

Frontal Oscillatory Activity and Phase-Amplitude Coupling during Chan Meditation

Authors : Arthur C. Tsai, Chii-Shyang Kuo, Vincent S. C. Chien, Michelle Liou, Philip E. Cheng

Abstract : Meditation enhances mental abilities and it is an antidote to anxiety. However, very little is known about brain mechanisms and cortico-subcortical interactions underlying meditation-induced anxiety relief. In this study, the changes of phase-amplitude coupling (PAC) in which the amplitude of the beta frequency band were modulated in phase with delta rhythm were investigated after eight-week of meditation training. The study hypothesized that through a concentrate but relaxed mental training the delta-beta coupling in the frontal regions is attenuated. The delta-beta coupling analysis was applied to within and between maximally-independent component sources returned from the extended infomax independent components analysis (ICA) algorithm on the continuous EEG data during mediation. A unique meditative concentration task through relaxing body and mind was used with a constant level of moderate mental effort, so as to approach an 'emptiness' meditative state. A pre-test/post-test control group design was used in this study. To evaluate cross-frequency phase-amplitude coupling of component sources, the modulation index (MI) with statistics to calculate circular phase statistics were estimated. Our findings reveal that a significant delta-beta decoupling was observed in a set of frontal regions bilaterally. In addition, beta frequency band of prefrontal component were amplitude modulated in phase with the delta rhythm of medial frontal component.

Keywords : phase-amplitude coupling, ICA, meditation, EEG

Conference Title : ICPBS 2017 : International Conference on Psychology and Behavioral Sciences

Conference Location : Tokyo, Japan

Conference Dates : May 28-29, 2017