell	Duke University	courtney.crowell@duke.edu

Lysianne	Beynel	Duke University	lysianne.beynel@duke.edu
Wesley	Lim	Duke University	wesley.lim@duke.edu
Sarah	Lisanby	NIH	sarah.lisanby@nih.gov
Angel	Peterchev	Duke University	angel.peterchev@duke.edu
Bruce	Luber	NIH	bruce.luber@nih.gov
Greg	Appelbaum	Duke University	greg@duke.edu
Roberto	Cabeza	Duke University	cabeza@duke.edu

## Keywords

### Keywords

working memory

network control theory

fMRI

DTI

sorting

connectivity