COMPARISON BETWEEN ARMS FOR RESPONSES TO A BOUT OF MAXIMAL ECCENTRIC EXERCISE OF THE ELBOW FLEXORS

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There are two common experimental designs employed for a study to investigate effects of a prophylactic or therapeutic intervention on muscle damage. One of them uses two or more groups of subjects, one of which receives an intervention while the other acts as either a control or receives a different intervention. In the second design, only one group of subjects is required due to the use of contralateral limbs. The contralateral limb model is based on the assumption that changes in markers of muscle damage are identical following exercise when no intervention is given. However, this assumption has not been examined systematically. The purpose of this study was to compare changes in indirect markers of muscle damage between arms after maximal eccentric exercise of the elbow flexors. Ethical approval was granted by the Institutional Human Ethics Committee. Eighteen men (30.8 ± 1.2 yrs) performed eccentric exercise of the elbow flexors with each arm separated by 4 weeks. The use of dominant or non-dominant arm for the first bout was counterbalanced among subjects. The exercise consisted of 10 sets of 6 maximal eccentric actions of the elbow flexors against the lever arm of an isokinetic dynamometer (Cybex 6000) moving at a constant velocity of 90°.s⁻¹. The dependent variables included maximal voluntary isometric and isokinetic strength, range of motion (ROM), upper arm circumference (CIR), plasma creatine kinase (CK) activity, and muscle soreness. All measures were taken before, and 1, 2, 3, 4, 5, and 7 days after exercise, and the strength, ROM, and CIR were also measured immediately and 30 minutes after exercise. Changes in the measures over time were compared between dominant and non-dominant arms, and between the first and second bouts by a two-way repeated measures ANOVA. Pearson’s product moment correlation coefficients were calculated for selected time points to compare the arms, and bouts. No significant differences in torque and work during exercise were evident between arms and between bouts. Changes in the measures were not significantly different between arms, but a significant (P<0.05) difference between bouts was evident for maximal isometric strength, CIR, and CK. A poor or no correlation was found for all of the measures between arms (r<0.63) and between bouts (r<0.59). When comparing between bouts, the majority of individuals showed smaller changes in all measures following the second than the first bout. These results suggest that order of exercise bout for a treatment and control condition should be considered when using an arm-to-arm comparison model, but no consideration is necessary for the arm dominance. It seems that the model may not detect any small but real differences due to an intervention. However, the same criticism can apply to the inter-subject model where the variances between matched individuals may be no smaller than any supposed crossover protection in the contralateral limb design.

Keywords: Eccentric Exercise, Adaptation, Muscle Damage

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