



Isolating neural correlates of conscious perception from neural correlates of reporting one's perception: A 2x2 manipulation of visual awareness and task-relevance

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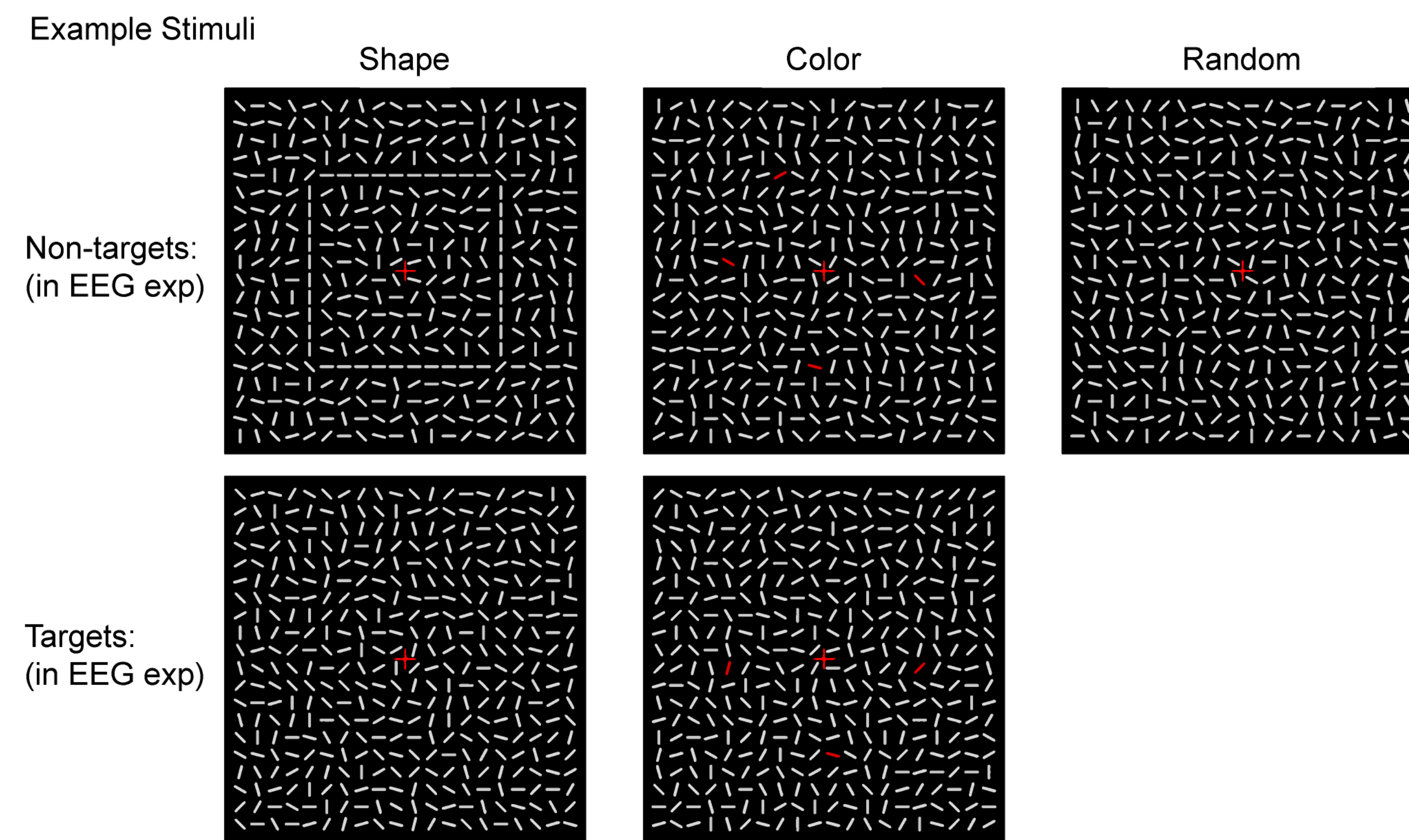
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Introduction

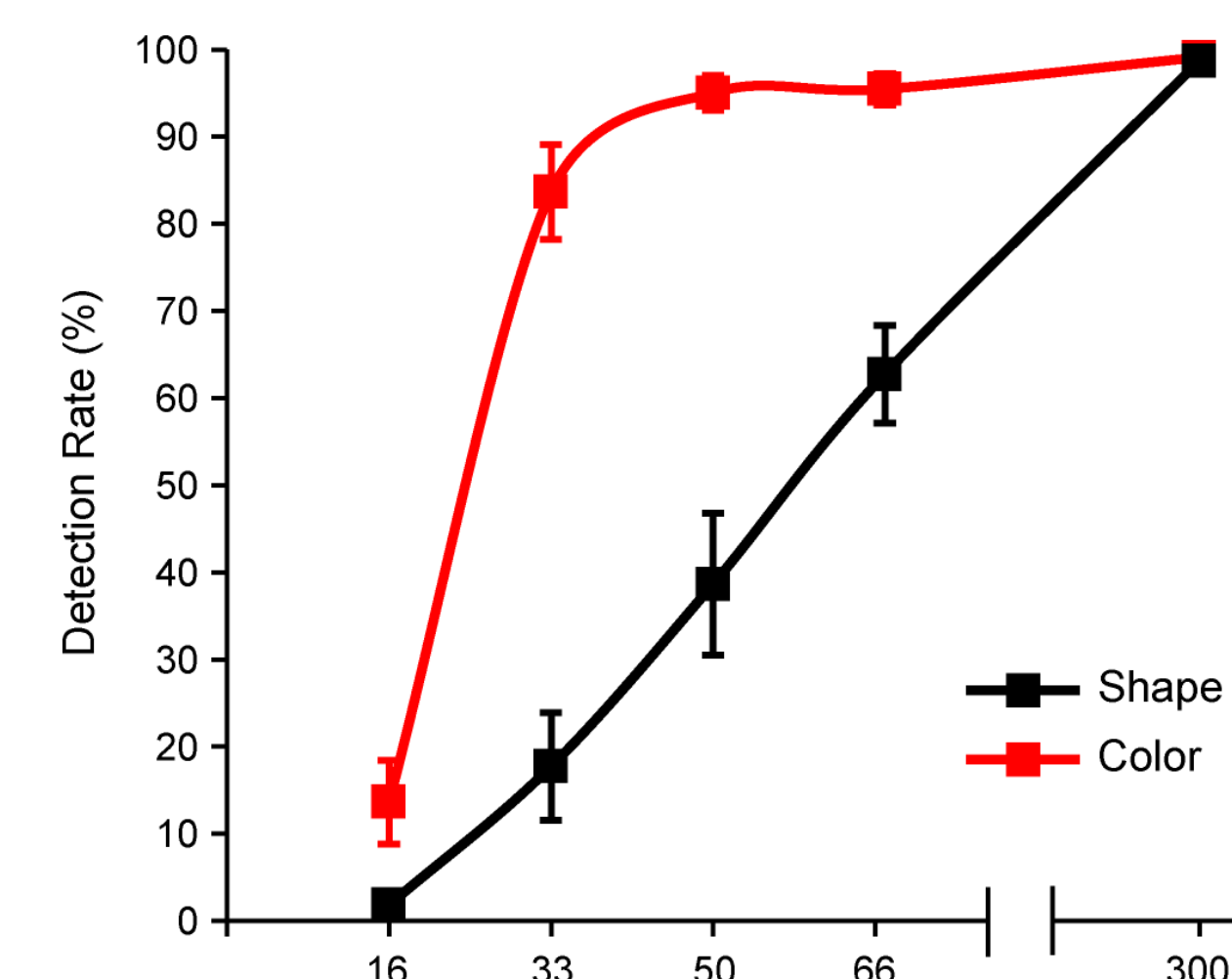
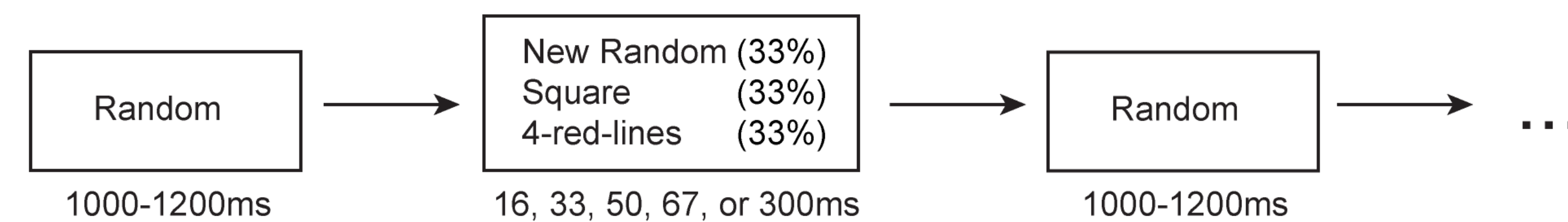
- Visual awareness of a stimulus can be easily manipulated via masking, attentional blink, change blindness, inattention blindness, binocular rivalry, interocular suppression, etc.
- To identify neural correlates of conscious perception (NCCs), a common approach is to contrast neural activity elicited by identical stimuli of which subjects report being aware versus unaware.
- This simple contrastive method conflates NCCs with neural correlates of reporting one's perception^{1,2}.
- The current study³ sought to address this issue by manipulating visual awareness of shape and color stimuli via masking while only requiring a report for either shape or color percepts on separate blocks of trials.

Methods



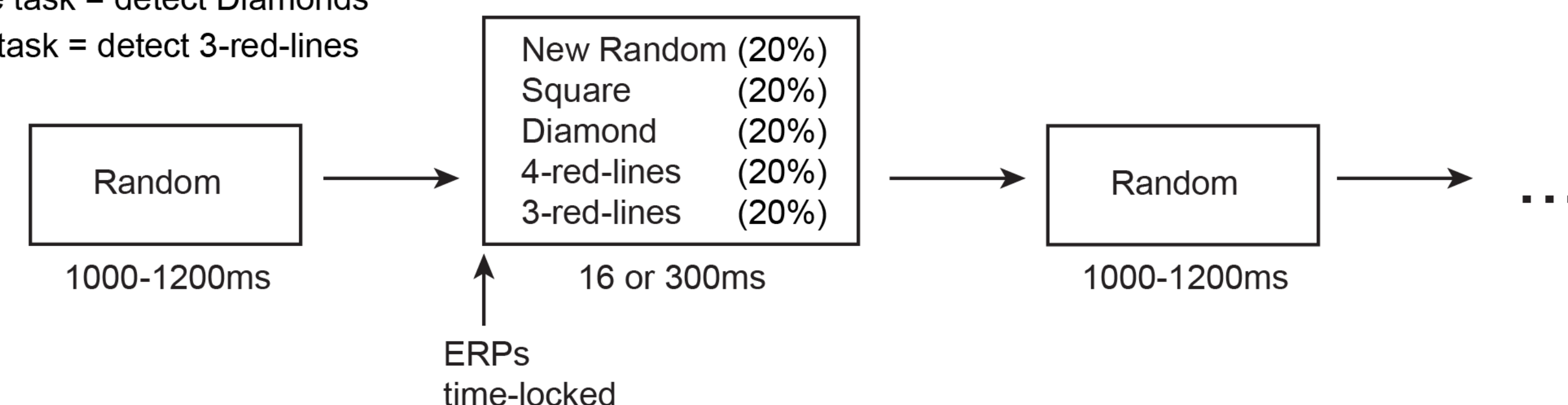
Behavioral Experiment

Task = detect all shape and color stimuli

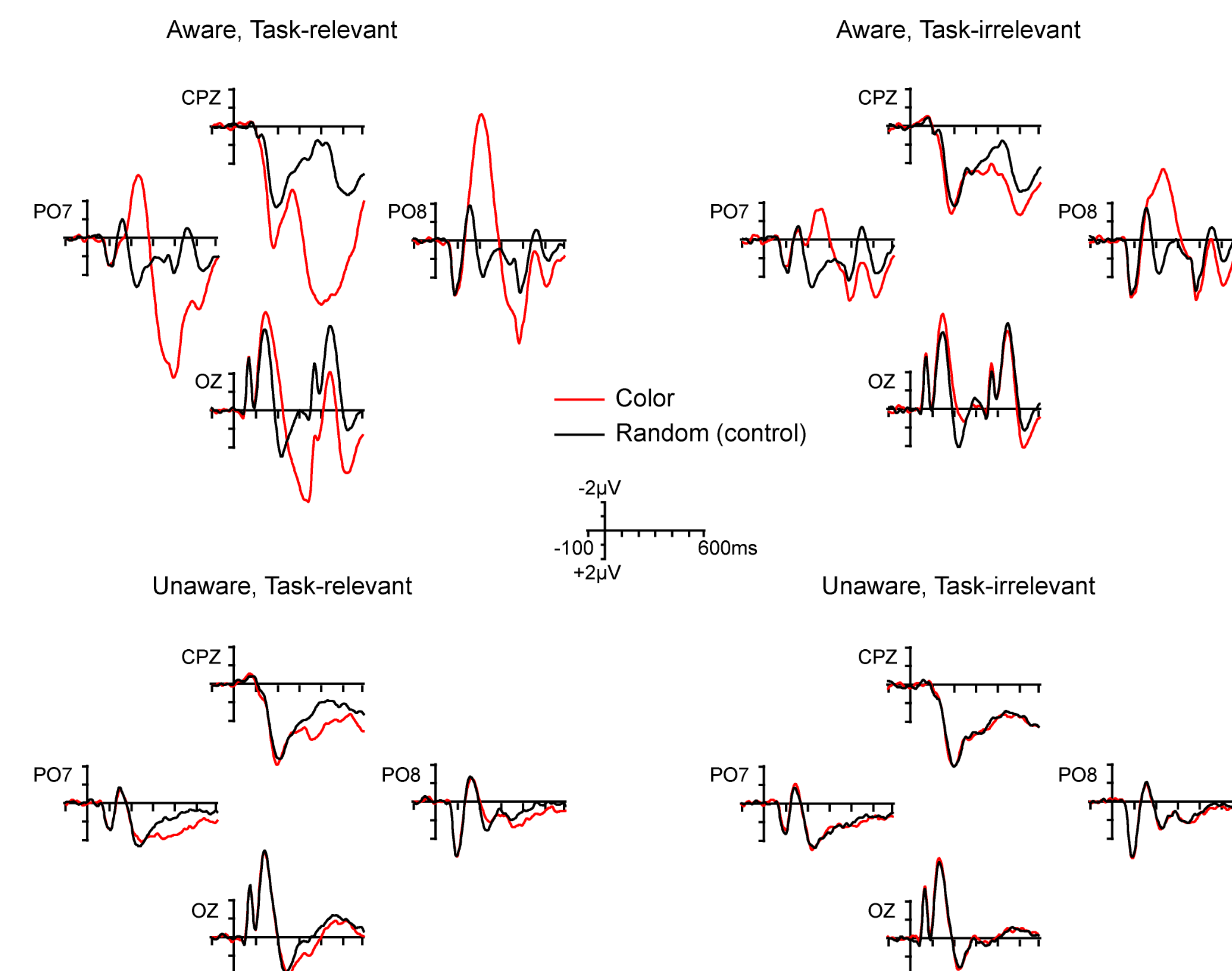
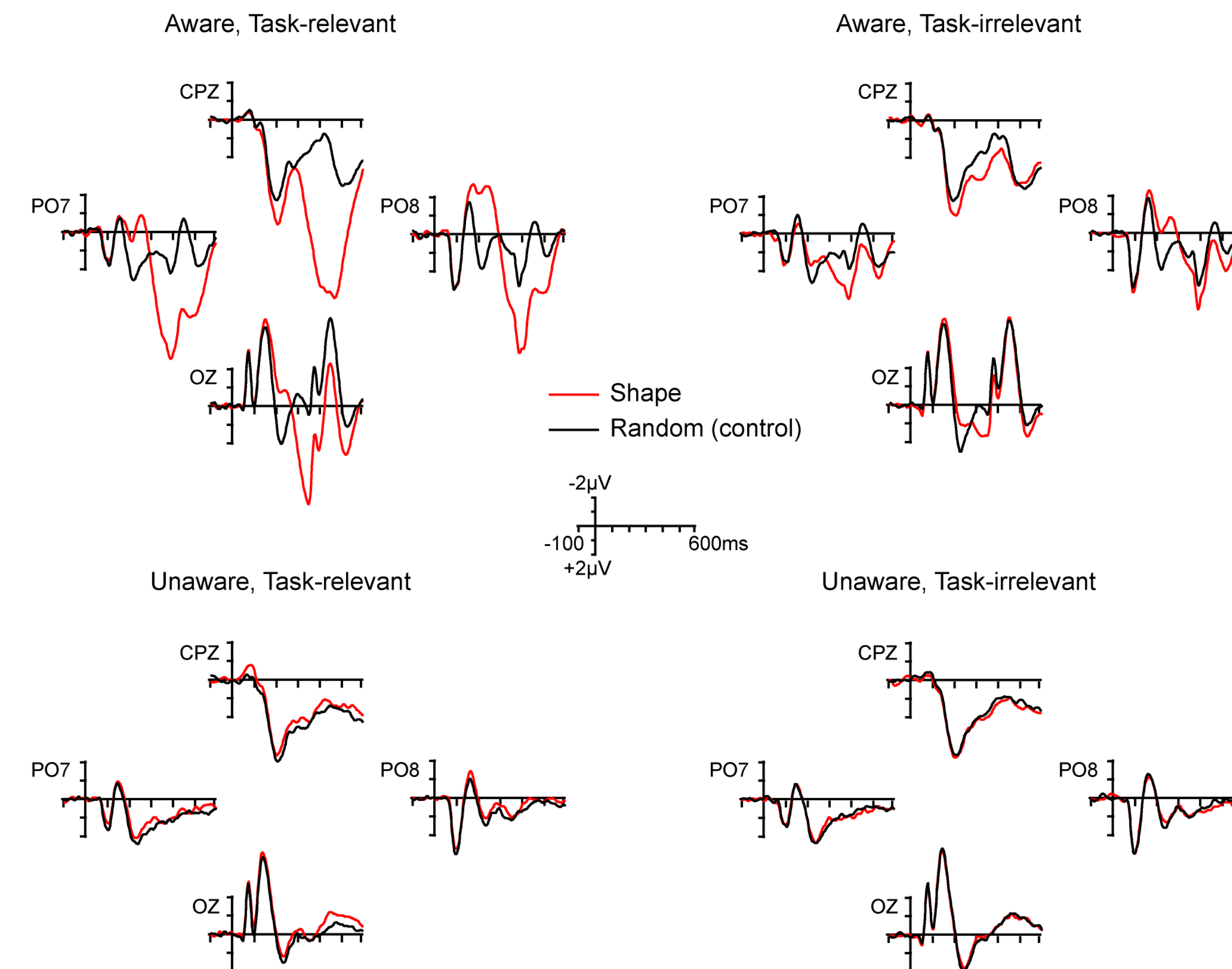


EEG Experiment

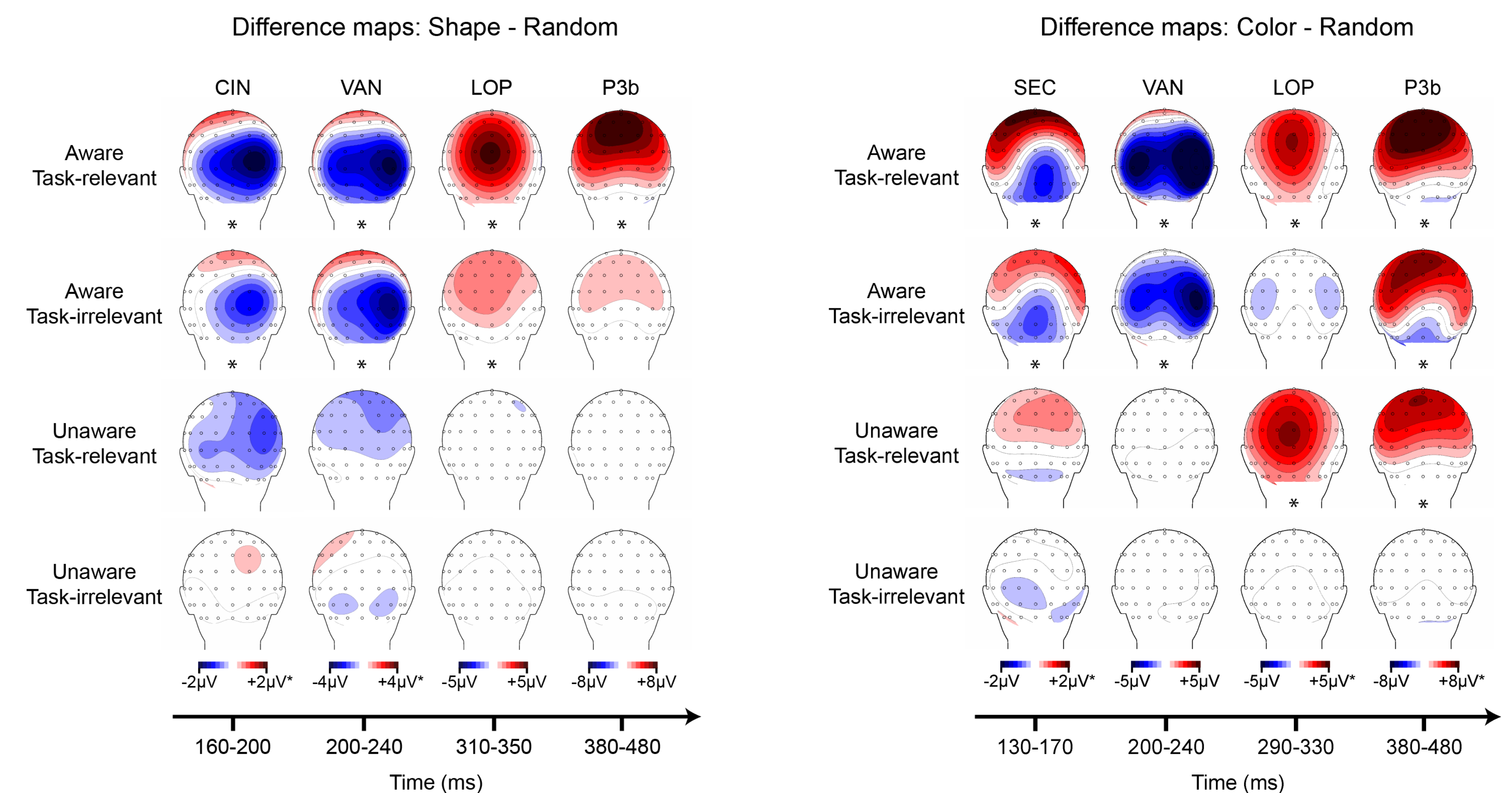
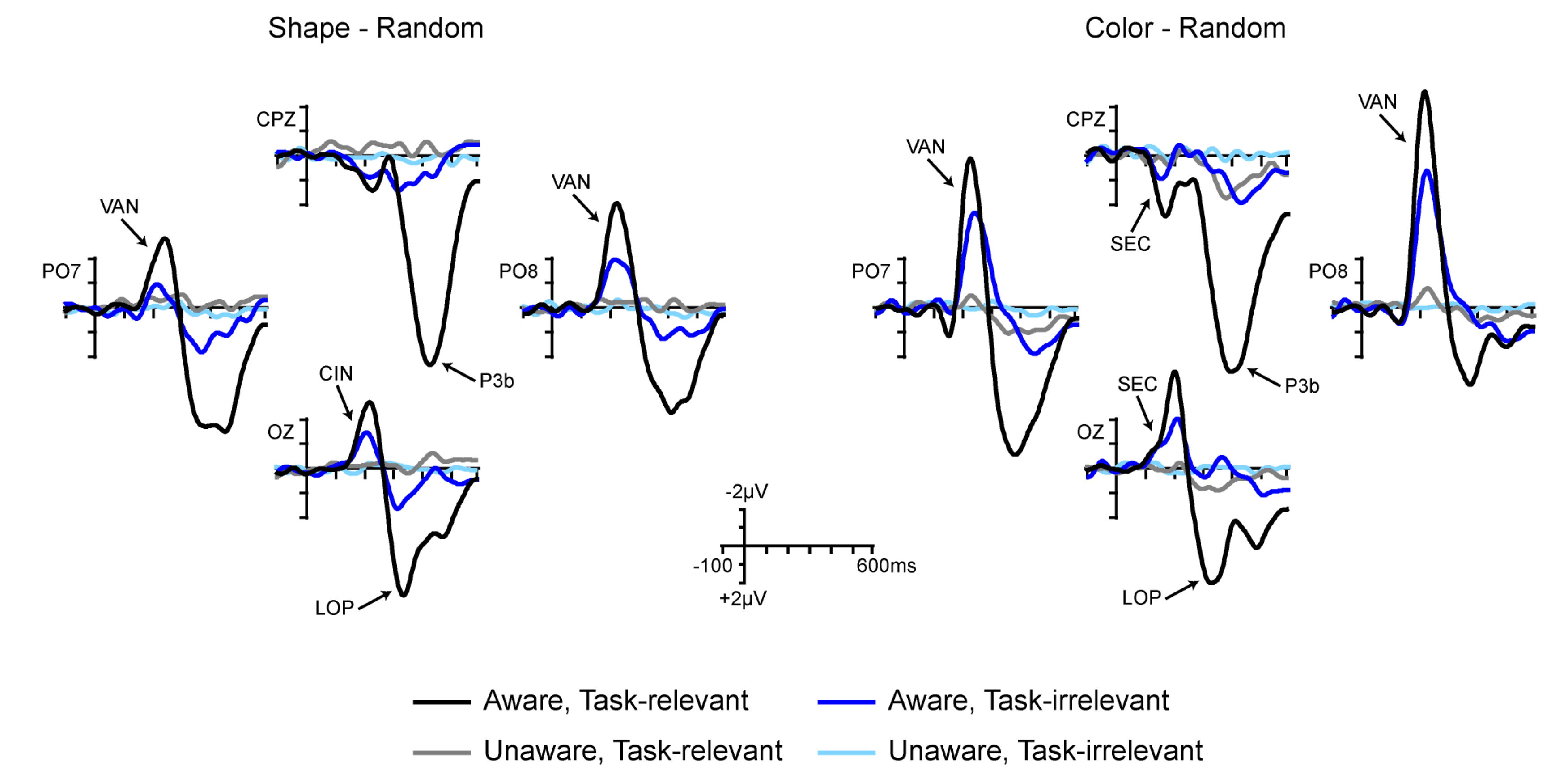
Shape task = detect Diamonds
Color task = detect 3-red-lines



ERPs



Difference Waves & Maps



Conclusions

- The visual awareness negativity (VAN) consistently correlated with conscious perception, regardless of task-relevance. The mid-latency VAN appears to be a leading candidate for an "NCC-proper"¹.
- Late positive waves, such as the late occipital positivity (LOP) and the P3b were absent in some aware conditions and present in some unaware conditions. These long-latency ERPs are unlikely to be NCCs^{3,4}.
- Early stimulus-specific components, such as the contour integration negativity (CIN) for shapes and the sensory effect of color (SEC) were only present in the aware conditions, however, previous studies⁴ have identified these components in unaware conditions. Their absence in the present experiment was likely due to the severe masking used to render the stimuli invisible in the unaware conditions (16ms SOA).
- Future studies seeking to identify NCCs should incorporate conditions in which subjects consciously perceive stimuli without having to immediately report their percepts to avoid conflating post-perceptual neural activity with neural correlates of conscious perception².

References

- ¹Aru, Bachmann, Singer, & Melloni (2012) Distilling the neural correlates of consciousness. *Neurosci. Biobehav. Rev.*, 36, 737-746.
- ²Aru & Bachmann (2015) Beyond the simple contrastive analysis: Appropriate experimental approaches for unraveling the neural basis of conscious experience. *Frontiers in Psychology, Research Topic*, <http://journal.frontiersin.org/researchtopic/2409/articles>
- ³Pitts, Metzler, & Hillyard (2014) Isolating neural correlates of conscious perception from neural correlates of reporting one's perception. *Frontiers in Psychology*, 5: 1078, 1-16.
- ⁴Pitts et al. (2014) Gamma band activity and the P3 reflect post-perceptual processes, not visual awareness. *NeuroImage*, 101, 337-350.