

Electrophysiological Measures of Working Memory During Interrupted Visual Search

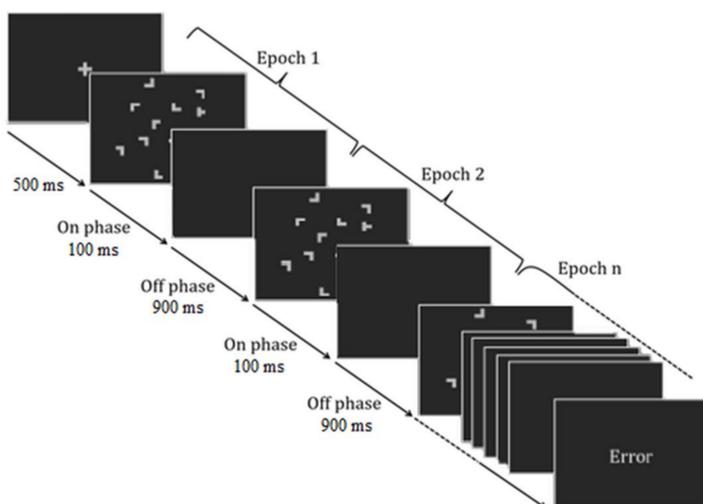
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Introduction

- Interrupted visual search paradigms have been thought of as perceptual hypothesis generation and prediction testing (Lleras et al., 2005)
- Building this perceptual hypothesis takes roughly 500 ms after which search can be rapidly resumed; responses to the initial presentation are longer than those to subsequent presentations
- This perceptual hypothesis may be represented in working memory and thus measurable with electroencephalography (EEG)
- If this is the case, rapidly resumed responses should be preceded by stronger working memory activity given that a high fidelity perceptual hypothesis has already been generated

The Interrupted Visual Search Task

- 11 L's and 1 left- or right-oriented T per display
- Max of 5 epochs (display presentations) per trial
- 24 trials per block, experiment ended when a minimum of 600 correct responses were made



EEG Procedure

- 64 Ag/AgCl electrodes at 10-20 coordinates
- Contralateral delay activity (CDA) as index of working memory time-locked to display N-1 epochs before either fast or slow response

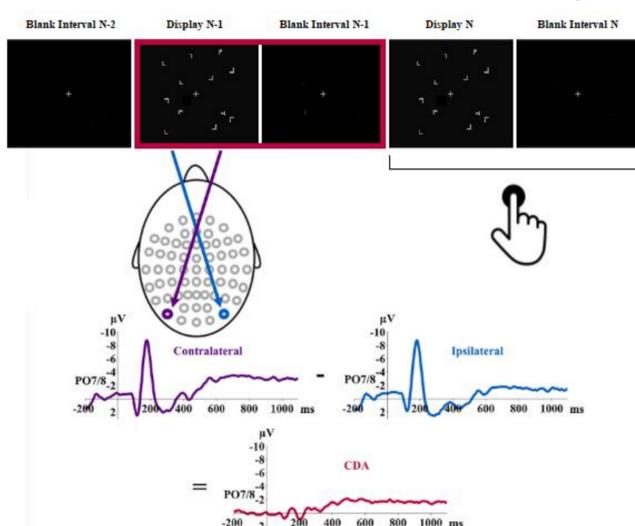
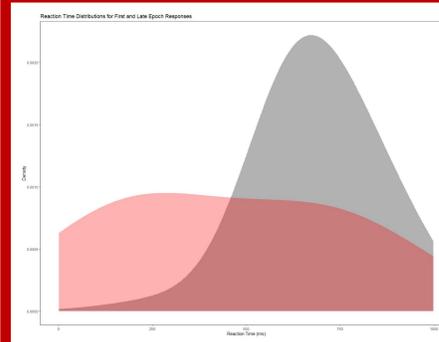


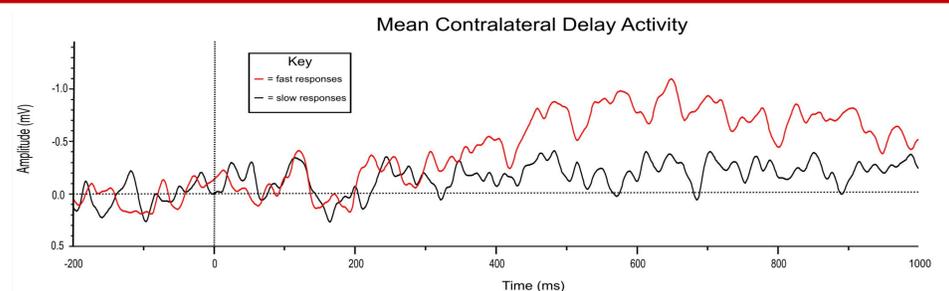
Figure adapted from Luria, Balaban, Awh, & Vogel (2016)

Behavioral Results

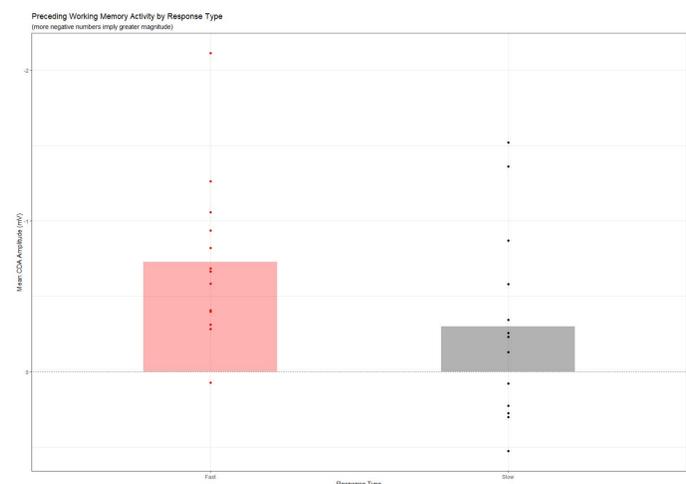


- N = 13
- Responses were faster in later epochs whereas only few responses were made <500 ms in the first epoch

EEG Results



- Grand-averaged ERP waveforms across all 13 subjects revealed greater CDA preceding fast (red) compared to slow (black) responses



- The average area of each subject's CDA is plotted at electrode pair P7/P8 from 450-900 ms
- Bars represent grand-averaged mean CDA

Discussion

- Behavioral results replicate previous findings: there are a greater number of fast responses made in later epochs compared to the first epoch where very few responses are made <500 ms
- Preliminary EEG results suggest that faster responses are associated with greater CDA elicited by the previous presentation of a display
- Faster responses may rely more heavily on the perceptual hypothesis being actively held in working memory from the previous presentation with the latest presentation serving to confirm it
- Poor working memory representations of the previous display might require subjects to gather more information from the next display which takes time and results in a slower response