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CHANGES IN REAL-TIME MUSCLE PERFORMANCE DUE TO STRETCH-SHORTENING CYCLE RANGE OF MOTION

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PURPOSE

To investigate the effect of range of motion (ROM) on stretch-shortening (S-S) cycleinduced muscle injury in real-time using force and work parameters.

METHODS

Testing was performed on dorsiflexor muscles of Sprague-Dawley rats in vivo. Animals were randomly assigned to a long ROM group (L-Inj) or short ROM group (S-Inj). The S-Inj group received 7 sets of 10 S-S cycles at 500°/s between 70°-120° ankle angle, whereas the L-Inj group received the same protocol between 90°-140. Dorsiflexor muscles were electrically stimulated for 2.8 s each set and sets were administered every minute. Force and angular position were recorded continuously for each set. The force data collected during the S-S cycles were used to calculate peak, minimum, mean, and cyclic forces for each S-S cycle. Peak force was the maximum force during S-S cycles. Minimum force was the isometric force prior to each S-S cycle. Mean force was the average eccentric force during each S-S cycle. Cyclic force was the magnitude of eccentric force enhancement. The force and angular position data were used to calculate negative, positive, and net work for each S-S cycle. Negative work was the work absorbed in the eccentric phase of each S-S cycle. Positive work was the work performed in the concentric phase of each S-S cycle. Net work is the difference between negative and positive work.

RESULTS

The different ROMs led to different force profiles for the two injury groups. ROM did not significantly affect peak force and mean force from Set 1 to Set 7 of the S-S cycles ($p = 0.813$ and 0.265, respectively). However, ROM did affect cyclic force and min force ($p < 0.0001$ for both parameters). Real-time changes in negative work, positive work, and net work did not differ with ROM ($p = 0.878$, 0.879, and 0.652 respectively) but did change significantly from Set 1 to Set 7 ($p = 0.001$, 0.04, and 0.001, respectively).

CONCLUSIONS

Longer ROM during S-S cycles resulted in a larger deficit in real-time muscle performance measures (cyclic force and minimum force). Real-time muscle performance measures also were sensitive to S-S cycle induced muscle injury.