

Perception of Tactile Stimuli in Children with Autism Spectrum Disorder

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Abstract : Tactile stimulation of a dorsal side of the wrist can have a strong impact on our attitude toward physical objects such as pleasant and unpleasant impact. This study explored different aspects of tactile perception to investigate atypical touch sensitivity in children with autism spectrum disorder (ASD). This study included 40 children with ASD and 40 healthy children aged 5 to 9 years. We recorded rsEEG (sampling rate of 250 Hz) during 20 min using EEG amplifier "Encephalan" (Medicom MTD, Taganrog, Russian Federation) with 19 AgCl electrodes placed according to the International 10-20 System. The electrodes placed on the left, and right mastoids served as joint references under unipolar montage. The registration of EEG v19 assignments was carried out: frontal (Fp1-Fp2; F3-F4), temporal anterior (T3-T4), temporal posterior (T5-T6), parietal (P3-P4), occipital (O1-O2). Subjects were passively touched by 4 types of tactile stimuli on the left wrist. Our stimuli were presented with a velocity of about 3-5 cm per sec. The stimuli materials and procedure were chosen for being the most "pleasant," "rough," "prickly" and "recognizable". Type of tactile stimulation: Soft cosmetic brush - "pleasant" , Rough shoe brush - "rough", Wartenberg pin wheel roller - "prickly", and the cognitive tactile stimulation included letters by finger (most of the patient's name) "recognizable". To designate the moments of the stimuli onset-offset, we marked the moment when the moment of the touch began and ended; the stimulation was manual, and synchronization was not precise enough for event-related measures. EEG epochs were cleaned from eye movements by ICA-based algorithm in EEGLAB plugin for MatLab 7.11.0 (Mathwork Inc.). Muscle artifacts were cut out by manual data inspection. The response to tactile stimuli was significantly different in the group of children with ASD and healthy children, which was also depended on type of tactile stimuli and the severity of ASD. Amplitude of Alpha rhythm increased in parietal region to response for only pleasant stimulus, for another type of stimulus ("rough," "thorny," "recognizable") distinction of amplitude was not observed. Correlation dimension D2 was higher in healthy children compared to children with ASD (main effect ANOVA). In ASD group D2 was lower for pleasant and unpleasant compared to the background in the right parietal area. Hilbert transform changes in the frequency of the theta rhythm found only for a rough tactile stimulation compared with healthy participants only in the right parietal area. Children with autism spectrum disorders and healthy children were responded to tactile stimulation differently with specific frequency distribution alpha and theta band in the right parietal area. Thus, our data supports the hypothesis that rsEEG may serve as a sensitive index of altered neural activity caused by ASD. Children with autism have difficulty in distinguishing the emotional stimuli ("pleasant," "rough," "prickly" and "recognizable").

Keywords : autism, tactile stimulation, Hilbert transform, pediatric electroencephalography

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