Attention Deficit/Hyperactivity Disorder (ADHD) Diagnosis: An Activation-Executive Model

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Attention deficit with, or without, hyperactivity and impulsivity (ADHD) is categorized as neuro-developmental disorder. ADHD is a common disorder in childhood and one of the most frequent conditions affecting school ages. This disorder is characterized by a persistent behavioral pattern associated with inattention, over-activity (or hyperactivity), and difficulty in controlling impulses. Current research suggests the existence of certain patterns of cortical activation and executive control, which could more objectively identify ADHD. Through the use of a risk and resilience model, this research aimed to analyze the interaction between brain activation variables (nirHEG and Q-EEG) and executive variables (Continuous performance test -CPT-) in subjects with ADHD. The study involved 499 children, 175 females (35.1%) and 324 males (64.91%); aged from 6 to 16 years (M = 11.22, SD = 1.43). Two hundred and fifty six of the children had been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD) and 243 were without ADHD. For the analysis of this objective, a causal model was designed to include the following different measures of task-execution: CPT TOVA (omissions, commissions, response time, variability, D prime and the ADHD Index); electrical activity (using Q-EEG); and blood-flow oxygenation activity (using nirHEG). The causal model was tested by means of structural equation modeling (SEM). The model that had been constructed was based upon three general assumptions: (1) There are different causal models for children with ADHD and those without ADHD; (2) The activation measures influence students’ executive performance; and (3) There are measurable structural differences between the ADHD and control group models (executive and activation). In general, the results showed that: (a) activation measures influence executive patterns differently, (b) the relationship between activation variables (nirHEG and Q-EEG) depends on the brain zone being studied, (c) both groups showed important differences in variables correlation, with a good fit in each model (with and without ADHD). Lastly, the results were analyzed with a view to the diagnosis procedure. Therefore, we discuss the implications for future research.