

Muscle adaptations in relation to different types of strength training: an application of diffusion tensor imaging technique

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Several exercise methods are commonly used by fitness practitioners to increase muscle strength and body mass. Pre-exhaustion (PE) is a strength training method of combining two exercises, in which a single-joint exercise performed exhaustively is followed by a multi-joint exercise. The purpose of PE of the smaller muscle is to provide lower involvement of this muscle in the subsequent multi-joint exercise, thereby enabling greater participation of other muscles. Conversely, in the post-exhaustion (PO) method is reversed the sequence of the exercises: first a determined muscle is trained with a multi-joint exercise and after with a single-joint exercise (Augustsson et Al., 2003).

The purpose of this study was to investigate the effects of pre-exhaustion and post-exhaustion methods on gastrocnemius muscles by Diffusion Tensor Imaging (DTI) and volumetric evaluation techniques. DTI allows for a non-invasive evaluation of water diffusion and its fractional anisotropy (FA) in tissues.

Four adults men (aged 22 +/- 0.81) have been divided in two groups by two different strength trainings: pre-exhaustion method (PE) and post-exhaustion (PO) method. All subjects have been performed 3 days a week for 3 months of training. Before and after training they have been subjected to conventional T1-weighted magnetic resonance.

Results, after both training protocols, have shown a growth of muscle volume differentiated in each subject, probably connected to individual variables. Moreover, we have observed that the volumetric changes are related to the FA mean and it can be assumed that this remodeling of the can't exclude, in addition to hypertrophy, phenomena of hyperplasia.

References:

- Augustsson et al. (2003) Effect of pre-exhaustion exercise on lower-extremity muscle activation during a leg press exercise. *J Strength Cond Res.* May;17(2):411-6
Froeling et al. (2015), Muscle Changes Detected with Diffusion-Tensor Imaging after Long-Distance Running. *Radiology.* Feb;274(2):548-62

Keywords

Training; Pre-exhaustion; DTI; Hypertrophy.