The normal fluctuations in heart rate (HR) or heart rate variability (HRV) in humans have been demonstrated to reflect the autonomic control of HR with several HRV frequency components identified to characterise the neural control of HR. Standard guidelines for HRV measurement have been developed however, HRV reproducibility has been highlighted as an important area for further examination. The majority of studies examining HRV reproducibility have investigated adults with very few studies examining HRV reproducibility in children. Therefore, the aim of the current study was to examine the reproducibility of HRV during rest and light to moderate exercise over a period typically utilised during intervention studies such as exercise training (i.e. 8 weeks). Ten healthy children (6 male, 4 female) volunteered for this study with HRV recordings obtained during supine rest and three exercise work rates (<65% maximum heart rate), initially and then eight weeks later. For rest and each exercise work rate, the low frequency (0.041-0.15 Hz); high frequency (0.15-0.40 Hz); and total power (0-0.40 Hz) components of HRV were examined and expressed in absolute units (ms²/Hz), normalised units (nu) and as a ratio (LF/HF), where appropriate. Differences (p<0.05) between variables were examined using paired t-tests or Wilcoxon Sign Ranks tests while reliability and reproducibility were examined by intraclass correlations coefficients (ICC), coefficient of variation (CV), and mean bias ratio and ratio limits of agreement (LOA). Heart rate and all measures of HRV at rest and exercise were unchanged after eight weeks. Significant ICC were documented primarily during rest (0.72-0.85) while weaker relationships (-0.02-0.87) were evident during exercise. A large range of CV was identified during rest (6-33%) and exercise (3-128%) while the ratio LOA were variable and substantial (1.04-2.73) particularly when HRV was expressed in absolute units. Despite similar HRV over an eight-week period, variable ICC and sizeable CV and ratio LOA indicate moderate to poor reproducibility of HRV in children, particularly during light to moderate exercise. This poor reproducibility may be associated with the maturation and development of the autonomic nervous system in pre-pubertal children. Although greater control of extraneous conditions may improve HRV reproducibility, the reliability of HRV in children may be unacceptable during rest and/or exercise for moderate term investigations. Studies examining HRV in children should include age or maturation stage, matched control participants to address the age-related change in HRV and inadequate HRV reliability in pre-pubertal children.

Keywords: Reproducibility, Children, Heart Rate Variability