

Real time electroencephalography analysis of brainwaves during perception of visual illusions

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Brain sometimes misinterprets visual information and causes the so called optical illusions. In our research, we used a 32-channel electroencephalography (EEG) apparatus to analyze the brain response to several optical illusion stimulus. Four groups of ambiguous patterns were prepared: normal patterns that have no illusory stimulus (blank tests) and three other groups of illusory patterns that we name as cognitive (e.g. Necker cube) geometrical (e.g. Müller-Lyer illusion) and physiological (e.g. Hermann grid illusion). After an initial adaptation to the stimulus, for each image, 30 msec of EEG signal was recorded, then subjects took five minutes break before the next test. To analyze the EEG data, firstly we used independent component analysis to reduce the signal noise and calculated the Fourier spectrum of the EEG signal from all of the channels. As found by Rufin VanRullen(The Journal of Neuroscience, 2006), EEG data with Wagon Wheel Illusion stimulus was analyzed, here we used all types of visual illusions and observed response of the brain. We focused on the peaks of the Fourier spectrum in different bandwidth. As we know, EEG signal are subdivided into δ wave (less than 4Hz), θ wave (4-7Hz), α wave (8-15Hz), β wave (16-31Hz), γ wave (greater than 32Hz). The percentage bandwidth of the biggest peak was calculated, we found that when the participant focused on the normal patterns or on cognitive optical illusion graphs, brain generated more γ waves. But with the stimulus of physiological optical illusion and geometrical one, brain generated more β waves. The percentage bandwidth of the three biggest peaks was also calculated, the result show that optical illusion in general stimulates an increase of α waves. Because of this increased α waves, we propose that the optical illusions promote more coherent signal transmission in brains, resulting in more intuition and imagination compared to stable non illusory patterns.

Methodology/Approach: Brain Imaging and Stimulation (fMRI, PET, MEG, TMS)

Primary Topic Descriptor: Visual search: other

Presentation Preference: talk preferred

Award Consideration: Wish to apply for Travel Award