

EFFECTS OF UNILATERAL ISOKINETIC ECCENTRIC TRAINING (AND DETRAINING) ON MUSCULOSKELETAL CHARACTERISTICS IN OLDER PEOPLE

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Introduction

Reductions in lower-limb strength and muscle mass are common in ageing, with a concomitant reduction in aerobic capacity also limiting exercise tolerance. However, eccentric-only exercise has a lower cardiovascular demand (Vallejo et al., 2006) and higher loading potential that may improve exercise tolerance whilst providing a high musculoskeletal adaptive stimulus. Therefore, the present study examined the impact of a 6-week seated isokinetic eccentric training programme and 8 weeks of detraining on lower-limb strength and muscle architectural characteristics in older people.

Methods

Maximal eccentric lower-limb force, and vastus lateralis (VL) thickness, pennation angle and fascicle length were measured in 12 participants (age = 67.0 ± 6.3 y, mass = 80.6 ± 16.0 kg, height = 1.6 ± 0.1 m) before (on two occasions separated by 1 week to determine reliability) and after the 6-week training programme using isokinetic dynamometry and real-time ultrasonography. All measures were then re-examined 8 weeks later to quantify detraining (i.e. regression) effects. Training was performed twice-weekly on a BTE Eccentron that simulated downhill walking using an alternating unilateral leg press motion and consisted of 5 min (week 1) or 10 min (weeks 2-6) of isokinetic eccentric contractions performed at 50%MVC at a rate of 40 'steps' per minute. Strength was reassessed every 2 weeks to ensure subjects' training intensities remained at 50%MVC, with rate of perceived exertion (RPE) recorded after each training session.

Results

A significant ($P < 0.05$) increase in lower-limb eccentric strength ($58.8 \pm 39.9\%$), VL muscle thickness ($9.8 \pm 5.4\%$), pennation angle ($4.4 \pm 5.7\%$) and fascicle length ($5.4 \pm 4.3\%$) was detected immediately after the 6-week training programme. RPE remained consistently low throughout the programme (3.3-4.1 out of 10), despite the increased duration and absolute intensity of training. Eight weeks later, lower-limb eccentric strength ($50.4 \pm 38.0\%$), VL muscle thickness ($6.1 \pm 5.5\%$) and fascicle length ($5.8 \pm 7.5\%$) remained significantly greater than pre-training levels, while pennation angle ($1.0 \pm 6.7\%$) returned to baseline.

Discussion

The substantial increases in strength and muscle size achieved whilst training with low RPE have important clinical and practical implications for exercise prescription in older people, with the practical application and functional outcomes of the exercise regime well-suited to the specific physical needs and challenges of older people. Furthermore, the limited regression detected eight weeks after the completion of the training programme is indicative that eccentric strength training provides prolonged musculoskeletal functional benefits.

References

Vallejo AF, Schroeder ET, Zheng L, Jency NE, Sattler FR. (2006). Cardiopulmonary responses to eccentric and concentric resistance exercise in older adults. *Age Ageing*, 35(3), 291-297.

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