Increase Ongoing Neural Variability in ADHD

Gil Gonen-Yaacovi, Ayelet Arazi, Nitzan Shahar, Anat Karmon, Shlomi Haar, Nachshon Meiran, Ilan Dinstein

Cortex (April 2016)
DOI: http://dx.doi.org/10.1016/j.cortex.2016.04.010.

Abstract

Attention Deficit Hyperactivity Disorder (ADHD) has been described as a disorder where frequent lapses of attention impair the ability of an individual to focus/attend in a sustained manner, thereby generating abnormally large intra-individual behavioral variability across trials. Indeed, increased reaction time (RT) variability is a fundamental behavioral characteristic of individuals with ADHD found across a large number of cognitive tasks. But what is the underlying neurophysiology that might generate such behavioral instability? Here, we examined trial-by-trial EEG response variability to visual and auditory stimuli while subjects’ attention was diverted to an unrelated task at the fixation cross. Comparisons between adult ADHD and control participants revealed that neural response variability was significantly larger in the ADHD group as compared with the control group in both sensory modalities. Importantly, larger trial-by-trial variability in ADHD was apparent before and after stimulus presentation as well as in trials where the stimulus was omitted, suggesting that ongoing (rather than stimulus-evoked) neural activity is continuously more variable (noisier) in ADHD. While the patho-physiological mechanisms causing this increased neural variability remain unknown, they appear to act continuously rather than being tied to a specific sensory or cognitive process.