

# Discovering EEG Signals Response to Musical Signal Stimuli by Time-frequency analysis and Independent Component Analysis

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## Abstract

In recent years, a lot of research has focus on the physiological effect of music. The electroencephalographic (EEG) is often used to verify the influence of music on human brain activity. In this study, we used frequency distribution analysis and the independent component analysis (ICA) to analyze to discover the EEG responses of subjects with different musical signal stimuli. It is expected that some features on EEG can be demonstrated to reflect the different musical signal stimuli. The EEG of six healthy volunteers listening different music was recorded. We used International 10-20 System to get 19 channels of EEG signal. Musical signal stimuli are metal music, sonata music and the favorite music selected by subjects. Spectra analyses based on Fourier transform were applied to obtain the  $\delta$ ,  $\theta$ ,  $\alpha$ , and  $\beta$  band power of EEG signal under different music stimuli. We used the power at each band of each channel as the features of EEG. The correlation of the features between different situations and subjects was used to show which channel display the difference of EEG signals. Besides, ICA was applied to assist us in the process of isolating noise components and to provide cues to explain the functions of different brain areas in point of neurology. The result showed that some independent components obtained from ICA can demonstrate more significant difference for different music. The features composed of spectral power of each band are very similar in listening metal music, but showed less similarity in listening sonata music.