

# Sports Training's Effects on Muscle and Tendon Characteristics at Different Stages of Development

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**Abstract:** *This study aimed to investigate the influence of sprint training on muscle and tendon properties across different developmental stages, specifically focusing on pre-adolescent children, adolescent boys, and young men. It is well-established that adults show higher force production, rate of force development, and effective re-use of elastic energy during the stretch-shortening cycle (SSC) compared to children due to different muscle and tendon properties. Thus, it is important to classify the interaction between age and the training process on muscle-tendon system. Participant's tendon properties were assessed using two 10 seconds ramp isometric contractions (increasing the force level every 2'') with an ultrasound probe stabilized on muscle-tendon junction. Moreover, two maximal isometric plantar flexions were performed to evaluate maximal isometric force. Both force capacity and tendon stiffness was evaluated. Our results showed significant increases in height, body mass, and strength levels through maturation ( $p < 0.05$ ). Moreover, significant changes were found in tendon stiffness and produced force in athletes compared with non-athletes groups ( $p < 0.05$ ). On the other hand, significant differences were found in relative stiffness and force between young adults and non-athletes with the athletes ( $p < 0.05$ ). Our results revealed that both maturity and sprint training imposes the tendons to a greater mechanical load through the higher produced force and strain. These stimuli lead to adaptive responses and changes in Achilles tendon properties. Moreover, our data support the importance of training in young adults to maintain tendon properties at the level of adolescence. This study provides valuable insights into the interaction between age, sprint training, and tendon adaptations to prevent tissue imbalances in male individuals engaged in sports activities.*

**Keywords:** Sprinting, adolescent, pre-adolescent, young adults, stiffness, force

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