Separating Target Enhancement from Distractor Suppression During Auditory Search

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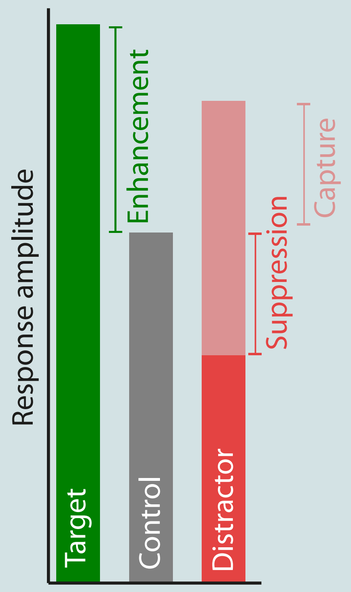
Background

Human environments consist of relevant targets and irrelevant distractors. In auditory attention research, the understanding of capture and suppression is premature, partly because target and distractor effects are often confounded[1].

Research goal: We introduce a baseline to directly compare neural and behavioral responses between control versus target and distractor sounds, inferring mechanisms of target **enhancement**, distractor **suppression** and **capture[2].**



Design

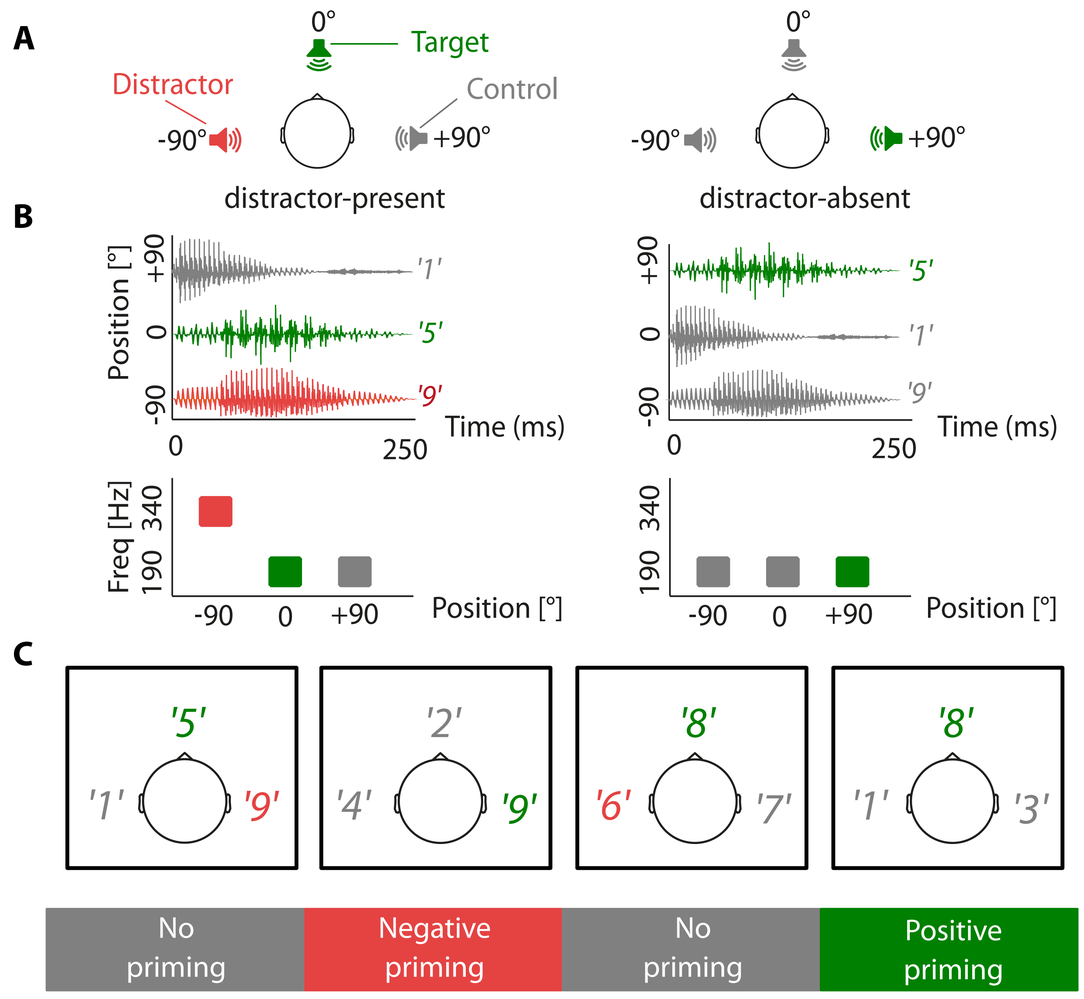


Figure 1: Trial procedure. **(A)** Speaker arrangement and sound categories. **(B)** Spatio-spectral trial composition. **(C)** Target and distractor repeats within a sequence of four consecutive trials[3].

Target enhancement

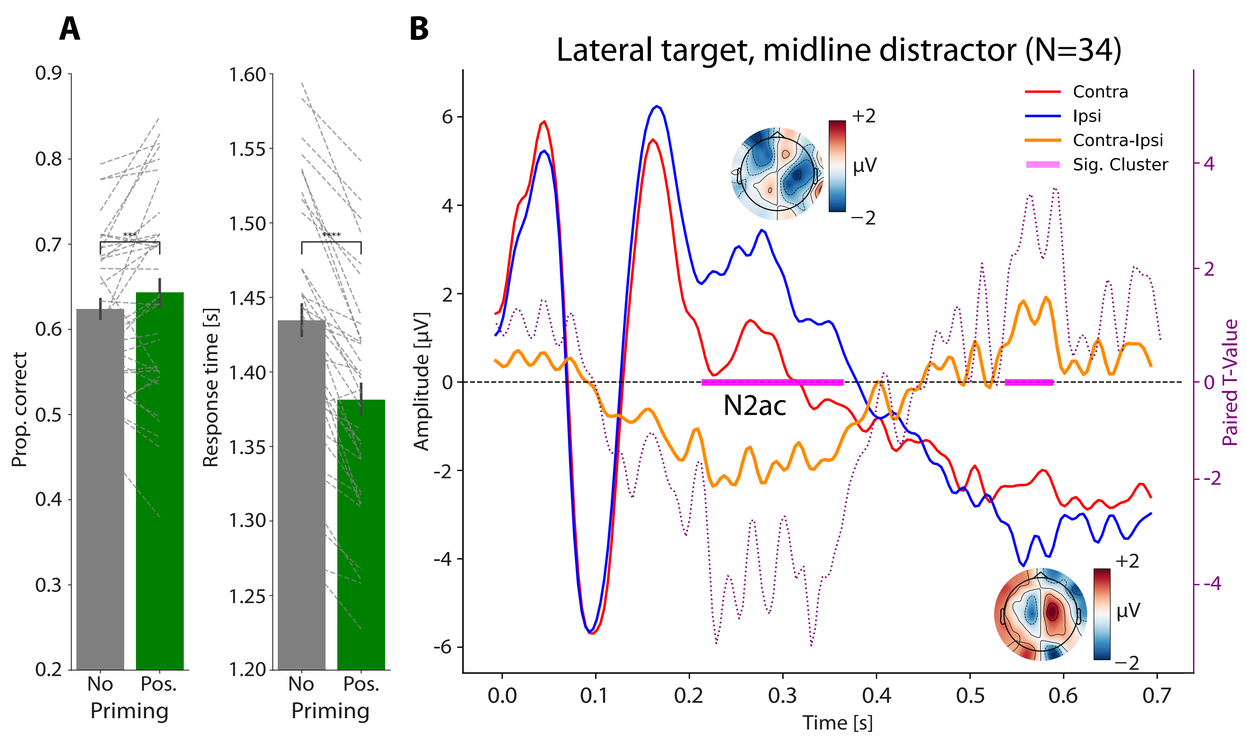


Figure 2: EEG Signatures of target enhancement. **(A)** Effects of target repeats on accuracy (left) and reaction time (right). **(B)** N2ac time course in response to lateralized targets. Insets show topographies during significant time intervals.

Distractor suppression

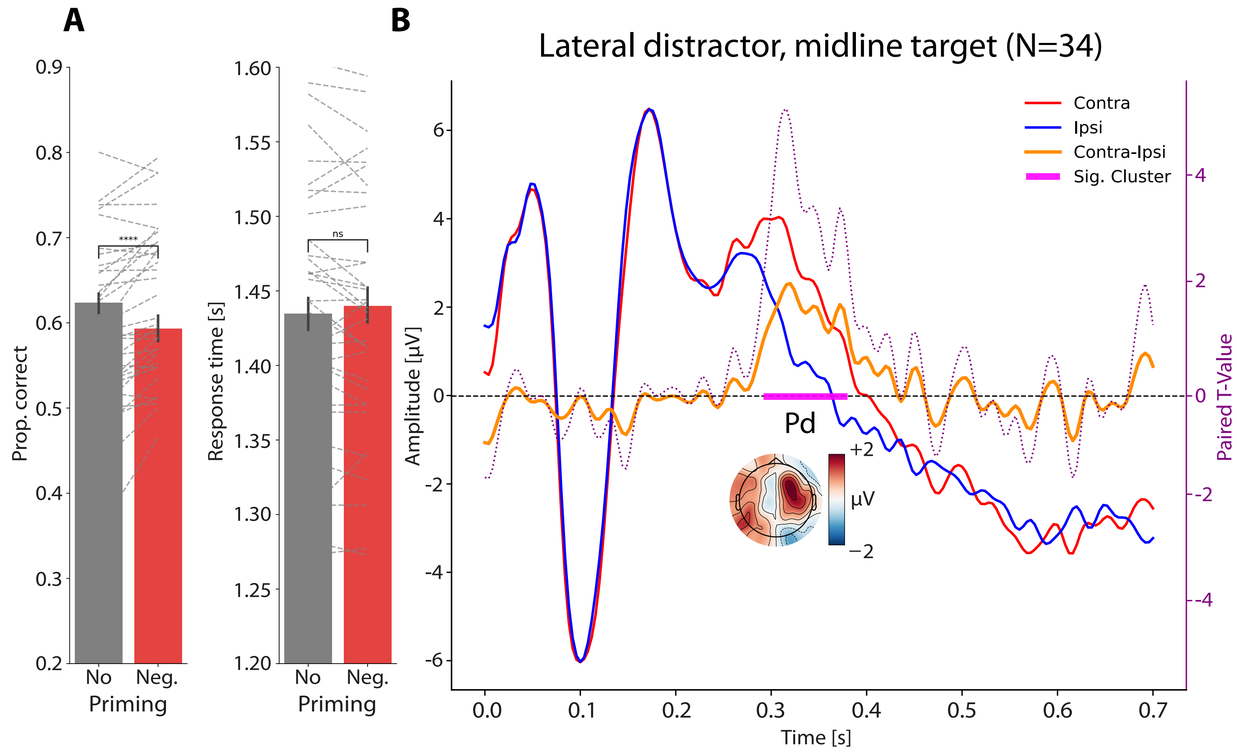


Figure 2: EEG Signatures of distractor suppression. **(A)** Effects of negative priming on accuracy (left) and response time (right). **(B)** Pd time course in response to lateralized distractors. Inset shows topography during significant time interval.

Temporal evolution of distractor suppression

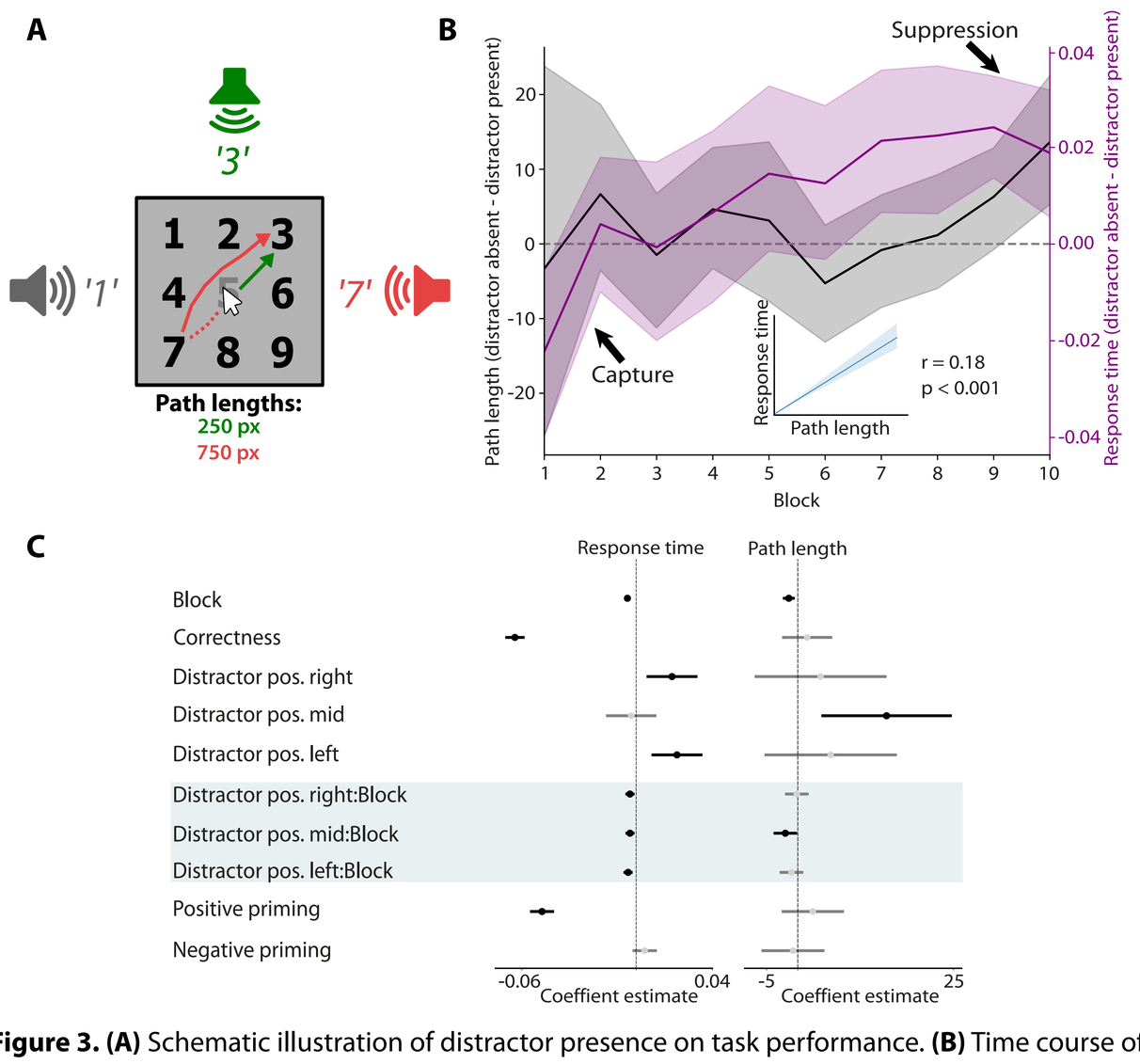


Figure 3. (A) Schematic illustration of distractor presence on task performance. **(B)** Time course of behavioral measures. **(C)** Coefficient estimates and 95% CI for linear mixed models predicting response time (left) and cursor path length (right). Significant coefficients ($p < 0.05$) are highlighted in black.

Conclusion

1. We successfully delineate mechanisms of target enhancement from distractor suppression in behavioral and neural signatures.

2. The salient distractor initially captures attention, but is gradually suppressed[4].

3. These findings set the stage for combined neuro-behavioral analyses to probe the functional relevance of target- and distractor-evoked neural activity for selective attention.

References

[1] Wöstmann et al. (2022), Progress in Neurobiology.
[2] Orf et al. (2023), iScience.
[3] Tipper (1985), The Quarterly Journal of Experimental Psychology.
[4] Gaspelin & Luck (2017), Journal of Experimental Psychology.

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