In-Season Changes in Heart Rate Recovery are not Related to Aerobic Fitness in Collegiate Intermittent Sport Athletes
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Although heart rate recovery (HRR) has been suggested as a simple method to monitor changes in fitness, there remains minimal and conflicting evidence regarding the relationship between HRR and aerobic capacity.

**Purpose:** To determine if in-season changes in HRR are related to aerobic fitness in collegiate athletes and whether this relationship is influenced by gender or body composition.

**Methods:** 50 NCAA Division 1 soccer and hockey athletes (male=32, soccer=24) completed testing immediately before and after their competitive seasons. Lean body mass (LBM) and body fat percentage (BF%) were determined by dual energy xray absorptiometry (DXA). Maximal aerobic capacity (VO$_2$max), and maximal respiratory exchange ratio (RERmax) were determined during maximal treadmill testing followed by 3 minutes of walking. Heart rate recovery (HRR) was calculated as the absolute decrease from maximal HR at 1 (HRR$_{1min}$), 2 (HRR$_{2min}$) and 3 minutes (HRR$_{3min}$) after test completion. Pre- and post-season fitness and HRR variables were compared using paired t-tests. Multivariate regression analysis was used to identify independent predictors of in-season changes in HRR at each time point using gender and in-season change in VO$_2$max, BF%, LBM and RERmax as covariates.

**Results:** Compared to pre-season, post-season VO$_2$max (4.31±0.87 v 4.08±0.85, p<0.001) and BF% (19.4±6.5 v 19.1±6.8%, p=0.057) was lower, while RERmax (1.13±0.1 v 1.21±0.1, P<0.001) and LBM (56.3±9.8 v 56.7±10.4kg, p=0.002) were higher. In-season changes showed faster HRR$_{1min}$ (27.6±9.4 v 30.4±8.4 bpm, p=0.027), but HRR$_{2min}$ (71.9±5.3 v 71.1±4.8, p=0.30), and HRR$_{3min}$ (64.9±4.5 v 65.2±4.7, p=0.78) were not. After inclusion in the multivariable model, VO$_2$max was not related to HRR$_{1min}$ (p=0.34), HRR$_{2min}$ (p=0.85), or HRR$_{3min}$ (p=0.72). Gender and in-season changes in VO$_2$max, BF%, LBM or RERmax were not related to in-season changes in HRR at any time point (p>0.05 for all).

**Conclusion:** In-season changes in HRR are not related to changes in aerobic fitness, gender or body composition. This study demonstrated faster HRR$_{1min}$ in collegiate soccer and hockey athletes from pre- to post-season. However, this improvement was unrelated to changes in VO$_2$max and body composition. Based on these findings, HRR is not a useful indicator of aerobic fitness in this population.