Living in the Fast Lane: Evidence for a Global Perceptual Timing Deficit in Childhood ADHD Caused by Distinct but Partially Overlapping Task-Dependent Cognitive Mechanisms

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Dysfunctions in perceptual timing have been reported in children with ADHD, but so far only from studies that have not used the whole set of timing paradigms available from the literature, with the diversity of findings complicating the development of a unified model of timing dysfunctions and its determinants in ADHD. Therefore, we employed a comprehensive set of paradigms (time discrimination, time estimation, time production, and time reproduction) in order to explore the perceptual timing deficit profile in our ADHD sample. Moreover, we aimed to detect predictors responsible for timing task performance deficits in children with ADHD and how the timing deficits might be positively affected by methylphenidate. Male children with ADHD and healthy control children, all aged between 8 and 13 years, participated in this longitudinal study with three experimental sessions, where children with ADHD were medicated with methylphenidate at the second session but discontinued their medication at the remaining sessions. The results of our study reveal that children with ADHD were impaired in all timing tasks, arguing for a general perceptual timing deficit in ADHD. In doing so, our predictor analyses support the notion that distinct but partially overlapping cognitive mechanisms might exist for discriminating, estimating/producing, and reproducing time intervals. In this sense, working memory deficits in terms of an abnormally fast internal counting process might be common to dysfunctions in the time estimation/time production tasks and in the time reproduction task, with attention deficits (e.g., in terms of disruptions of the counting process) additionally contributing to time estimation/time production deficits and motivational alterations additionally contributing to time reproduction deficits. Methylphenidate did not significantly alter the performance of the ADHD sample, presumably due to the limited statistical power of our study. The findings of our study demonstrate a pivotal role of disturbed working memory processes in perceptual timing task performance in childhood ADHD, at the same time broadening the view for additional attentional and motivational determinants of impaired task performance.