

Age-Related Differences in Absolute and Relative Maximal Strength at Different Velocities

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Introduction: Examining peak torque (PT) relative to muscle size provides insight on qualitative factors (e.g., fiber type composition, muscle activation) that are influential for maximal strength, yet data is scarcer for higher velocity contractions. Acceleration (ACC) has been proposed to be influenced by similar physiological factors. **Purpose:** To examine absolute and relative PT, as well as ACC at different velocities in young (YM) and older (OM) males. **Methods:** Healthy, YM (n=15, age=20.7±2.2 yrs) and OM (n=15, age=71.6±3.9 yrs) performed maximal voluntary contractions at 0°·s⁻¹ (isometric), 60°·s⁻¹, and 180°·s⁻¹ using a dynamometer. Ultrasonography was used to obtain cross sectional area (CSA) of the vastus lateralis and rectus femoris. Peak torque (PT) was obtained at all velocities, and acceleration (ACC) was recorded at 60°·s⁻¹ and 180°·s⁻¹ prior to the load range phase. Relative PT for each velocity was calculated by dividing PT by CSA. **Results:** CSA was lower in OM (19%, p=0.001). Absolute PT was decreased at all velocities (27-38%, p<0.001), while relative PT (22%, p=0.003) and ACC (11%, p=0.004) were decreased only at 180°·s⁻¹ in OM. ACC was only correlated with CSA in OM (r=0.59, p=0.02). **Conclusion:** The smaller CSA in OM was less influential for PT at 180°·s⁻¹, thus indicating the importance of other physiological factors for high-velocity strength. A higher contraction velocity was needed to reveal age-related differences for ACC, which is likely due to the greater duration of velocity development. Interestingly, ACC was moderately associated with CSA, but not relative PT.

Keywords: Aging, muscle quality, torque, skeletal muscle