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Alpha oscillations causally support the integration of expectations in metacognitive confidence

Saturday, September 13, 2025 10:00 AM (20 minutes)

Introduction
Confidence—the capacity to assess the correctness of one's own decisions—is a central component of metacognitive evaluation. While perceptual choices are increasingly understood to be shaped by prior expectations, the extent to which these expectations also bias confidence judgments remains largely unknown. Moreover, the oscillatory mechanisms supporting this integration have yet to be fully explored.

Methods
We conducted two complementary behavioral and EEG studies to examine how expectations shape confidence and to identify their neural underpinnings. We then performed a TMS-EEG experiment on an independent sample to test the causal role of posterior alpha oscillations in this process. Specifically, we applied a protocol designed to functionally inhibit posterior regions and examined its effects on (a) the neural signatures of prior integration, and (b) the behavioral ability to incorporate priors into confidence judgments.

Results
Across studies, we found that expectations systematically biased confidence: participants were more confident when their decisions matched their expectations. This effect was supported by modulations in alpha-band activity over posterior electrodes. Crucially, perturbing this activity via TMS disrupted both the alpha signatures and the confidence bias, abolishing the influence of expectations-like information on confidence.

Discussion
These findings provide causal evidence that alpha oscillations in posterior regions support the integration of expectations into metacognitive confidence. Inhibiting these rhythms impaired the brain's ability to incorporate prior information into confidence judgments, revealing a key mechanism by which subjective certainty is constructed from top-down information.

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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