

Age-Related Differences in Vertical Jump Power and Muscle Size and Quality of the Vastus Lateralis

AHALEE C. CATHEY, CHINONYE C. AGU-UDEMBA, ERIC J. SOBOLEWSKI, BRENNAN J. THOMPSON, and TY B. PALMER

Muscular Assessment Laboratory; Department of Kinesiology and Sport Management; Texas Tech University; Lubbock, TX

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Advisor / Mentor: Palmer, Ty (ty.palmer@ttu.edu)

ABSTRACT

Previous studies have reported that decreases in muscle size and quality of the vastus lateralis (VL) may contribute to the lower vertical jump power observed in old compared to young males. However, we are aware of no previous studies that have examined the contribution of VL muscle size and quality to age-related power differences in females, nor have there been any studies that examined these differences between young, middle, and older age groups. **PURPOSE:** To determine the effects of age on vertical jump power and muscle size (cross-sectional area [CSA]) and quality (echo intensity [EI]) of the VL in young, middle-aged, and old females. **METHODS:** Twenty-six young (age = 22 ± 2 yr; height = 163 ± 7 cm; mass = 61 ± 8 kg), 30 middle-aged (36 ± 5 yr; 164 ± 7 cm; 62 ± 11 kg), and 23 old (71 ± 5 yr; 161 ± 5 cm; 59 ± 10 kg) females underwent two diagnostic ultrasound assessments followed by three countermovement vertical jumps (CMJs). Peak power output (Pmax; W) was measured during the CMJs using a portable force plate. VL CSA (cm²) and EI (AU) were measured on the right leg using a portable B-mode ultrasound imaging device and linear-array probe. One-way ANOVAs and post-hoc analyses were used to compare Pmax, CSA, and EI between age groups. Pearson product-moment correlation coefficients (*r*) were used to examine the relationships between Pmax and CSA and EI. **RESULTS:** Higher Pmax and CSA values were observed for the young (Pmax = 2257.40 ± 438.42 W; CSA = 20.59 ± 4.23 cm²) compared to the old (Pmax = 1098.55 ± 242.10 W; CSA = 10.69 ± 2.47 cm²) and middle-aged (Pmax = 1958.20 ± 341.87 W; CSA = 18.05 ± 4.24 cm²) and the middle-aged compared to the old ($P \leq 0.001-0.039$). EI values for the young (104.29 ± 16.86 AU) and middle-aged (107.71 ± 17.30 AU) were lower than the old (128.35 ± 14.99 AU) ($P < 0.001$), but they were not different from each other ($P = 0.720$). There was a significant positive relationship between Pmax and CSA ($r = 0.830$; $P < 0.001$) and a significant negative relationship between Pmax and EI ($r = -0.442$; $P < 0.001$). **CONCLUSION:** These findings demonstrated that vertical jump power and muscle size and quality decrease with age. The significant relationships observed between Pmax and CSA and EI perhaps suggest that these age-related declines in VL muscle size and quality may play an important role in the lower vertical jump power observed in middle-aged and older adults.