TACSM Abstract

3-Nitrotyrosine and Soluble Vascular and Intracellular Adhesion Molecule Responses to High-Intensity Interval and Steady-State Moderate-Intensity Exercise

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Category: Doctoral

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ABSTRACT

Vascular endothelium may respond differently to high-intensity interval exercise (HIIE) when compared to moderate-intensity steady state exercise (SSE). We hypothesized that greater sympathetic stimulation of soluble vascular adhesion molecule-1 (sVCAM-1) and intracellular adhesion molecule-1 (sICAM-1) and greater oxidative and nitrative stress on the vascular endothelium may transiently result from HIIE. **PURPOSE:** Determine the influence of HIIE on sVCAM-1, sICAM-1 and 3-nitrotyrosine (NT), a marker of nitric oxide-dependent reactive nitrogen species and nitrative stress, relative to a comparable amount of moderate-intensity SSE and a dose that is half that of SSE. **METHODS:** Seventeen male participants (age 27.8 $\pm$ 6.4 yr; weight 80.6 $\pm$ 9.0 kg; BMI 25.1 $\pm$ 2.4 kg/m2; %fat = 19 $\pm$ 5; VO2max 52.1 $\pm$ 7.5 ml/kg/min) underwent HIIE by treadmill running (90% and 40% of VO2reserve in 3:2 min ratio) to expend 500 kcals (H500); HIIE to expend 250 kcals (H250), and; SSE at 70% VO2reserve to expend 500 kcals (M500) in a randomized crossover design. Intensities of all exercise conditions averaged 70% VO2reserve. Blood measures of sVCAM-1 (ng/mL), sICAM-1 (ng/mL), NT (nM), epinephrine (EPI) and norepinephrine (NE) in pg/mL, were obtained just before, immediately after, 2 hr and 24 hr after exercise. Significant differences were determined using 3 by 4 repeated measures ANOVAs. Effect sizes were calculated to determine the magnitude of dependent variable responses to exercise. **RESULTS:** HIIE resulted in 2 to 2.5 fold greater EPI responses immediately after exercise versus SSE ($p = 0.0059$, H250 ES = 1.89; H500 ES = 3.04). NE increased an average of 5.4 times above pre-exercise values across all exercise conditions ($p < 0.0001$). NT decreased immediately after HIIE (H250 ES = - 0.39; H500 ES = -0.97) and returned to baseline by 2 hr post-exercise; whereas, NT was elevated 111% 2 hr (ES = 2.46) and remained 24 hr after SSE ($p = 0.0001$). sVCAM-1 was unchanged with HIIE but increased 6% immediately following moderate-intensity SSE and remained elevated 24 hr post-exercise ($p < 0.0005$, ES = 1.01). **SUMMARY:** Our results are in direct opposition to our hypothesis. Transient elevations in NT and sVCAM-1 after moderate-intensity SSE but not HIIE of similar average intensity and duration may indicate unique effects of interval exercise. NT and sVCAM-1 were not elevated after HIIE in spite of a greater sympathetic response than what was observed after moderate-intensity SSE.