The role of brain oscillations in feature integration

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Abstract

Our sensory system is able to build a unified perception of the world, which although rich, is limited and inaccurate. Sometimes, features from different objects are erroneously combined. At the neural level, the role of the parietal cortex in feature integration is well-known (Humphreys, 2016; Shafritz et al., 2002). However, the brain dynamics underlying correct and incorrect feature integration are less clear. To explore the temporal dynamics of feature integration, we studied the modulation of different frequency bands in trials in which feature integration was correct or incorrect. Participants responded to the color of a shape target, surrounded by distractors. A calibration procedure ensured that accuracy was around 70% in each participant. To explore the role of expectancy in feature integration, we introduced an unexpected feature to the target in the last blocks of trials. Results demonstrated the contribution of several frequency bands to feature integration both pre- and post-stimulus. During the pre-stimulus period, alpha power was higher for illusions compared to hits. After stimulus onset, alpha, beta, and gamma-band power was reduced for hits compared to illusions. Moreover, gamma power was overall larger during the experiment for participants who were aware of the unexpected target presented during the last blocks of trials (as compared to unaware participants). These results demonstrate that feature integration is a complex process that can go wrong at different stages of information processing and is influenced by top-down expectancies.

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