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INTER-STRETCH REST TIME IS IMPORTANT FOR DEVELOPMENT OF PATHOLOGY FROM STRETCHES OF ACTIVATED MUSCLES

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PURPOSE:

To examine myofiber pathology 2 days after stretches of activated plantarflexor muscles with short (40 seconds) and long (180 seconds) inter-stretch rest times.

METHODS:

Using nerve stimulation (80 Hz, 0.2 ms pulse duration, 6.5 ± 0.4 V), stretches (30) were imposed on isometric contractions (stimulation time 0.9 seconds) by ankle rotation from 90° to 40° (velocity = 600° s^{-1}) in female Sprague Dawley rats (3-5 mo). Isometric contractions (90°) with 40-s rest times served as controls. Isometric (90°) and peak stretch forces (40°) during the stretch protocols and the isometric force-frequency relationships (90°) were measured before and one hour after the protocols. Using antibody immunohistochemistry, cross-sections (thickness $8 \mu\text{m}$) of distal parts of gastrocnemius medialis muscle were analyzed for desmin, albumin, laminin and dystrophin.

RESULTS:

Peak stretch forces and isometric force deficits [total deficits $56.7 \pm 2.1\%$ (40-s); $51.3 \pm 3.7\%$ (180-s)] were similar at each stretch number for both protocols. Isometric force deficit at 5, 10, 20, 40, 60, 80 [$46.6 \pm 2.5\%$ (40-s); $50.4 \pm 2.9\%$ (180-s)] and 100 Hz were also similar one hour after the protocols. Myofiber pathology was not observed in controls and after stretches with long rest times but was present only after stretches with short rest times. Pathology was characterized by swollen myofibers, desmin deficient but albumin positive myofibers and loss of dystrophin.

CONCLUSIONS:

It is concluded that 1) stretch-induced force deficits do not always lead to myofiber pathology and 2) inter-stretch rest time is important for development of pathology from repeated stretches of activated skeletal muscles. Supported by NIOSH R01-OH-02918.

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