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LETTER TO THE EDITOR

Hemodynamics of aerobic and resistance blood flow restriction exercise in young and older adults

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We have read with interest the study conducted by Craig A. Staunton and colleagues (2015). Although clinically relevant results were shown, key aspects of the study concerning the risks and benefits of the training exercise interventions need to be discussed.

One important issue involving training exercise, be it aerobic or resistance, is its capacity to attenuate the progressive decline in functional capacity in aging. It is well established in the literature that resistance exercise plays a role in slowing the progression of sarcopenia and its effect on skeletal muscle strength. Regular aerobic exercise improves cardiorespiratory fitness and increases survival. Thus, both exercise modalities are particularly effective in maintaining or improving physical fitness.

However, we understand that conventional exercise protocols need to be adapted to fill scientific gaps, and caution is required in interpreting and generalizing the results. In an elegantly conducted study (Staunton et al. 2015), Craig A. Staunton and colleagues demonstrated that resistance and aerobic exercises, performed with blood flow restriction, resulted in increased hemodynamic stress response as compared with those without flow restriction, and this effect was similar between young and older adults. The greater hemodynamic stress response was lower for aerobic session than resistance exercise session, suggesting that the former modality would be more appropriate to older adults. I would like to highlight, however, that regardless of the hemodynamic stress results, a number of points, not mentioned by the authors, should be considered before the final recommendation is made. First, cardiovascular diseases are more prevalent in the elderly, and their association with other comorbidities, including diabetes mellitus, systemic arterial hypertension, and atherosclerosis has been well documented. Since endothelial dysfunction is present in all stages of atherosclerosis, it is expected that older individuals have increased risk to develop endothelial dysfunction associated with cardiovascular risk factors. Second, the continuous process of endothelial recovery is crucial to minimize endothelial injury, especially in individuals with these risk factors. Increased in blood pressure is an expected physiological response induced by exercise. Nevertheless, in addition to increase the systemic blood pressure, blood flow restriction exercise also leads to disturbances in local blood flow and consequent injury and apoptosis of endothelial cells at blood vessels distal to the occlusion (Jenkins et al. 2013). This is of particular importance when considering the elderly population, who are more likely to develop endothelial dysfunction. Besides, bone marrow-derived circulating endothelial progenitor cells, responsible for maintaining the integrity of damaged blood vessels, are reduced in subjects with cardiovascular risk factors, as well as in older individuals (Schmidt-Lucke et al. 2010). Then, by considering the influence of age on endothelial function, the number of endothelial progenitor cells, as well as the likelihood of these individuals to have higher risk of atherosclerosis, a caveat should be mentioned regarding the regular practice of blood flow restriction exercises by the elderly.

Undoubtedly, the authors developed an elegant approach to discriminate hemodynamic responses to resistant exercise from responses to aerobic exercise, and the study has its merits. We only advise caution in recommending flow

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restriction exercises to elderly individuals. In addition, the limited number of studies on exercises with flow restriction emphasizes the need to elucidate their effects on local vascular cells prior to their prescription to increase muscle cross-section.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

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