Caudal evidence for hemisphere-specific frontal oscillatory mechanisms underlying the modulation of conscious visual perception

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Frequency bands emerging from discrete areas and distributed across wide-spread brain networks have been correlated with specific cognitive processes such as perception, attentional orienting, decision-making and awareness. Nonetheless, potential hemisphere-causal contributions of brain oscillatory activity to human visual cognition remain to be causally explored. In two groups of participants, we applied 4-pulse real or sham TMS bursts either to the *left* or the *right* Frontal Eye Field (FEF) to induce *frequency-specific* activity patterns and study the impact on a visual detection and categorization task involving low-contrast near-threshold targets. In separate experimental blocks, high-beta *frequency-specific* TMS bursts (30 Hz) were compared to *non-frequency-specific* patterns, matched in duration and number of pulses in order to assess the effects of oscillation frequency in such processes. Our interventions revealed hemisphere-specific modulations of frontal activity on visual detection. More specifically, right FEF *frequency-specific* high-beta TMS bursts enhanced perceptual sensitivity (d') as compared to sham, whereas no visual performance effects derived from the use of *non-frequency-specific* patterns. For the left FEF, only *non-frequency-specific* TMS pattern yielded significant perceptual sensitivity (d') improvements, whereas no visual performance effects emerged from the use of *frequency-specific high-beta* bursts. No significant impact was observed on visual categorization task for any of the TMS patterns used. Our results provide causal evidence in favor of hemisphere-specific frontal contributions to the modulation of visual performance and suggest different oscillation based signaling mechanisms for the right and the left human FEF in such processes.