Sustained Attention and Heart Rate Variability in children and adolescents with ADHD.

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Abstract

The autonomic nervous system (ANS) plays an important role in attention and self-regulation by modulating physiological arousal to meet environmental demands. Core symptoms of ADHD such as inattention and behavioural disinhibition may be related to dysregulation of the ANS, however, previous findings have been equivocal. We examined autonomic activity and reactivity by assessing heart rate variability (HRV) in a large sample of unmedicated children and adolescents (6-19 years) with ADHD (n=229) compared to typically-developing controls (n=244) during rest and sustained attention. Four heart rate variability measures were extracted: Root means square of successive differences between inter-beat-intervals (rMSSD), absolute high frequency (HFA) power, absolute low frequency (LFA) power and the ratio of low-frequency power to high-frequency power (LF/HF). There were no group differences in HFA or rMSSD, even when assessing across child and adolescent groups separately, by gender or ADHD subtype. LF/HF, however, was higher in ADHD during both rest and sustained attention conditions, particularly in male children. Sustained attention was impaired in ADHD relative to controls, and a higher LF/HF ratio during sustained attention was associated with poorer performance in both groups. Lower rMSSD and HFA were associated with higher anxiety, oppositional behaviours and social problems, supporting prevailing theories that these measures index emotion regulation and adaptive social behaviour. Different measures of heart rate variability provide important insights into the sustained attention and emotional and behavioural regulation impairments observed in ADHD and may aid in delineating ADHD pathophysiology.