

Heart Rate Variability, Rowing Performance, and Physiology of Elite Rowers

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Abstract:

Background: Heart Rate Variability (HRV) is the variation in time between the R-R intervals of one's heartbeat. Previous studies have determined that HRV may be a useful, non-invasive indicator of acute adaptations to training. However, training demands differ among sports, particularly at the elite level. Purpose: To characterize a group of elite rowers (body comp, max aerobic fitness, and peak power), track their HRV, and determine, on an individual basis, when their HRV falls outside their normal window, and what effect this may have on their rowing performance Hypothesis: HRV outside of an individual's normal window will have a significant effect on their rowing performance. Methods: Elite Female Rowers from Saratoga rowing association (n=5) partook in a body composition analysis and a baseline performance analysis via a peak power and VO₂ max test (Tables 1 & 2). HRV was measured each morning using the HRV4training app for a total of 9 weeks. Participants partook in the National Selection Regatta at week 5 (n=3). Results: Upon initial testing, all participants VO₂ max ranked within the top 75th percentile for women ages 20-30 (Table 2). Across all 9 weeks rMSSD and LnrMSSD seemed consistent. SDNN gradually increased until week 7, at which time there was a meaningful decrease of 22.13 ± 32.13 ms. The LF/HF ratio gradually decreased a total of 0.177 ± 0.320 (Figure 2). There were notable decreases in rMSSD, LnrMSSD, and LF/HF from the third to fourth day of the NSR. Neither SDNN nor LF/HF appear to be meaningfully different in the 5 days preceding the regatta as compared to the four days during the regatta ($d=0.061$ and 0.066 respectively) (Figure 3). In contrast, there was a large effect size in regard to the rMSSD and LnrMSSD differences between the 5 days preceding and the four days during the regatta ($d = 0.917$ and 0.804 respectively) (Figure 3). The relationship between HRV and on-water performance remains unclear as further data is needed. Conclusion: In support of previous studies, HRV seemed to be inversely related to training intensity and athletic performance, making HRV a useful tool for exercise prescription and performance estimation. Further analysis of HRV and rowing performance will provide greater insight into its effectiveness specifically in relation to on and off water rowing performance.