TACSM Abstract

Fatigue and Recovery Profiles of Unilateral Resistance Exercise in a Resistance Trained Population

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ABSTRACT

Recent data shows that fatiguing unilateral isometric contractions affect the performance of the non-exercising, contralateral muscles (i.e., cross-over effect). However, there is limited data on the time-course of the contralateral response, whether the effects occur during resistance exercise, and the influence of resistance training experience. **PURPOSE**: To examine force and electromyographic (EMG) activity during and after a fatiguing unilateral resistance exercise protocol for the ipsilateral and contralateral elbow flexors in a resistance trained population. **METHODS**: Eight participants (7 right hand dominant; mean age=22yrs; 7 males; resistance trained with ≥ 2days/week upper body) visited the laboratory on two days separated by ≥ 48 hrs. On the first visit, maximal dynamic strength was determined for the ipsilateral arm and control procedures for maximal isometric strength of the contralateral arm was performed. On the second visit, participants completed 4 sets of unilateral dynamic bicep curls to failure with 50% 1RM with 2 min rest intervals between sets. Maximal voluntary contractions (MVC) and EMG activity of the elbow flexors were recorded immediately before exercise and after each set for both arms, except for set 1 and 3 where only the ipsilateral arm performed MVC's. The responses during acute recovery were recorded at 2.5 min, 5 mins, and 10 mins post exercise. Separate repeated measures ANOVA tests were performed on the MVC and EMG responses for each arm. Alpha was set at 0.05. **RESULTS**: The results of the analysis show that for the ipsilateral arm, baseline MVC values declined to set 1 ($p<0.01$; ~26%), with no significant differences in force loss thereafter for set 2 (~29%), set 3 (~28%), set 4 (~30%), recovery 1 (~28%), recovery 2 (~27%), or recovery 3 (~24%). There was no significant change in maximal EMG activity for the ipsilateral biceps brachii ($p=0.189$; $\eta_p^2 =0.177$). For the contralateral biceps brachii, there was no significant difference across time in maximal EMG activity between the fatigue visit versus the control visit ($p=0.732$; $\eta_p^2=0.018$). However, collapsed across visit, there was a significant decrease in maximal EMG amplitude ($p<0.01$; $\eta_p^2=0.614$) that appears to be explained by the fatigue visit ($p=0.319$; $d=0.379$). For the contralateral arm, there was no significant change in MVC across time for either visit ($p=0.166$; $\eta_p^2=0.211$). **CONCLUSION**: These results show that following acute resistance exercise performed to failure, there is no change in maximal force of the contralateral elbow flexors. This finding brings into question whether the cross-over effect of fatigue occurs during resistance exercise or in resistance trained populations. The fatigability profile of the ipsilateral arm demonstrates there was no compounding effect on force loss with additional sets to failure. The lack of force recovery following acute resistance exercise emphasizes the importance of task dependency. The applications of these data suggests that relative fatigability may not be a useful metric to monitor training session outcomes.