Electrophysiological Correlates of Improved Distractor Filtering

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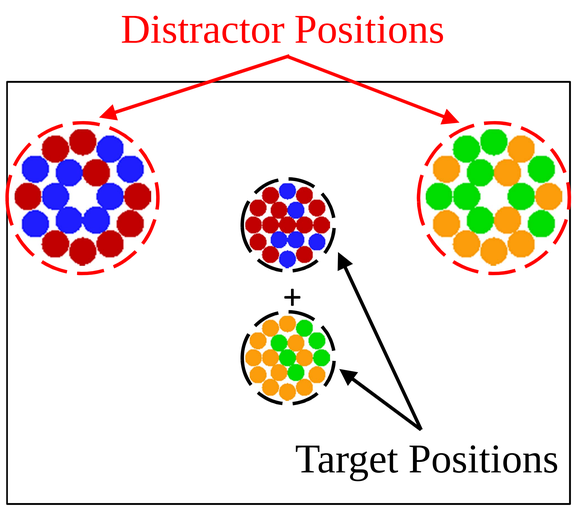
53

Introduction

Repeated exposure to distracting stimuli leads to reduced behavioral interference (Kelley & Yantis, 2009). This has been linked to changes in activity in prefrontal cortex (Kelley & Yantis, 2010). We used ERP to examine how practice with distractor filtering is related to suppression of sensory information, response preparation, and top-down cognitive control.

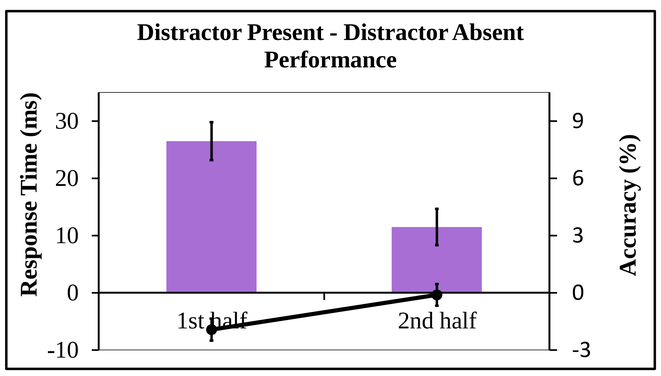
Stimuli & Task



Duration: 100 ms; ITI: 1.5 – 2 s

Task: Identify majority color within target. Target colors (Red/Blue or Orange/Green) alternated from block to block. Response hand depended on target position (above vs. below fixation, counterbalanced across subject). Distractors presented bilaterally on 50% of trials; position of target-colored distractor varied from trial to trial. Behavior and electrophysiological data were compared between the first and last half of the session. One session consisted of 16 blocks of 64 trials.

Results: Behavior

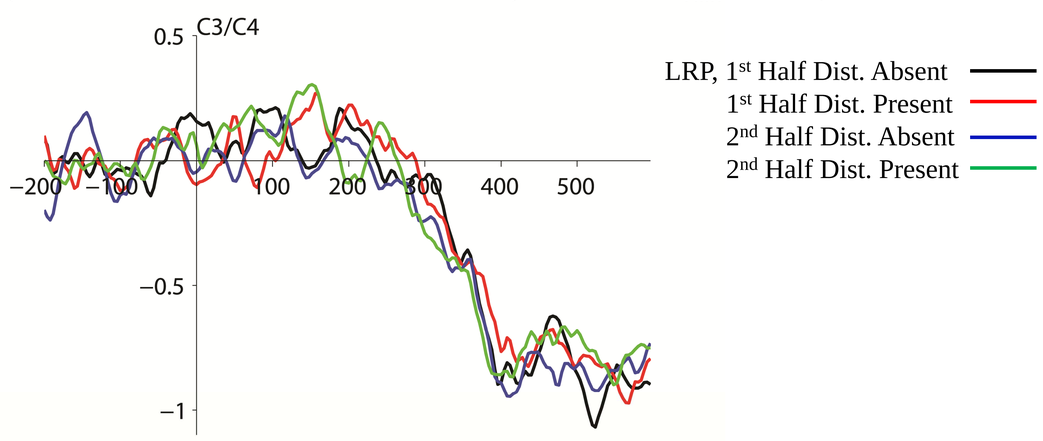


RT: $t(17) = 4.27$, $p < 0.001$

Accuracy: $t(17) = 2.55$, $p = 0.021$

Results: Lateralize Readiness Potential

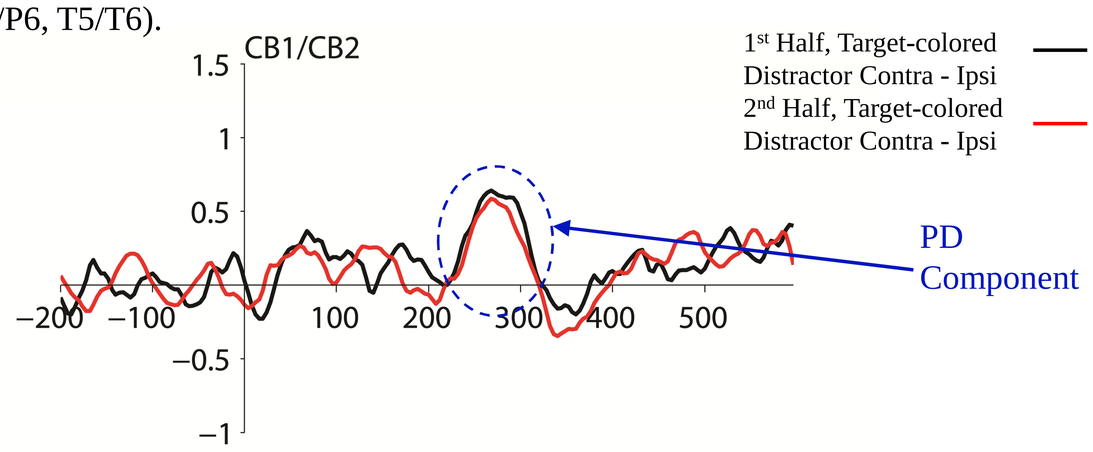
Latency (50% of max. amplitude) measured using Jackknife procedure, analyzed with 2x2 (Distractor Presence vs. Session Half) ANOVA. $F_{Half} = 1.07$, all other F's < 1.



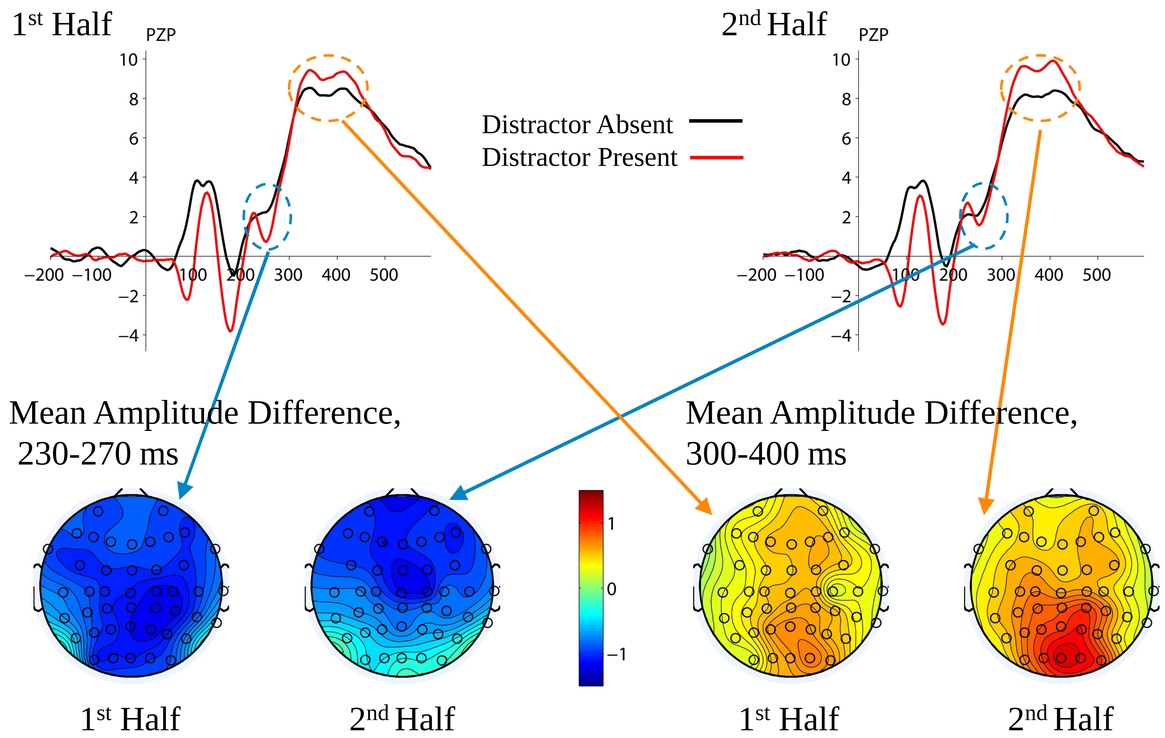
Results: PD

PD component (Sawaki & Luck, 2010): Increased positivity *contralateral* (compared to ipsilateral) to a distracting item (here: target-colored distractor), observed in lateral posterior channels.

No significant difference in the mean amplitude of the PD component from the 1st to 2nd half (all t's < 1; channels O1/O2, P1P/P2P, P3P/P4P, CB1/CB2, P1/P2, P3/P4, P5/P6, T5/T6).



Results: Distractor Related ERP's



Summary

Here we observe that practice-induced reduction in distractor interference is not related to the speed of response preparation (LRP) or focused suppression of the sensory signal (PD). Rather, it appears to be related to a decrease in the processing of distractors as task-relevant stimuli (smaller posterior N2), and an increase in effort when distractors are present (larger posterior P3).

References and Acknowledgments

Kelley TA, Yantis S (2009) Learning to attend: Effects of practice on information selection. *J Vis* 9(7):16, 1-18

Kelley TA, Yantis S (2010) Neural correlates of learning to attend. *Front Hum Neurosci* 4:216. doi: 10.3389/fnhum.2010.00216

Sawaki R, Luck SJ (2010) Capture versus suppression of attention by salient singletons: electrophysiological evidence for an automatic attend-to-me signal. *Atten Percept Psychophys* 72(6): 1455-1470

This research was supported by XXXX Grant XXXXXXX to GRM.