Neural oscillations underlie individual differences in brightness perception

ABSTRACT:

EEG recordings of human occipital alpha-band oscillations have been strongly linked to visual perception. In particular, cortical excitability is increased in areas exhibiting low alpha amplitude. Although the frequency of alpha oscillations varies significantly between individuals, it has only rarely been studied as an independent factor in shaping perception. Temporal integration of successive stimuli has recently been shown to depend on individual alpha oscillation frequency, with faster frequencies resulting in finer temporal resolution in perception. This suggests that perception may qualitatively differ between individuals with different spontaneous alpha frequencies. Moreover, underlying the differences in temporal resolution may be a more basic visual process: differences in sensitivity to visual flicker. We tested this hypothesis by correlating performance in a flicker detection task with the speed of individual alpha rhythms. For each participant, we obtained temporal contrast sensitivity functions and related the stimulus frequency at peak sensitivity to individual alpha frequency. Our results demonstrate that individual alpha frequency predicts contrast sensitivity to visual flicker. Individuals with faster spontaneous alpha rhythms were maximally sensitive at faster stimulus flicker frequencies. Importantly, such individuals performed worse at slower stimulus frequencies than those with naturally slower alpha rhythms. This suggests that individual alpha frequency specifically predicts the stimulus flicker frequency which produces maximum contrast sensitivity. The findings provide evidence for a link between alpha frequency and individual differences in basic, low-level visual perception.

Keywords

EEG, Oscillations, Alpha, Visual, Perception

Researcher's Contacts:

James Macdonald
Department of Health and Social Sciences
University of the West of England
Frenchay Campus
Coldharbour Lane
Bristol
BS16 1QY
Tel: +44 (0) 11732 83121
Email: james.macdonald@uwe.ac.uk