Exploring the dynamics of design fluency in children with and without ADHD using artificial neural networks

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Abstract
The neuropsychology of attention deficit/hyperactivity disorder (ADHD) has been extensively studied, with a general focus on global performance measures of executive function. In this study, we compared how global (i.e., endpoint) versus process (i.e., dynamic) measures of performance may help characterize children with and without ADHD using a design fluency task as a case study. The secondary goal was to compare the sensitivity of standard versus connectionist statistical models to group differences in cognitive data. Thirty-four children diagnosed with ADHD and 37 children without ADHD aged 8–11 years old were tested on the Five-Point Test. The continuous process measure of performance, indexed as the number of produced designs at each consecutive 1 minute interval during 5 minutes, was analyzed against the discrete process measure, that is, the number of designs between first and last intervals and the standard global performance measure of total number of produced designs. Results show that the continuous process measure distinguished the two groups better than the two other measures. The detailed observation of production patterns revealed a decreasing linear trajectory in children without ADHD that contrasts with the flat, but fluctuating productivity pattern of children with ADHD. With regards to the second goal, results show that the connectionist and standard methods are equally sensitive to group differences for the three types of measures. This illustrates the utility of quantitative process measures together with the connectionist method in neuropsychological research and suggests great potential for a dynamical approach to cognition.