

Abstract

The heart rate is largely under control of the autonomic nervous system. The aim of the present study is to investigate the interactions between the brain and heart underlying volitional control of the heart and to explore the effectiveness of volition as a strategy to control the heart rate without biofeedback. Twenty seven healthy male subjects voluntarily participated in the study and were instructed to decrease and increase their heart beats according to rhythmic, computer generated sound either 10% faster or slower than the subjects' measured heart rate. Sympathetic and parasympathetic activities were estimated with the heart rate variability (HRV) obtained by power spectral analysis of RR intervals. Functional coupling patterns of cerebral cortex with the heart were determined by Partial directed coherence (PDC). In HRslow task; HR and sympathetic activity significantly decreased. However parasympathetic activity and power spectral density of EEG in low Alpha (8–10.5 Hz) band significantly increased. Moreover information flow from parietal area (P3 and P4) to RR interval significantly increased. During HRquick task; HR, sympathetic activity and power spectral density of EEG in low Beta (14–24 Hz) band significantly increased. Parasympathetic activity significantly decreased. Information flow from FT8, CZ and T8 electrodes to RR interval significantly increased. Our findings suggested that the heart beat can be controlled by volition and is related to some special areas in the cortex.