Title – Low dose caffeine attenuates the positive effects of anaerobic exercise on Heart Rate Variability (HRV)
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Abstract. Cardiovascular benefits of exercise, including reducing blood pressure and reducing mortality in heart disease patients, have been confirmed by researchers. Studies on cardiovascular benefits of caffeine have been equivocal and inconclusive. Heart rate variability (a measure of cardiac autonomic balance) has been proven as an independent predictor of mortality in heart disease patients and marker of cardiac health. Effects of caffeine on HRV, and the combination of caffeine and anaerobic exercise on HRV and cardiac health, remains to be clearly elucidated. We hypothesized that acute consumption of 200mg of caffeine will improve HRV but a 30sec wattbike test will not improve HRV, and when combined, HRV will be decreased. A crossover trial was conducted on 28 healthy college-age students (19 females and 9 males). A wattbike collected anaerobic performance data, then AD Instruments' Powerlabs 26T and HRV/ECG analysis tools measured HRV with and without caffeine. The measures of HRV included SDRR (standard deviation of normal RR intervals), RMSSD (root mean square of RR intervals), HF (high-frequency), and LF (low-frequency). Using a one-way-repeated ANOVA, statistically significant differences existed in SDRR over each condition, $F(2, 54) = 10.994$, $p < .0005$, with SDRR increasing 101% during exercise and decreasing thereafter by 6% post-caffeine consumption. RMSSD ($F(1.654,44.647)=13.760$, $p < .0005$) and HF($F(1.429,38.578)=3.681$, $p=0.048$) displayed statistically significant similarity. LF/HF ($F(1.477,39.869)=5.384$,$p=0.015$) ratio decreased 57.5% during exercise, then further decreased by 23% post-caffeine consumption. LF ($F(1.489,40.216)=0.215$,$p=0.741$) displayed the same trend, but no statistically significant differences. Caffeine alone did not significantly increase HRV - SDRR ($t(66)=0.360$, $p=0.720$). We conclude that a 30sec wattbike (anaerobic) exercise improves HRV and cardiac health but the acute consumption of caffeine does not. The HRV from a 30sec wattbike exercise decreases when 200mg of caffeine is consumed before exercise. Therefore, low dose caffeine attenuates the positive effects of anaerobic exercise on HRV.