THE EFFECT OF ECCENTRICALLY INDUCED DAMAGE ON MUSCLE TENSION AND FORCE PRODUCTION ON THE BICEPS BRACHII.

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Introduction
It has been established that eccentric muscle damage causes a decline in force production. It is likely that this disruption will cause a change in the tension of the muscle that will inhibit force production. Tensiomyography (TMG) is a passive muscle stimulation tool that can assess muscle tension through maximal displacement (Dm) of the muscle and the time taken for peak activation to occur (Tc).

Purpose
To examine the alteration in muscle tension as a result of inducing muscle damage in the elbow flexors.

Methods
19 Healthy males (age 21.1±4.7 years, height 180.0±7.0 cm, mass 81.3±14.9 kg) visited the laboratory on 7 consecutive days. Subjects were not resistance trained and abstained from exercise 5 days prior to, and for the duration of the study. All visits involved a TMG measurement from both biceps brachii and 3x5 second isometric maximal voluntary contractions of the elbow flexors at a fixed elbow angle of 90° during which electromyographic (EMG) measurements were recorded. Measurements from dominant and non dominant arms represented control and treatment interventions respectively. Antecubital venous blood samples were drawn on day 1 (baseline), and on days 2, 4 and 7 (post damage) to determine plasma creatine kinase (CK) levels pre and post damage.

Damage was induced in each subject’s non dominant elbow flexors immediately following the completion of testing on day 1 by performing 5 sets of 10 repetitions of maximal eccentric contractions. The range of movement was set at 90° with the speed of extension set at 30° per second. Subjects rested for 3 seconds between repetitions and 60 seconds between sets. Comparisons between the damaged and control arm were made using a repeated measures ANOVA. All data is presented as mean±SE.

Results
Force in the damaged limb significantly declined by 35.0±4.2% (p<0.01) on day 2 before gradually returning towards baseline over the following 5 days. Dm followed a similar pattern to force, significantly decreasing by 30.0±4.1% (p<0.01) on day 2 then returning towards baseline by day 7. EMG amplitude decreased significantly by 19.2±8.0% before remaining at a similar level by day 7. Tc increased significantly by 12.5±3.5% (p<0.01) on day 5 and stayed at a similar level by day 7. CK levels rose significantly from 334.0±38.5I.UL-1 to 642.4±59.7I.UL-1 (p<0.01) by day 7. Force in the control arm on days 5, 6 and 7 was significantly (p<0.05) higher than baseline, although the damaged arm remained significantly (p<0.01) less than control by day 7.

Conclusion
This study induced muscle damage that inhibited force capacity. We suggest that some of the potential mechanisms for this inhibition were; i) an acute decrease in muscle displacement that negatively affected the optimal force tension relationship and; ii) delayed neuromuscular recruitment and contraction time of the muscle as a result of a progressive inflammatory response to damage as indicated by CK efflux.

Keywords: Tensiomyography, Force Measurement, Muscle Soreness