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On the Role of Posterior Connectivity in Learning and Exploiting Statistical Regularities: A Neuromodulation and EEG Study

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Introduction
According to the predictive coding framework, perception results from integrating sensory inputs with prior knowledge. Past experience constitutes a fundamental source of priors by enabling the extraction of statistical regularities from the environment, a process known as statistical learning. A major challenge is to understand how learned statistics are implemented within perceptual systems to guide behavior. Recent studies highlight the role of parieto-occipital networks in transmitting top-down predictions, with parietal regions modulating occipital activity through oscillatory dynamics within the alpha band. However, causal evidence linking connectivity within these networks to statistical learning processes remains scarce. Here, we used cortico-cortical paired associative stimulation (ccPAS) to selectively modulate network connectivity and directly test its contribution to perceptual inference and statistical learning mechanisms.

Method
We aimed to assess the role of posterior networks in perceptual decision-making using the two-flash fusion task, in which different cues predicted different stimulus probabilities. Cue-stimulus associations were implicit and required statistical learning. Participants underwent different ccPAS protocols while EEG activity was recorded. Three groups were tested: V5-to-V1, IPS-to-V1 ccPAS, and sham stimulation.

Results
Participants successfully acquired cue-stimulus associations, exhibiting significant cue-related modulations in behavioral responses. Post-ccPAS, behavioral differences emerged across the three groups, reflecting distinct learning patterns. EEG analyses further revealed changes in oscillatory activity within the alpha band, suggesting a network-specific modulatory effect of ccPAS.

Conclusions
Our findings demonstrate the role of implicit statistical learning in shaping perceptual decisions and provide causal evidence for the distinct contributions of occipital and parieto-occipital networks in predictive perceptual processes.

If you're submitting a symposium talk, what's the symposium title?

Advanced Applications of Noninvasive Brain Stimulation and EEG in Experimental Psychology

If you're submitting a symposium, or a talk that is part of a symposium, is this a junior symposium?

Yes

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