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Chronic Adaptations to Eccentric Training: A Systematic Review.

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BACKGROUND: Resistance training is an integral component of physical preparation for athletes. A growing body of evidence indicates that eccentric strength training methods induce novel stimuli for neuromuscular adaptations.

OBJECTIVE: The purpose of this systematic review was to determine the effects of eccentric training in comparison to concentric-only or traditional (i.e. constrained by concentric strength) resistance training.

METHODS: Searches were performed using the electronic databases MEDLINE via EBSCO, PubMed and SPORTDiscus via EBSCO. Full journal articles investigating the long-term (≥ 4 weeks) effects of eccentric training in healthy (absence of injury or illness during the 4 weeks preceding the training intervention), adult (17-35 years), human participants were selected for the systematic review. A total of 40 studies conformed to these criteria.

RESULTS: Eccentric training elicits greater improvements in muscle strength, although in a largely mode-specific manner. Superior enhancements in power and stretch-shortening cycle (SSC) function have also been reported. Eccentric training is at least as effective as other modalities in increasing muscle cross-sectional area (CSA), while the pattern of hypertrophy appears nuanced and increased CSA may occur longitudinally within muscle (i.e. the addition of sarcomeres in series). There appears to be a preferential increase in the size of type II muscle fibres and the potential to exert a unique effect upon fibre type transitions. Qualitative and quantitative changes in tendon tissue that may be related to the magnitude of strain imposed have also been reported with eccentric training.

CONCLUSIONS: Eccentric training is a potent stimulus for enhancements in muscle mechanical function, and muscle-tendon unit (MTU) morphological and architectural adaptations. The inclusion of eccentric loads not constrained by concentric strength appears to be superior to traditional resistance training in improving variables associated with strength, power and speed performance.

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