Symbolic dynamics of heart rate variability - a promising tool to investigate cardiac sympathovagal control in attention deficit/hyperactivity disorder (ADHD)?

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ABSTRACT

We aimed to evaluate complex cardiac sympathovagal control in attention deficit/hyperactivity disorder (ADHD) by using heart rate variability (HRV) non-linear analysis – symbolic dynamics. We examined 29 boys with untreated ADHD and 25 healthy boys (age 8 to 13 years). ADHD symptoms were evaluated by ADHD-RS-IV scale. ECG was recorded in three positions: baseline supine position, orthostasis, and clinostasis. Symbolic dynamics indices were used for the assessment of complex cardiac sympathovagal regulation: normalised complexity index (NCI), normalised unpredictability index (NUPI), and pattern classification measures (0V%, 1V%, 2LV%, 2UV%). The results showed that HRV complexity was significantly reduced at rest (NUPI) and during standing position (NCI, NUPI) in ADHD group compared to controls. Cardiac-linked sympathetic index 0V% was significantly higher during all posture positions and cardiovagal index 2LV% was significantly lower to standing in boys suffering from ADHD. Importantly, ADHD symptom - inattention positively correlated with 0V%, and negatively correlated with NCI, NUPI. Concluding, symbolic dynamics revealed impaired complex neurocardiac control characterised by potential cardiac beta-adrenergic overactivity and vagal deficiency at rest and to posture changes in boys suffering from ADHD that is correlated with inattention. We suggest that symbolic dynamics indices could represent promising cardiac biomarkers in ADHD.