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TEMPORAL EFFECTS OF STRETCH-SHORTENING CYCLE RANGE OF MOTION ON MUSCLE PERFORMANCE

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PURPOSE

To investigate the effect of range of motion (ROM) on stretch-shortening (S-S) cycle induced injury using force-length (F-L) curves and S-S cycle properties.

METHODS

Testing was performed on the dorsiflexor muscles of Sprague-Dawley rats in vivo. Animals were randomly assigned to a long ROM group (L-Inj), short ROM group (S-Inj), or isometric control group (CON). Each group (N=6) performed a series of isometric contractions in 10° increments over the ROM to generate the F-L curve, then a single S-S cycle from which negative, positive, and net work were calculated. This was performed before, after, and 48 hr after the injury or control protocol. The injury protocol consisted of 70 S-S cycles at 500°/s. The S-Inj group received S-S cycles between 70°-120° ankle angle, whereas the L-Inj group received S-S cycles between 90°-140°.

RESULTS

Isometric preinjury forces at 70°-140° were similar for all three groups. Differences between preinjury and 48-hr recovery forces at each angular position were calculated for all groups. Differences in the S-Inj group were not statistically different from the CON force differences. In contrast, differences in the preinjury and 48 hour recovery forces of the L-Inj group were statistically greater than CON at 80, 90, and 100 degrees ($p = 0.006$, 0.028, and 0.042, respectively). Positive work did not show a treatment-time interaction among CON, S-Inj, and L-Inj groups ($p = 0.092$). In contrast, negative work was affected by treatment ($p < 0.0001$). Change in negative work of CON was less at 48 hr post than the S-Inj or L-Inj groups ($p = 0.019$ and 0.0001 respectively). Net work of the S-Inj and L-Inj groups were more affected than CON ($p = 0.0022$ and 0.0007, respectively).

CONCLUSIONS

S-S cycles at a longer ROM result in a larger isometric force deficit 48 hr after exposure. Eccentric muscle performance (negative work) was also negatively affected, regardless of the ROM, 48 hr after exposure to S-S cycles while concentric muscle performance (positive work) was not.