

26 UNDERGRADUATE RESEARCH CRITIQUE

Research Critique on “Effects of Resistance Training on Tendon Mechanical Properties and Rapid Force Production in Prepubertal Children”

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ABSTRACT

Introduction: This study investigated the effects of resistance training on human body connective tissue. Within resistance training, the researchers focused the effects resistance training has on tendon mechanical properties and rapid force production in prepubertal children. This study focused on the overall improvements the participating children made to their connective tissues and physical health after participating in the resistance training.

Purpose: The main purpose of this study was to explore the effects of plantar flexor resistant training on the mechanical properties of the Achilles tendon within prepubertal children. In addition, this aimed to examine what mechanisms had a likely chance of adapting to the training.

Methods: Participants included 10 boys and 10 girls who were divided into either control or experimental groups. During the final measurements due to illness and absence each group lost a participant leaving us with a total of 18 active participants. The group went through a resistance training program where groups of no more than 3 completed circuit training with nine stations. Each station a different activity was planned, with plantar flexion resistance training being at one of the nine stations. While the experimental group performed two sets of eight to fifteen the control group had a rest station. Rotations were determined by the completion of one set of repetitions at the plantar flexion RT station by the experimental group or two minutes for the control group's rest period at that station.

Results: Achilles' tendon properties, Electromechanical delay, rate force development, and rate of electromyographic were measured at pre- and post-resistance training. Results showed that tendon stiffness and young's modulus increased significantly in the experiment group only (~29% and ~25%, respectively). For the experimental group, there was a significant increase in mean training load from the first to last training session by 208%. All other prosperities, however, were not significantly changed.

Conclusion: Although this is an indication of changes in the underlying microstructure it may only be hypothesized. Resistance training not only aids in stiffness of tendon allowing for stronger contractions, but it is also an indicator of improved motor performance, coordination, and motor unit activation of the experimental group of participants.

Critique: The synchronous adaptation of tendon to muscle resistance capability must be achieved to efficiently transmit maximal force to the skeletal muscle with minimization of possible injury. These results demonstrate that tendons adapt to heavy resistance training in prepubertal children as they do in adults. The increase in tendon stiffness was accompanied by an increase in the Young's modulus. Increases in the Young's modulus is an indicative of changes in the tendon's underlying microstructure. This may include changes within the tendon's extracellular matrix. This indication also leads to belief that microstructural changes in the tendon most likely underpinned the increase in tendon stiffness and power expressed. The disregard of muscular hypertrophy, Neuromuscular measurements, and sole focus on tendon adaptation bias limits the validity of these findings. Neuromuscular adaptations and muscular hypertrophy must be regarded in the findings that indicate an increase in strength and change in elasticity and motor performance. The equipment utilized is also not adequate due to the angular resistance and being a primary quad based machine (GLPH1100; Body Solid) and when used for plantar flexion it reduces effectiveness of movement. It should also be considered that a standing calf raise machine (Hammer Strength Hs-Sc), or seated calf raise (Hammer Strength PL-CALF) would yield clearer findings. Although this study is a strong indicator of the success of weight training and increased muscular power distribution, it limits credibility due to a need for better program design, variability, and a larger array of measurable results.

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