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Chronic SSC-Exercise Results in Differential Physiological and Morphological Adaptation in Young and Old Rats: 963: 8:45 AM – 9:00 AM

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Although muscles from aged animals can adapt to loading, few studies have investigated if age affects muscle adaptation and injury following a specific repetitive loading protocol designed to induce muscle hypertrophy.

PURPOSE: The purpose of this study was to determine if aging attenuated the changes in muscle plasticity and muscle-fiber morphology following a chronic administration of stretch-shortening cycle (SSCs).

METHODS: Dorsiflexor muscles of young (12 weeks, N = 6) and old (30 months, N= 5) male F344xBN F1 rats were exposed 3 times per week for 4.5-weeks to a protocol of 80 maximal SSCs per exposure *in vivo.* Twenty-four hours after the final exposure, rats were weighed and exsanguinated. The left (exercised) and right (contralateral control) tibialis anterior muscles were dissected and weighed. To quantify muscle quality, the pre-test isometric force measured at the last session of the chronic exposure period was normalized to muscle wet-weight of the tibialis anterior of the exposed limb. Muscle fiber cross-sectional area (CSA) was determined from software (ImageJ, National Institutes of Health) analysis from 10 non-overlapping digital images obtained from tissue sections stained with Harris Hematoxylin and Eosin.

RESULTS: Muscle wet-weight was significantly increased by 17% in the exercised limb of the young animals compared with the contralateral control limb ($p < 0.001$); there was no difference in the old animals. In addition, the young group showed an increased muscle quality in the exercised limb after the chronic exposure protocol compared with the old group ($p = 0.001$). Finally, in the contralateral control, approximately 45% of the fibers from the older animals and 54% of the fibers from the younger animals were >= 35,000 um^2. In the exercised limb, approximately 46% of the fibers from the older animals and 76% of the fibers from the younger animals were >35,000 um^2. These date indicate that exposure to chronic SSCs resulted in an increased percentage of larger fibers in the young animals (from 54% to 76%) without a corresponding shift to larger fibers in the older animals (45% to 46%).

CONCLUSIONS: Our results indicate that chronic exposure to SSCs significantly increases muscle hypertrophy (weight increase and larger fibers) and leads to greater muscle quality in young rats, while muscles of older rats are not able to adapt to the same chronic SSC-exercise protocol.

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