Low-intensity resistance exercise as a countermeasure to 14d of reduced ambulation-induced atrophy on leg skeletal muscle in elderly adults

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Sarcopenic skeletal muscle loss has been linked to an increased risk of diabetes, cardiovascular disease and falls amongst older adults, decreasing physical independence and ultimately a decline in quality of life. We hypothesized that periods of inactivity that occur as a result of illness or injury can transiently accelerate muscle loss in the elderly. Such periods are more common with aging and in older persons are something from which recovery of muscle mass is often incomplete. This study aimed to evaluate the use of resistance exercise as a means of attenuating muscle mass and strength losses during a two-week period of reduced ambulation (< 1500 steps/d). Thirty healthy, elderly men (70 ± 1 yr; mean ± SEM) reduced their habitual daily step-count from 7036 ± 2710 steps/d to 1166 ± 740 steps/d for 14 days. During this period subjects completed six sessions of unilateral leg resistance exercise at ~30% of 1-repetition maximum (1RM) to voluntary failure while the contralateral leg remained unexercised. Leg isometric torque was reduced in the inactive leg decreasing by -6.9 ± 3.0% (P=0.023) and in the exercise leg increasing by +1.5 ± 3.0%. All voluntary strength 1RM measures increased, however only significant increases were seen for knee extension (both legs) and in the trained leg for leg-press (P<0.03). Fat free mass (FFM, P=0.028), and skeletal muscle mass (SM, P=0.068) were reduced in the inactive leg, whereas FFM and SM were increased (P = 0.053 and P = 0.037, respectively) in the trained leg, leading to significant differences in the lean mass composition of the lower limbs. We show that a relative inactivity (reduced steps) reduces leg lean mass. Our results suggest that despite the net catabolic nature of periods of reduced activity, low-intensity, high-volume loading of the quadriceps muscles is an effective countermeasure against declines in muscle mass and strength in older adults.