

The Comparative Electroencephalogram Study: Children with Autistic Spectrum Disorder and Healthy Children Evaluate Classical Music in Different Ways

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Abstract : In our EEG experiment participated 27 children with ASD with the average age of 6.13 years and the average score for CARS 32.41 and 25 healthy children (of 6.35 years). Six types of musical stimulation were presented, included Gluck, Javier-Naida, Kenny G, Chopin and other classic musical compositions. Children with autism showed orientation reaction to the music and give behavioral responses to different types of music, some of them might assess stimulation by scales. The participants were instructed to remain calm. Brain electrical activity was recorded using a 19-channel EEG recording device, 'Encephalan' (Russia, Taganrog). EEG epochs lasting 150 s were analyzed using EEGLab plugin for MatLab (Mathwork Inc.). For EEG analysis we used Fast Fourier Transform (FFT), analyzed Peak alpha frequency (PAF), correlation dimension D2 and Stability of rhythms. To express the dynamics of desynchronizing of different rhythms we've calculated the envelope of the EEG signal, using the whole frequency range and a set of small narrowband filters using Hilbert transformation. Our data showed that healthy children showed similar EEG spectral changes during musical stimulation as well as described the feelings induced by musical fragments. The exception was the 'Chopin. Prelude' fragment (no.6). This musical fragment induced different subjective feeling, behavioral reactions and EEG spectral changes in children with ASD and healthy children. The correlation dimension D2 was significantly lower in autists compared to healthy children during musical stimulation. Hilbert envelope frequency was reduced in all group of subjects during musical compositions 1,3,5,6 compositions compared to the background. During musical fragments 2 and 4 (terrible) lower Hilbert envelope frequency was observed only in children with ASD and correlated with the severity of the disease. Alfa peak frequency was lower compared to the background during this musical composition in healthy children and conversely higher in children with ASD.

Keywords : electroencephalogram (EEG), emotional perception, ASD, musical perception, childhood Autism rating scale (CARS)

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