Children's heart rate variability as stress indicator: Association with reported stress and cortisol


Abstract

Stress is a complex phenomenon coordinated by two main neural systems: the hypothalamic-pituitary-adrenal system with cortisol as classical stress biomarker and the autonomic nervous system with heart rate variability (HRV) as recently suggested stress marker. To test low HRV (5 minute measurements) as stress indicator in young children (5-10y), associations with self-reported chronic stress aspects (events, emotions and problems) (N=334) and salivary cortisol (N=293) were performed. Peer problems, anger, anxiety and sadness were associated with lower root mean square of successive differences (RMSSD) and high frequency power (i.e. lower parasympathetic activity). Anxiety and anger were also related to a higher low frequency to high frequency ratio. Using multilevel modelling, higher cortisol levels, a larger cortisol awakening response and steeper diurnal decline were also associated with these HRV patterns of lower parasympathetic activity. Conclusion: Low HRV (lower parasympathetic activity) might serve as stress indicator in children.

KEYWORDS:

Biomarker, CAR, ChiBS, Children, HF, HRV, Heart rate variability, LF, PA, Questionnaire, RMSSD, SA, Salivary cortisol, Stress, children's body composition and stress, cortisol awakening response, heart rate variability, high frequency, low frequency, normalized units, nu, pNN50, parasympathetic activity, percentage of consecutive normal RR intervals differing more than 50 ms, root mean square of successive differences, sympathetic activity