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ANKLE POSITION DURING ISOMETRIC CONTRACTIONS ALTERS STRETCH-INDUCED FORCE DEFICITS OF RAT PLANTAR FLEXOR MUSCLES

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This study examined the effect of forceful isometric contractions at long and short muscle lengths on the force deficit induced by active stretches (15) of the plantar flexor muscles in intact rats. Ankle position of 0.70 rad and 2.09 rad was considered a long (ISO-LONG) and short muscle length (ISO-SHORT), respectively. Three isometric contractions of 1900 ms and 3 min rests were performed prior to the stretches. Rats without preceding isometric contractions (ISO-NO) served as controls. For all groups (n = 4 each), maximal isometric forces at 2.09 rad were similar (ISO-NO: 22.7 ± 2.1 N; ISO-LONG: 23.3 ± 1.0 N; ISO-SHORT: 22.2 ± 1.7 N). Stretches (one every 3 min) were imposed on maximally active muscle by ankle rotation from 1.57 to 0.70 rad (velocity 0.87 rad s^{-1}). Following ISO-NO and ISO-SHORT, similar force levels (at 1.57 rad) preceded the first ankle rotation. Force levels following ISO-LONG were 25% lower. In all groups, force decreased exponentially with half of the total force deficit within the first five strains. The force for ISO-LONG was decreased to 76.3 ± 3.8% and significantly less than for ISO-NO and ISO-SHORT (to 60.7 ± 3.1% and 58.3 ± 4.1%, respectively). It is concluded that the reduction of force deficits by repeated strains following forceful isometric contractions is dependent on ankle position during the isometric contractions. Isometric conditioning appears to protect from muscle injury (i.e. force deficits) particularly when performed at long muscle lengths. Supported by NIOSH R01-OHAR-02918

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