Low Frequency Waves on EEG Recordings during Stimulation of Sound

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Introduction

It has been reported that delta band waves were observed during sleep (Gevins & Cutillo, 1986; Melnechuk, 1988), during altered states of consciousness (Jovanov, 1997) and during hypnagogium (Faber et al., 2003). In this article, the delta band waves are shown in spectral power of EEG recordings during sensory stimulation of sound. Four patterns of spectral power are shown in stimuli of Song and Talk by female and male participants.

While the participants were stimulated by sound, the EEG data were recorded into ESA-16 (Musha, 2000) from 10 electrodes according to the international 10-20 system. We present the content and the strength of the delta (1/4 ~ 5 Hz), theta (5 ~ 8 Hz), alpha (8 ~ 13 Hz) and beta band (13 ~ 20 Hz) waves from the spectral power of EEG recordings.

Experiment

Eight university students (4 females and 4 males) aged between 21 and 23 years participated to the experiment. The materials were song and talk.

Song Boy Soprano: Green grasslands in England (60"), by Anthony Way. Rock: Why I'm me (60"), by RIZE. Cheer Song: Aida! Decide a goal! (60"). Chorus: Barbie Girl (60"), by AQUA. Hip Hop: Return of the Ripper (1'29"), by LL Cool J.

Talk Man's DJ: The voice of the man in the 40's who talks slowly and softly in a low voice can be heard (60"). Woman's DJ: The voice of the woman in the 20's who talks clearly in a cheerful voice can be heard (24"). Woman's Voice: The voice of the woman in the 20's who talks fast in a high-pitched voice can be heard (30"). Conversation: The voice of two native speaker men who talk fast in a low voice in English can be heard (60").

Results

We obtained the following four patterns of spectral power.

Pattern 1 (Song, female participants): The delta band waves of the content 21.0% with small strength were observed on the frontal region, the theta band waves of the content 13.6% with rather large strength on the lateral and back regions, the alpha band waves of the content 57.6% with large strength on the frontal, lateral and back regions, and the beta band waves of the content 7.8% with small strength on the lateral and back regions.

Pattern 2 (Song, male participants): The delta band waves of the content 44.6% with rather large strength were observed on the frontal region, the theta band waves of the content 3.3% with very small strength on the frontal region, the alpha band waves of the content 47.6% with large strength on the frontal, lateral and back regions, and the beta band waves of the content 4.5% with very small strength on the lateral and back regions.

Pattern 3 (Talk, female participants): The delta band waves of the content 16.9% with very small strength were observed on the lateral and back regions, the theta band waves of the content 9.7% with small strength on the lateral and back regions, the alpha band waves of the content 66.7% with large strength on the frontal, lateral and back regions, and the beta band waves of the content 6.7% with very small strength on the lateral and back regions.

Pattern 4 (Talk, male participants): The delta band waves of the content 41.8% with small strength were observed on the frontal region, the theta band waves of the content 6.7% with very small strength on the frontal region, the alpha band waves of the content 37.5% with large strength on the lateral region and with small strength on the frontal and back regions, and the beta band waves of the content 14.0% with very small strength on the lateral and back regions.

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