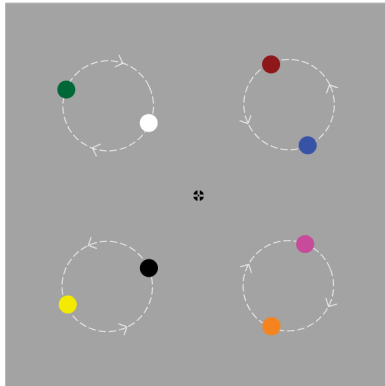


Spatiotemporal Processing Drives Contralateral Delay Activity in a Dual Working Memory and Attentional Tracking Task



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Edward Vogel
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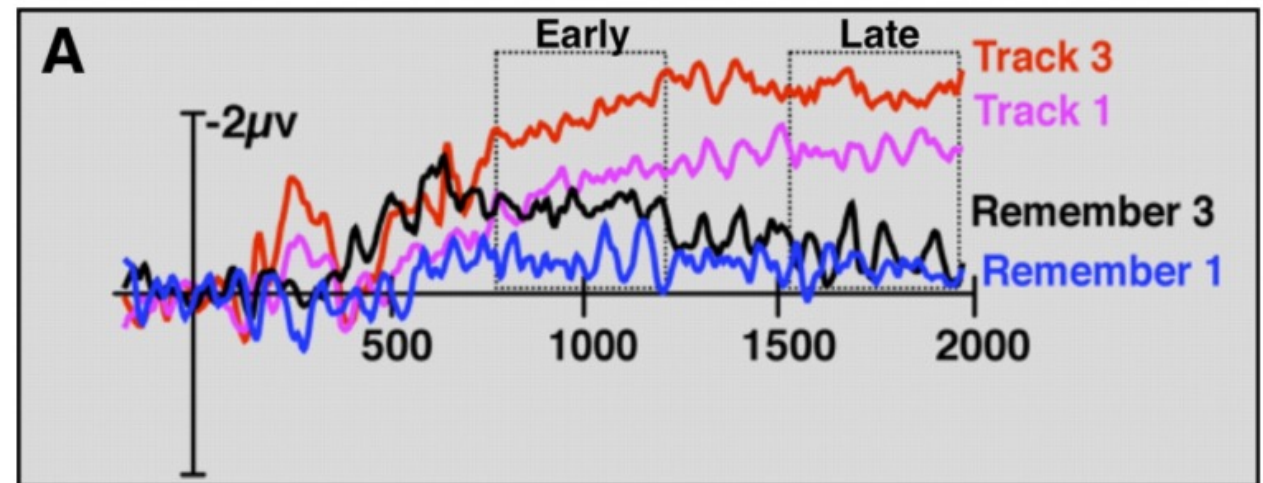
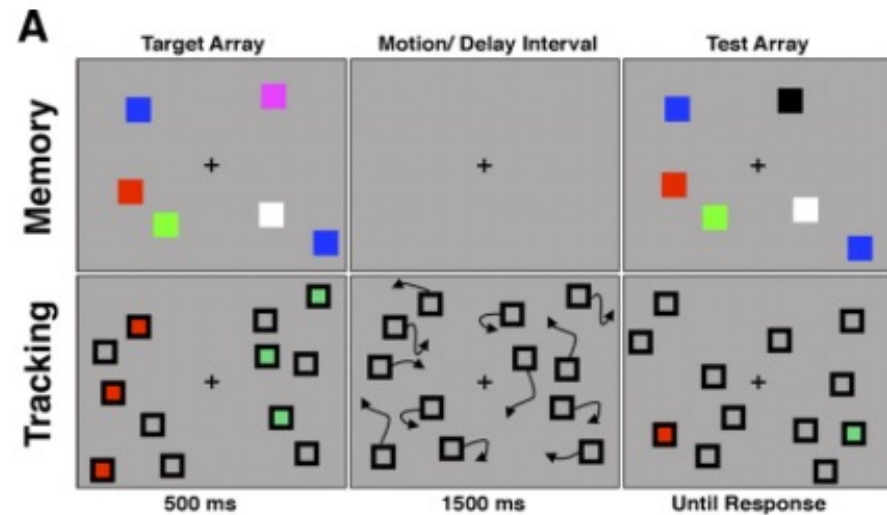
May 19, 2024
St. Pete Beach



Introduction

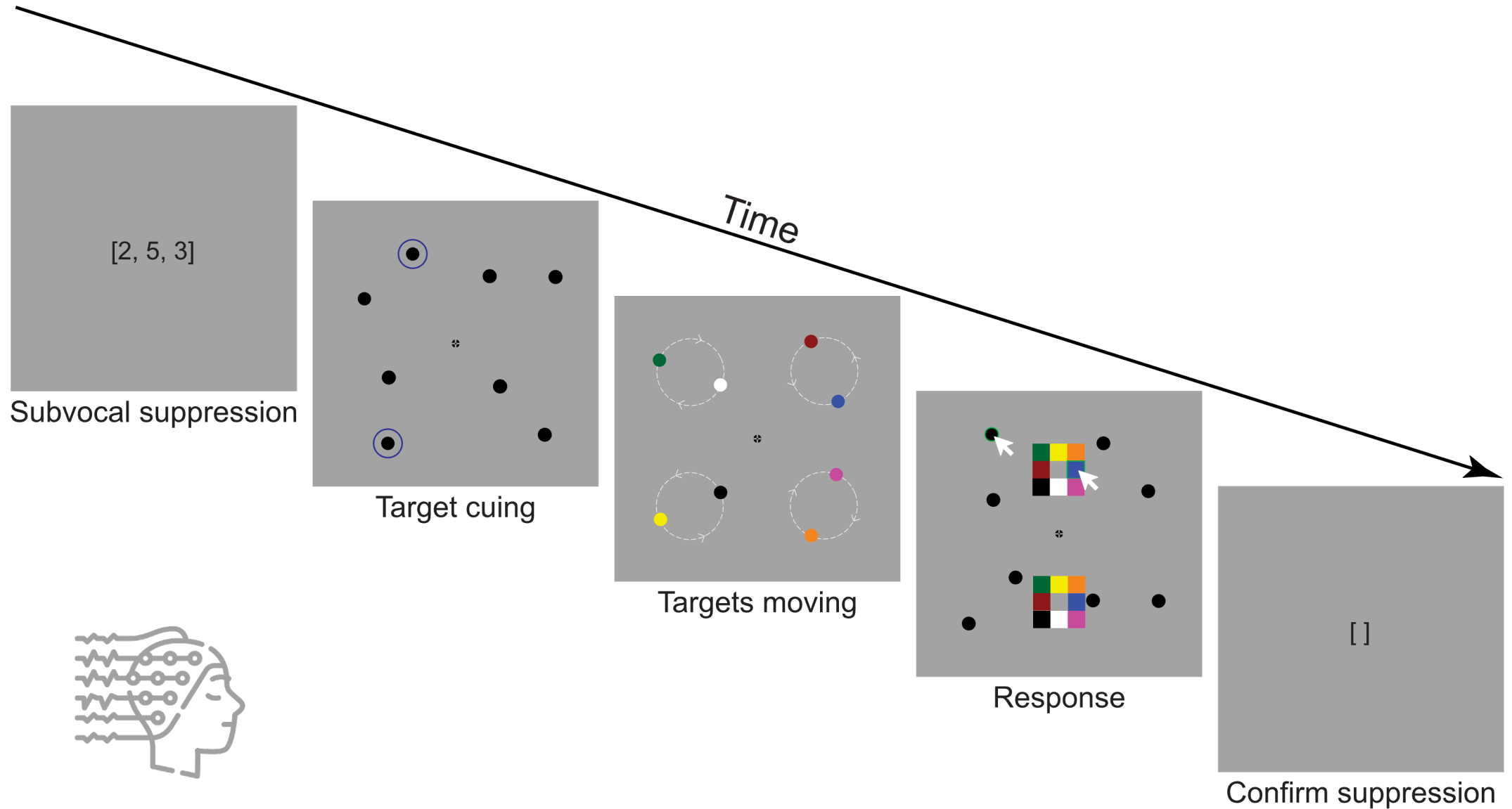
It has been shown that CDA is sensitive to:

- visual working memory load (Vogel & Machizawa, 2004, *Nature*)
- attentional tracking load (Drew & Vogel, 2008, *JoN*)



Drew, Horowitz, Wolfe & Vogel, 2011, *JoN*

Experiment 1 - method



Experiment 1 - method

Attentional tracking only

[click all discs]

1 disc, 2 colors

1 disc, 4 colors

2 discs, 2 colors

2 discs, 4 colors

Attentional tracking and
working memory

[click all discs and all colors]

1 disc, 2 colors

1 disc, 4 colors

2 discs, 2 colors

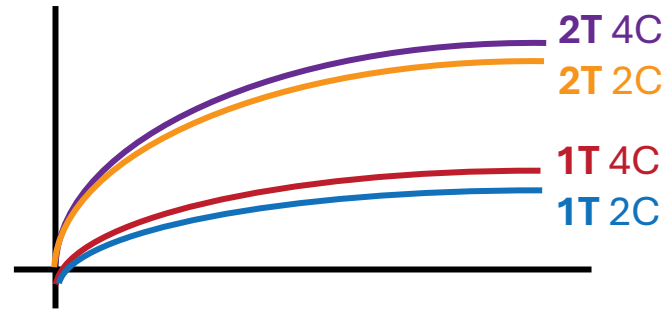
2 discs, 4 colors

96 trials per condition 16 blocks

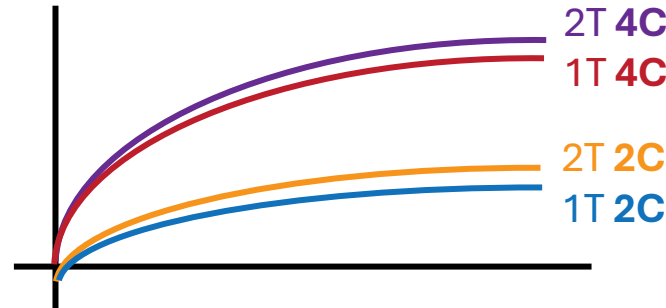
20 participants

Possible patterns of results

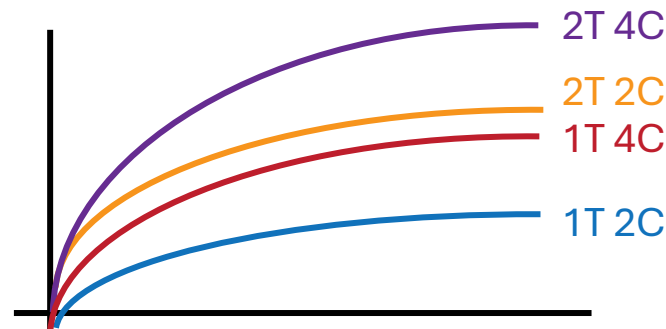
- CDA will reflect mainly attentional tracking load



- CDA will reflect mainly working memory load

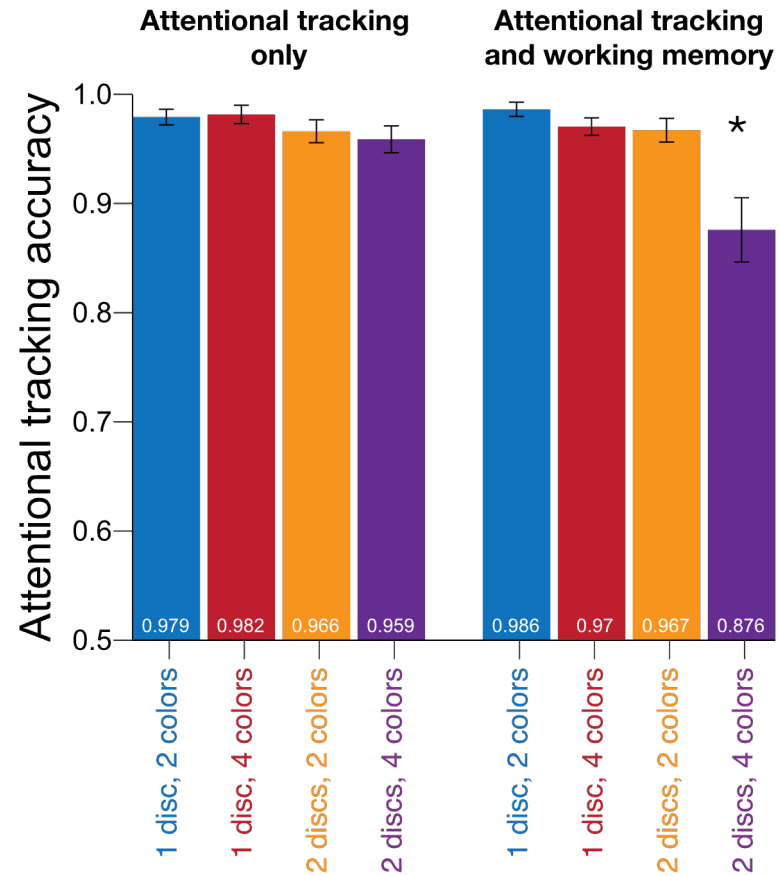


- CDA will reflect combined effect of attentional tracking load and working memory load

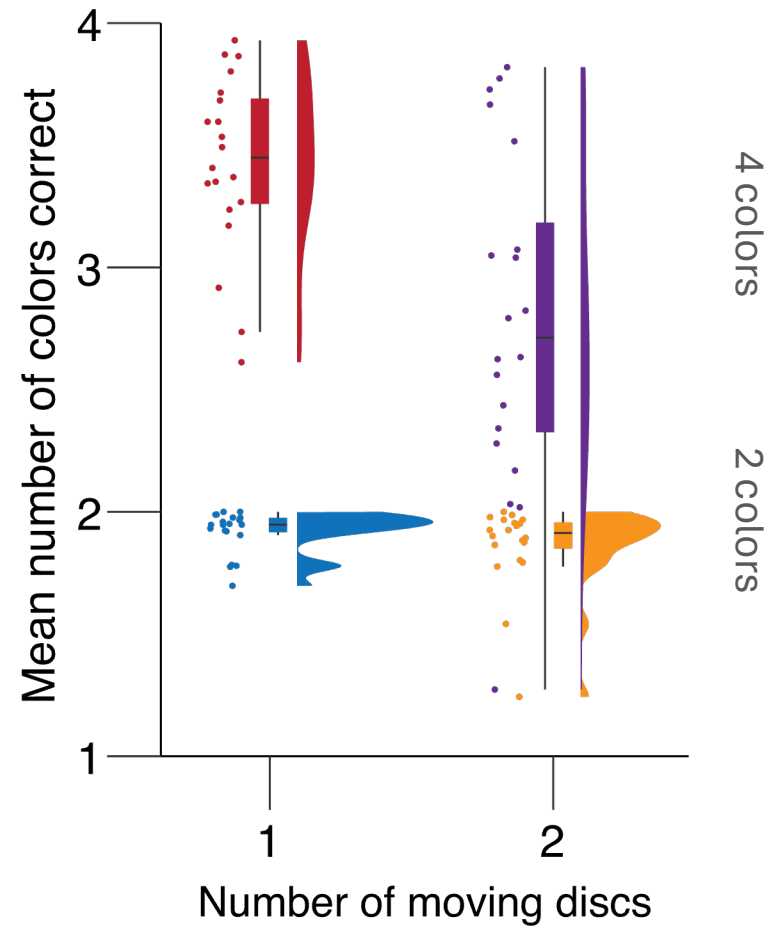


Experiment 1 – behavioral results

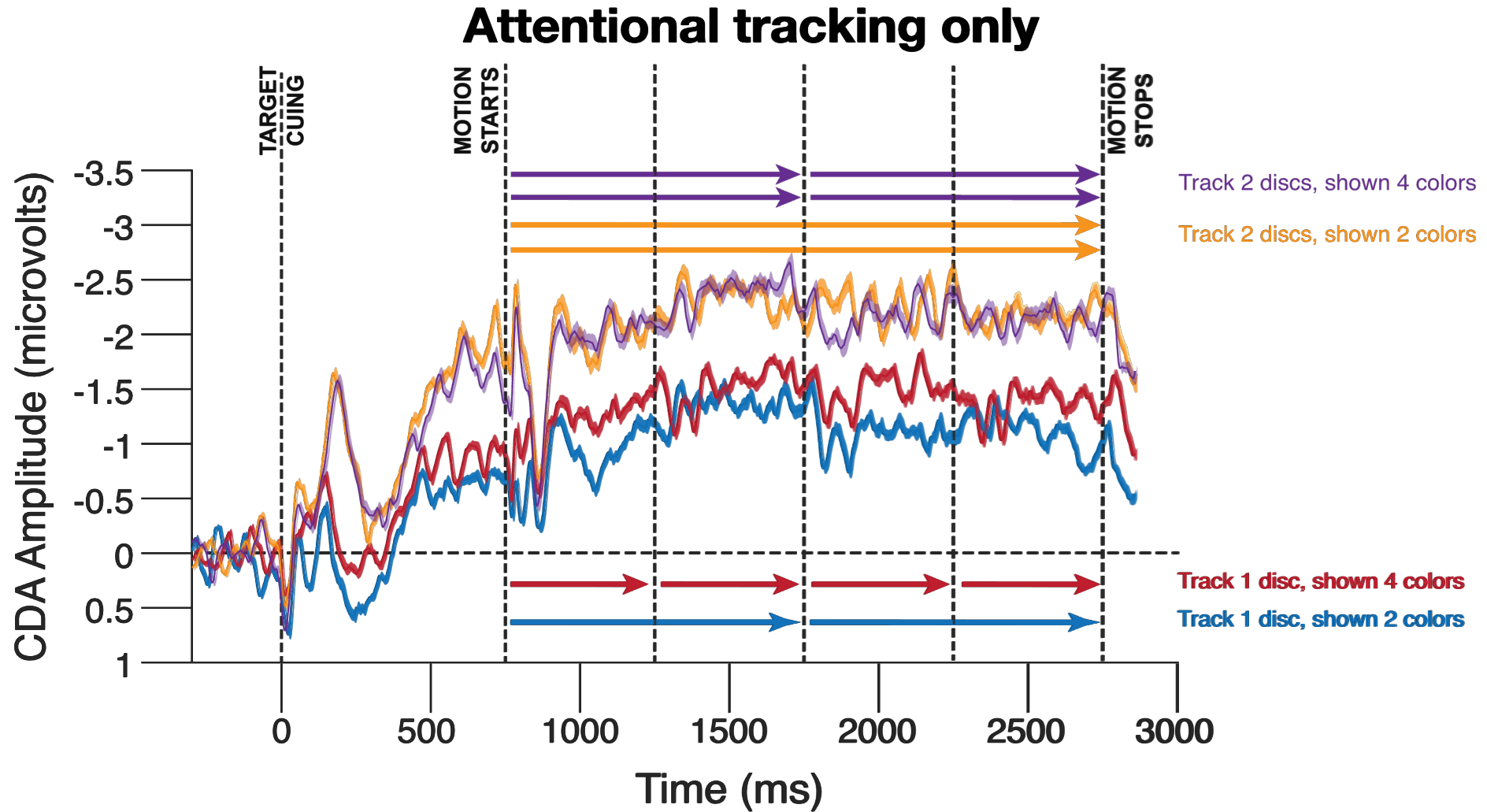
Attentional tracking performance



Working memory performance (number of colors correct)

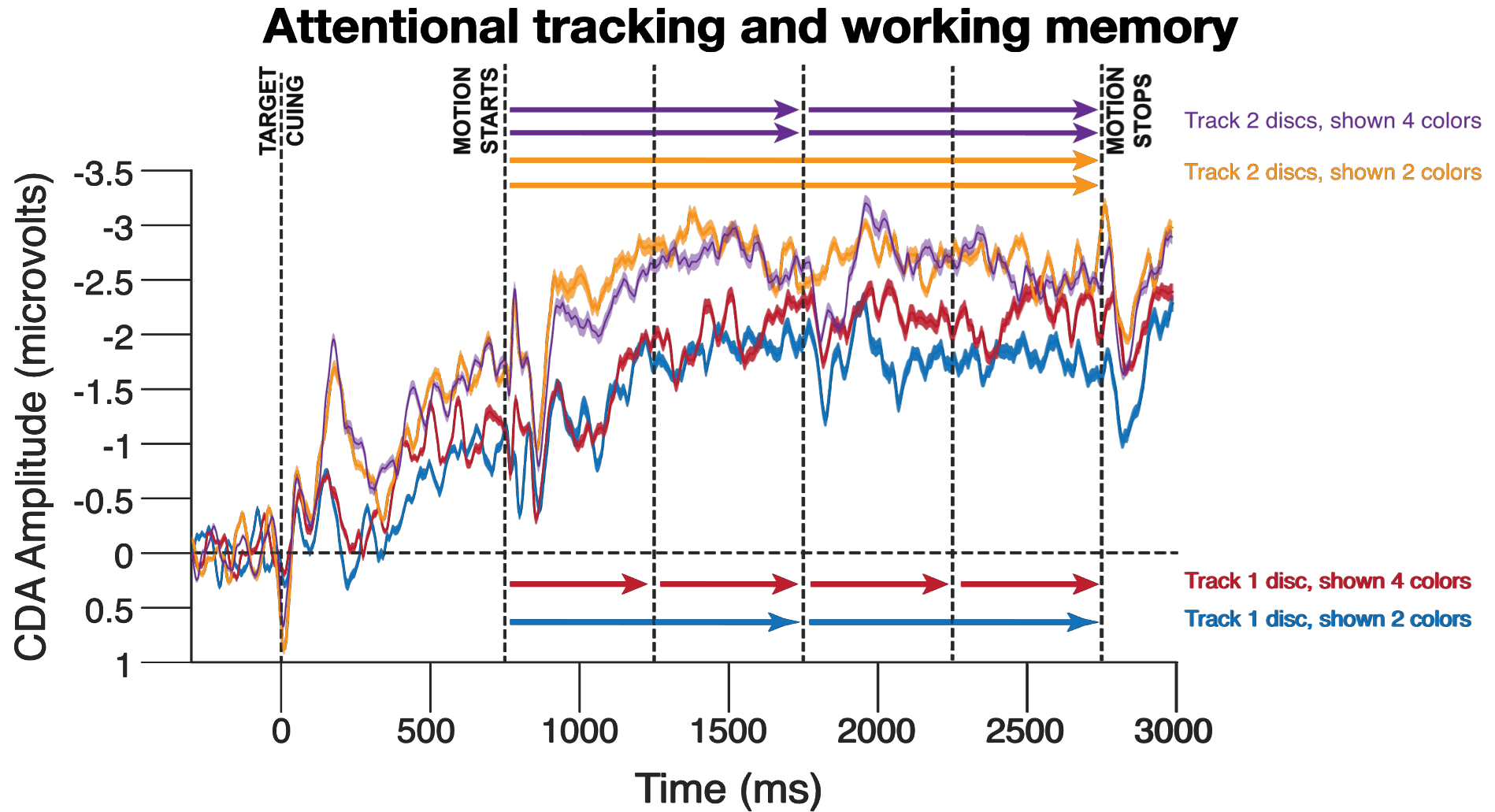


Experiment 1 – EEG results



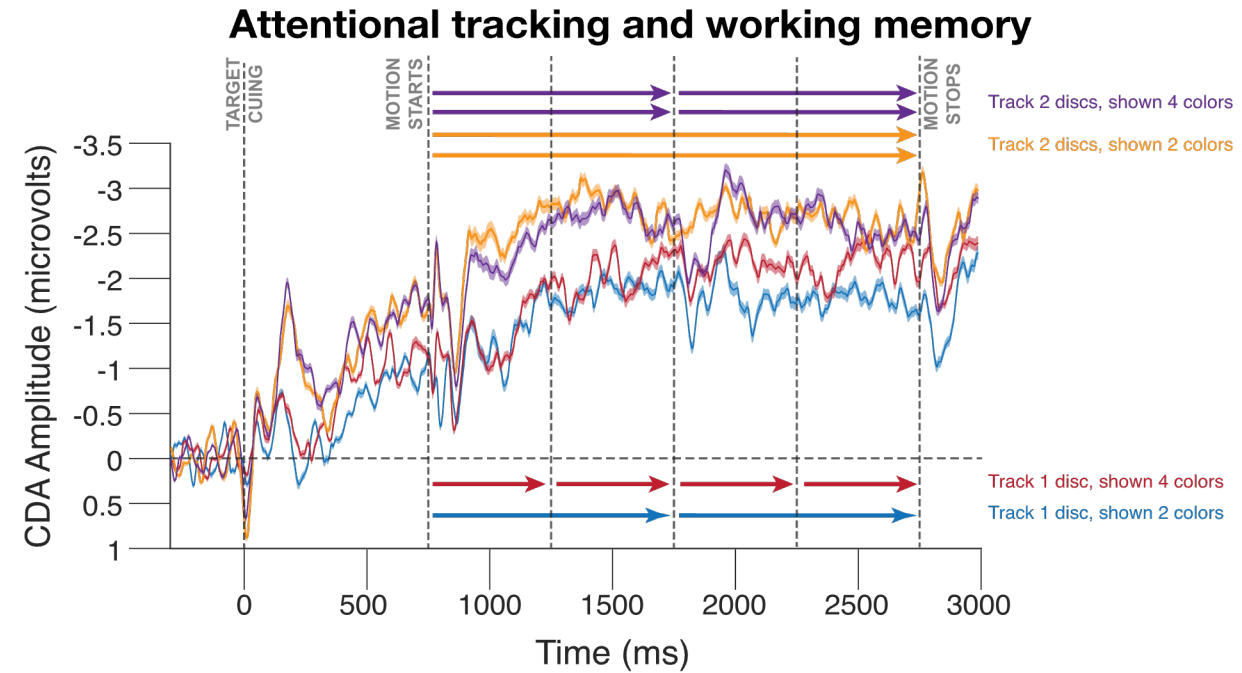
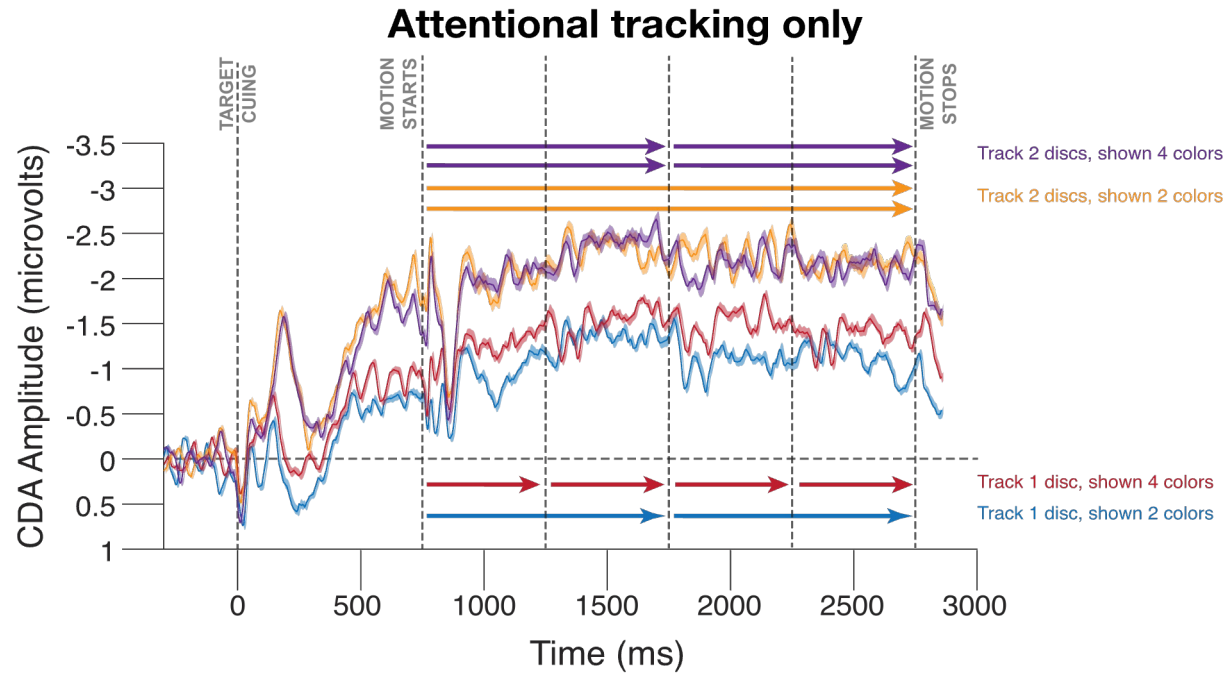
CDA was calculated using the PO3/PO4, PO7/PO8, P3/P4, and P7/P8 electrode pairs

Experiment 1 – EEG results



CDA was calculated using the PO3/PO4, PO7/PO8, P3/P4, and P7/P8 electrode pairs

Experiment 1 – EEG results



CDA was calculated using the PO3/PO4, PO7/PO8, P3/P4, and P7/P8 electrode pairs

Interim conclusions

- In the combined attentional tracking and working memory task, the CDA is primarily driven by the attentional tracking load, not working memory load.
- CDA also captures differences between attentional tracking alone and attentional tracking with working memory
 - This might be due to separate but related cognitive mechanisms associated with these tasks

Experiment 2 - method

[9, 6, 7]

Static conditions
[attend discs and remember colors]

2 discs, 2 colors

2 discs, 4 colors

Moving conditions
[track discs and remember colors]

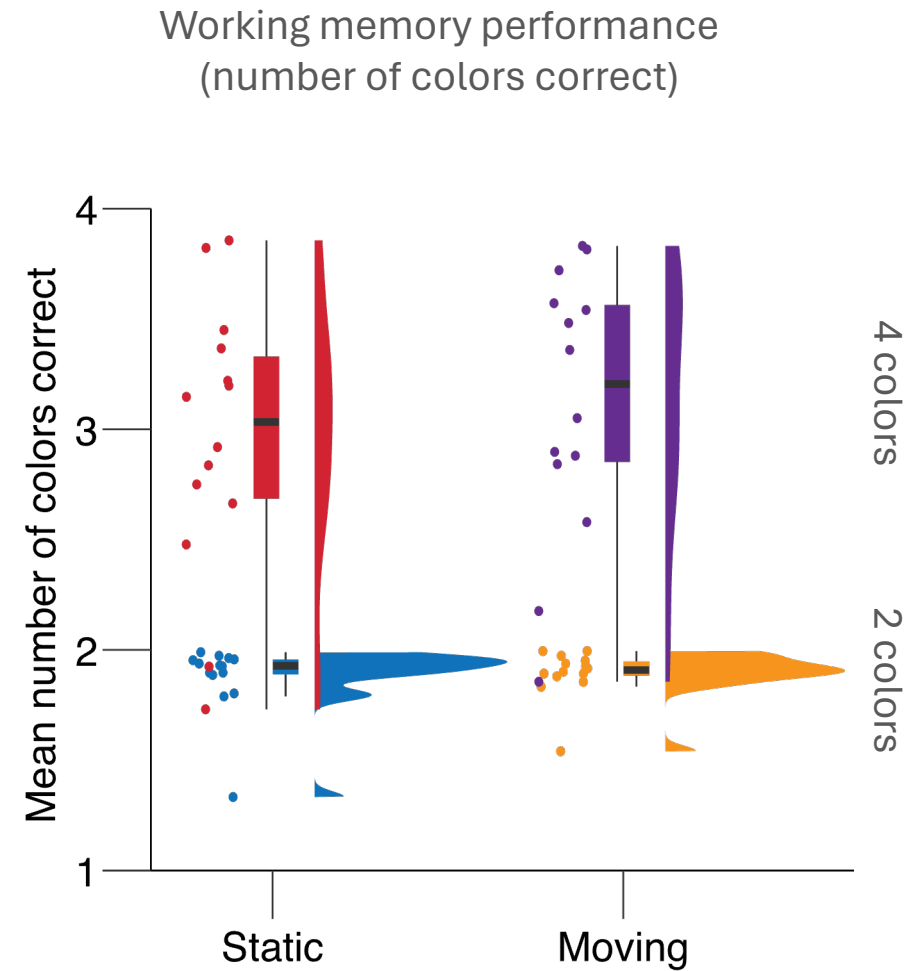
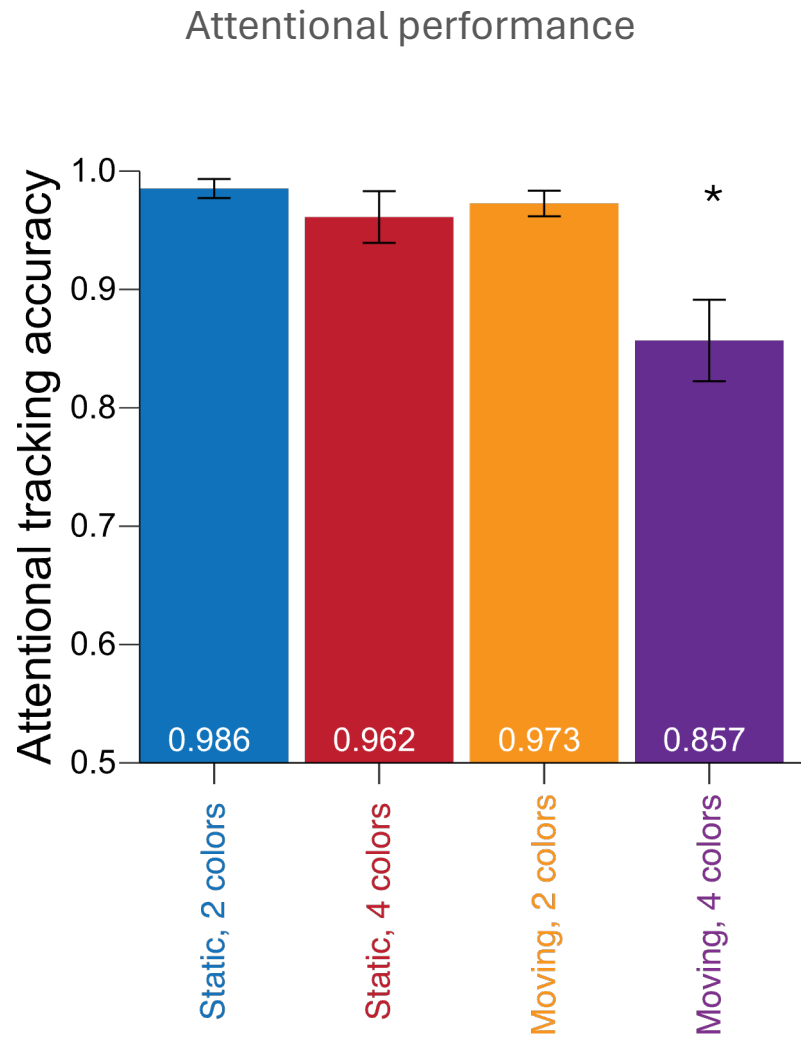
2 discs, 2 colors

2 discs, 4 colors

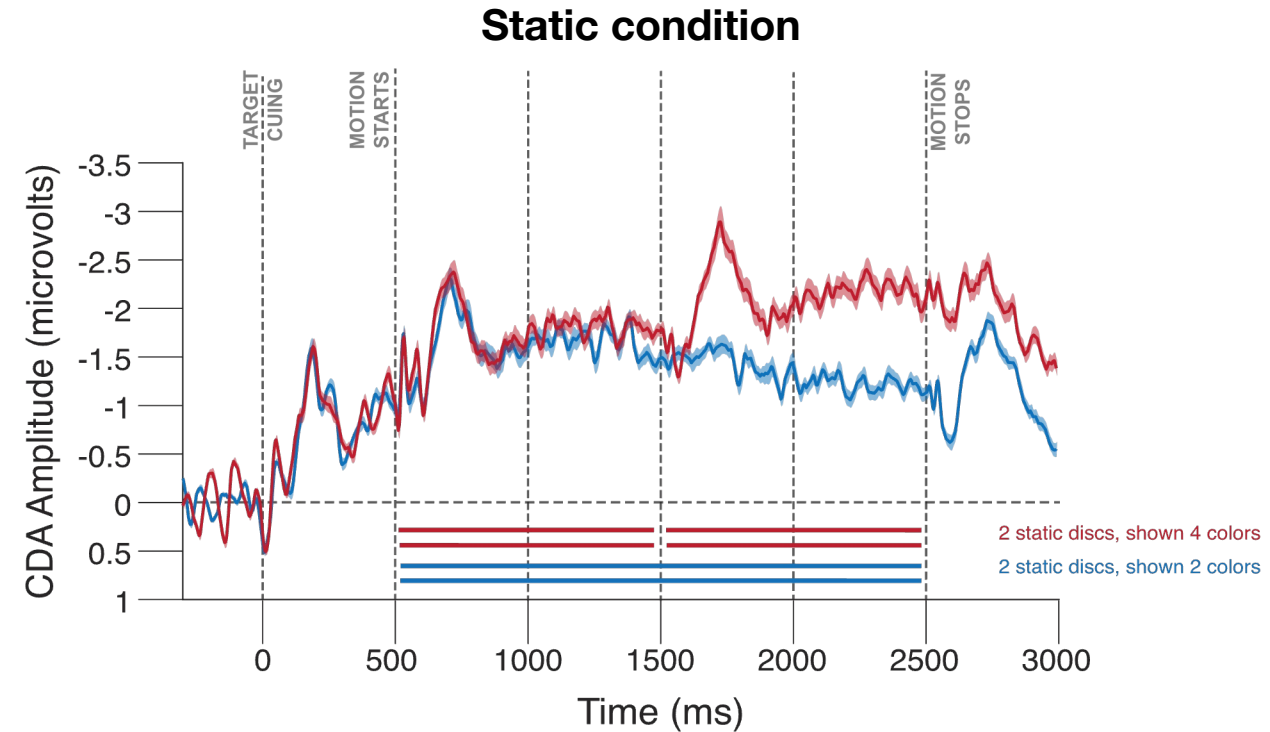
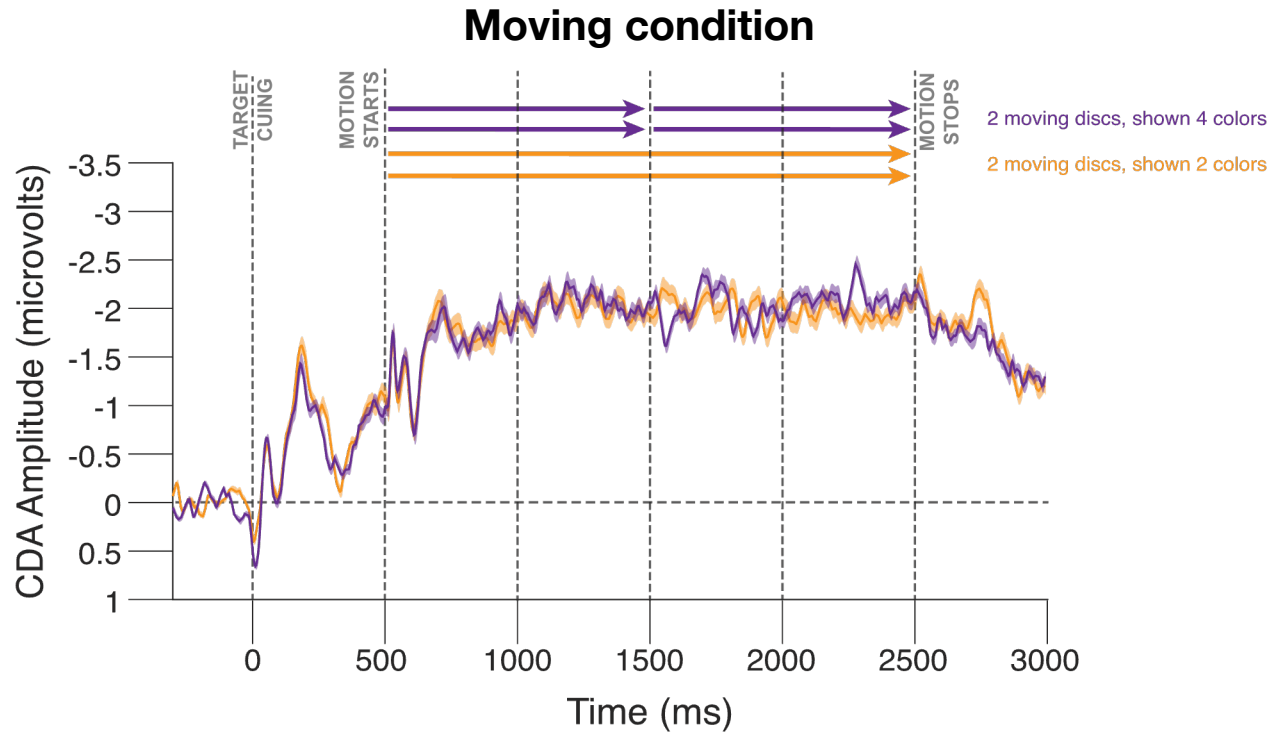
192 trials per condition
16 blocks

14 participants so far

Experiment 2 – behavioral results

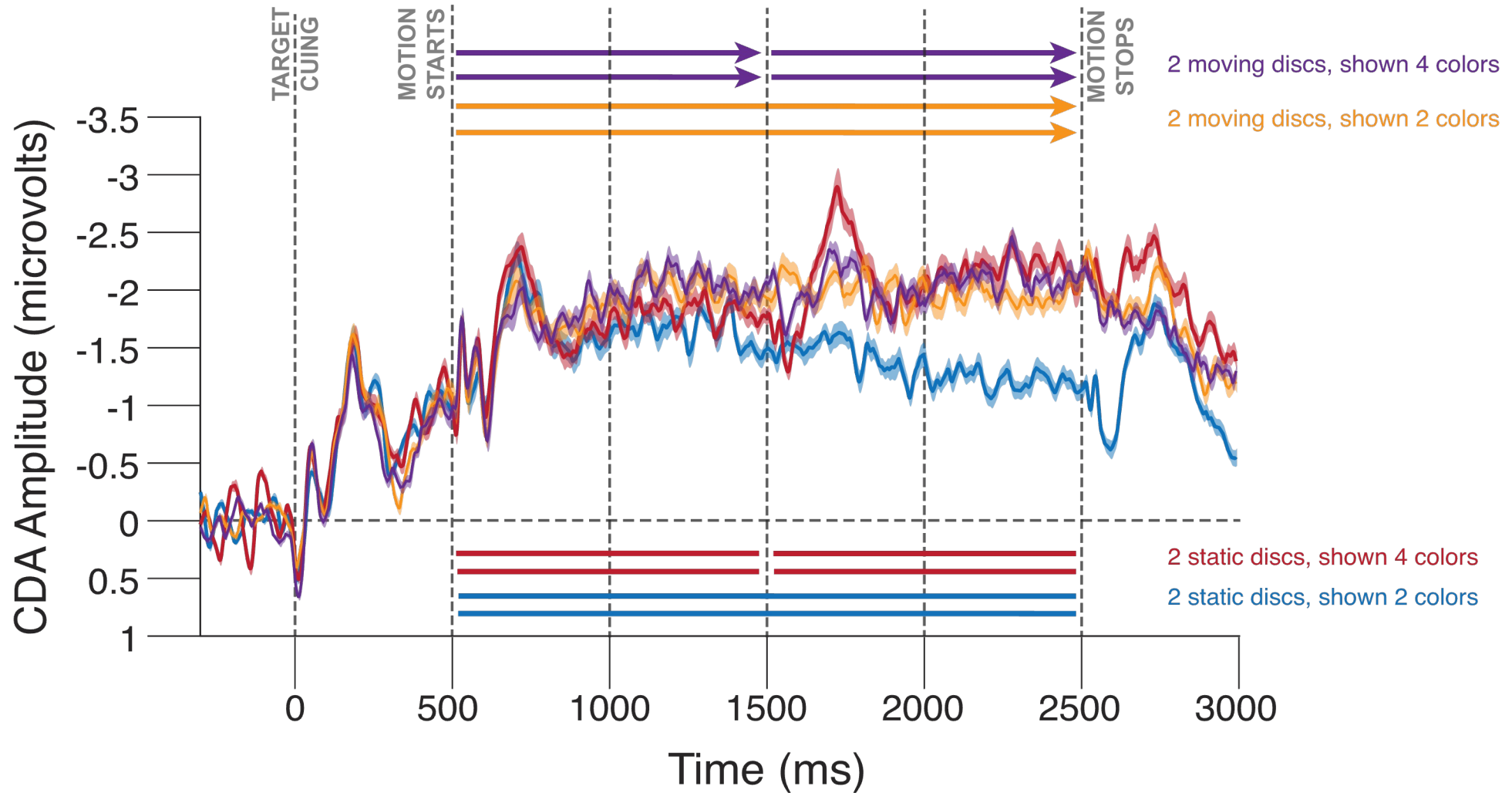


Experiment 2 – EEG results



CDA was calculated using the PO3/PO4, PO7/PO8, P3/P4, and P7/P8 electrode pairs

Experiment 2 – EEG results



CDA was calculated using the PO3/PO4, PO7/PO8, P3/P4, and P7/P8 electrode pairs

Conclusions

- In our new paradigm, Contralateral Delay Activity is dominated by attentional tracking demands when motion is involved
 - When both the number of discs to track and the number of colors per disc are varying, CDA amplitudes are determined by the number of tracked discs
- Why was the CDA not sensitive to the number of colors in Exp. 1?
 - Motion serves as a strong Gestalt cue for objecthood (e.g. motion silencing)
- Spatiotemporal indexing is important both for attentional tracking and visual working memory
 - It remains open if this indexing in attentional tracking and working memory is the same or are different processes

Acknowledgments



Will Ngiam



Ed Awh



Ed Vogel



Will Epstein



Ron Gneezy



AwhVogel Lab

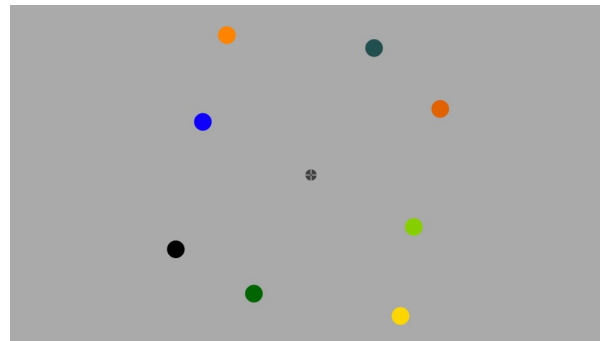
VSS pre-data-collection poster session



Scan for the lab's
VSS content
and these slides

pstyrkowiec@uchicago.edu

THANK YOU



FOR ATTENTION!

Multidimensional Scaling Exp.1

