Comprehensive cardiac evaluation to maximal exercise in a contemporary population of prepubertal children

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Abstract

Background: Heart rate (HR) is a biomarker used to measure physiological function, health status and cardiovascular autonomic function. The purpose of this study was to determine sex- and age-specific reference values for cardiac autonomic function at rest, during maximal exercise and the recovery phase in prepubertal children. Methods: Five hundred and twelve healthy children 7–11 years of age performed a Léger test. A heart RR-interval monitor recorded the heart data and a specific software analysed the cardiac autonomic response through HR and HR variability (HRV). It analysed HR before the test (resting HR, RHR), during the test (HR_{peak}) and HR recovery (HRR) in the first minute (HRR1) and the fifth minute (HRR5). The values are mean ± SD. Results: Collectively, 91.2% of girls and 92.3% of boys were within the recommended ranges regarding RHR. The average HR_{peak} was 199 ± 10.83 b.p.m. and 96.8% of girls and 95.3% of boys were within the minimum threshold value recommended (180 b.p.m.). Boys showed lower values of RHR than girls ($p < 0.001$) and larger values of HRR 1 and HRR5 ($p < 0.001$). Conclusions: This study comprehensively provides a reference set of data for the most important HR variables that can be obtained during exercise testing in prepubertal children regarding age and sex and in a field setting. Impact: This is the first study to provide reference values of autonomic cardiac function at rest, during maximal exercise and during the recovery period in prepubertal children aged 7–11 years.Despite the early age of participants, cardiorespiratory fitness, RHR and HRR are different according to sex.Aerobic performance and HR_{peak} have a negative correlation with body mass index and cardiometabolic risk.