

Elevated cortical excitability in children with autism spectrum disorder and intellectual disability

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A balanced excitation and inhibition in the brain (E/I balance) is necessary for normal brain functioning, while abnormally elevated level of neural excitability is observed in animal models of psychiatric disorders [1]. Electrophysiological research suggest that E/I ratio can be estimated from the spectral slope of the aperiodic 1/f neural activity [2,3]. Here, we used magnetoencephalography (MEG) to record cortical magnetic fields in 49 boys with autism spectrum disorder (ASD) and broad IQ range (from below-average to above-average) and 49 age-matched typically developing control boys (6-15 years of age). MEG was recorded in eyes open and eyes closed conditions. The 1/f spectral slope was estimated by fitting linear function into the log-log spectra in the gamma frequency range (35-45 Hz), where the number of artifacts was minimal. The 1/f spectral slope was calculated in the 448 similar-size cortical labels and was averaged over them for reliability. This averaged 1/f spectral slope in both eyes open and eyes closed conditions was elevated in ASD children with below-average IQ, both as compared to typically developing children and children with ASD but average or higher than average IQ. This result could not be explained by artifacts or power of periodic activity. Our results suggest that children with ASD and co-morbid intellectual disability, but not those with average IQ, are characterized by elevated cortical excitability. The 1/f spectral slope in the gamma frequency range may be an efficient measure of E/I imbalance that could be used for diagnostics and testing of treatment efficacy in psychiatric conditions characterized by abnormal E/I ratio.

Источники и литература

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