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Sex differences in cardiovascular risk factor responses to resistance and endurance training in a primary prevention cohort

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Introduction: Cardiovascular (CV) diseases remain the major global causes of premature death and disability in men and women. The first line strategy for CV disease prevention involves modification of risk factors, including physical activity levels. It is also accepted that distinct forms (or modalities) of exercise induce different physiological adaptations, which may in turn translate to differences in CV risk. The comparison between males and females in terms of the impact of resistance (RES) versus endurance (END) training on fitness, strength, body composition and other CV disease risk factors has not been comprehensively described in humans. This study aimed to compare differences in CV risk factor responses between males and females following END and RES training. We present the frequency of responders to each training modality, and the magnitude of response to each training modality, in both males and females. We hypothesised that; i) the magnitude of change in CV risk factors would be greater following END training compared to RES training, ii) the frequency of responders would be greater following END training compared to RES training, and iii) both the magnitude and frequency of responders would be similar between males and females.
Methods: Using a randomized cross-over design, 68 (M: n=28; F: n=40) healthy adults (age: M: 27.3±6.6; F: 24.5±4.6) completed 3-months of RES and END training, with an intervening 3-months washout. Participants were tested pre and post each exercise intervention (weeks 0, 12, 24 and 36). Measures included cardiorespiratory fitness (VO_2peak), strength (1RM), body composition (lean mass, fat mass and visceral adipose tissue using dual-energy X-ray absorptiometry), blood pressure, heart rate, glucose, insulin, and lipids.
Results: Cardiorespiratory fitness (L/min) significantly increased in both sexes following END, but not RES. The magnitude of change was larger in males (M: +0.32 L/min; F: +0.20 L/min), although this did not achieve statistical significance (P=0.05). Strength significantly increased in both sexes following RES (P<0.01), with a larger increase in males (Leg press: M: +63kg; F: +39kg; P<0.05). Lean mass significantly increased in both sexes (P<0.01) following RES, and fat mass decreased in females following END (P=0.02). The change in C-reactive protein following END was significantly different between sexes (M: +0.5 mg/L; F: -0.4 mg/L; P=0.035). There were no differences between sexes in the proportion of individuals who responded positively to any variable following RES or END. Hence, differences that were apparent could be ascribed to the *magnitude* rather than the frequency of response, despite training being performed at matched relative intensities for all participants.
Conclusions: Males had a larger increase in cardiorespiratory fitness following END, and in strength following RES. Despite these modality and sex differences in cardiorespiratory fitness and strength, there were no sex differences apparent in the responses to other risk factors. This suggests that differences in physiological responses to strength and cardiorespiratory fitness may not translate to changes in CV risk in healthy subjects.