Acute Effects of Concurrent Exercise on Biomarkers of Angiogenesis and Cardioprotection in Sedentary Adults: Preliminary Findings

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ABSTRACT

There is evidence that performing brief bouts of aerobic-type exercise before each set of resistance exercise (i.e., integrated concurrent exercise) leads to superior health and fitness outcomes than when the modalities are performed independently (i.e., serial concurrent exercise). This advantage may be due in part to an exaggeration of functional hyperemia leading to an augmented cardiovascular adaptive response. **PURPOSE**: To analyze circulating levels of an endothelial shear stress-induced biomarker (microRNA-126) and a biomarker of cardiovascular development (microRNA-222) before and after volume- and time-matched serial and integrated concurrent exercise sessions in young, healthy, sedentary adults. **METHODS**: One female and three male participants (age = 27.8 ± 6 yrs; height = 172.8 ± 4.6 cm; weight = 71.8 ± 17.6 kg; BMI = 23.9 ± 4.9 kg/m^2; VO_{2max} = 30.13 ± 4.92 ml/kg/min) who were healthy and had performed no more than 1 hr of structured physical activity per week over the previous year completed all procedures. Participants performed one-repetition maximum tests on the Leg Press, Leg Curl, and Leg Extension exercises, and also completed a maximal cycling test. At least one week after testing, participants performed one of two exercise patterns: 3 sets of 10 repetitions of each resistance exercise followed by 20 min of cycling (serial), or 2 min of cycling performed before each set of resistance exercise (integrated). At least three weeks after the first exercise session, the participants performed the other session. Blood was collected before each exercise session, immediately after each exercise session, and 1 and 3 hours after each exercise session. RNA was extracted from the frozen plasma samples and microRNAs were quantified using PCR analysis. Values were normalized to a spike-in control and adjusted for plasma volume shifts. Fold-change of target microRNAs from baseline were calculated. Data were analyzed using a two-way ANOVA with repeated measures. Significance was set at 0.05. **RESULTS**: MicroRNA-126 changed 0.24 vs. 1.70-fold immediately post-exercise, 0.23 vs 0.75-fold 1 hr post-exercise, and 0.26 vs. 1.29-fold 3 hr post-exercise following serial and integrated concurrent exercise, respectively. There was no time effect (p = 0.34), no exercise effect (p = 0.85), and no interaction effect (p = 0.58). MicroRNA-222 changed 0.20 vs. 3.07-fold immediately post-exercise, 0.21 vs 1.21-fold 1 hr post-exercise, and 0.22 vs. 2.09-fold 3 hr post-exercise following serial and integrated concurrent exercise, respectively. There was no time effect (p = 0.26), no exercise effect (p = 0.73), and no interaction effect (p = 0.41). **CONCLUSION**: Although not statistically significant, a more robust response from integrated concurrent exercise compared to serial concurrent exercise was observed. At this early stage, it is unclear if these results will persist with the addition of more participants.