

The Influence of Age on Hip Extension Strength Characteristics and Vertical Jump Power

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ABSTRACT

Hip extension strength characteristics, such as peak torque and rate of torque development (RTD), are important measurements relevant to functional performance. Declines in functional performance are commonly reported as a consequence of aging. However, few studies have investigated the influence of age on hip extension peak torque and RTD. **PURPOSE:** This study aimed to compare hip extension peak torque and RTD characteristics between young and older women. A secondary aim was to determine the correlations between these characteristics and vertical jump (VJ) power. **METHODS:** Ten young (age = 22 ± 3 years) and ten older (68 ± 10 years) healthy women completed three VJs followed by three hip extension maximal voluntary contraction (MVC) assessments. VJs were performed using a linear velocity transducer that was attached to a belt fastened around the participants' waist. For all VJs, participants were instructed to jump up as explosively as possible with both feet at the same time and land on the floor in the starting position. Estimated peak power output was calculated in watts (W) and displayed by the transducer at the conclusion of each jump. Hip extension MVCs were performed using a novel strength testing device. For each MVC, participants laid in a supine position and were instructed to extend their right thigh "as hard and fast as possible" for 3-4 seconds. Hip extension peak torque, peak RTD, and RTD at 0-100 (RTD100) and 0-200 (RTD200) milliseconds from contraction onset were calculated and displayed by the testing device at the conclusion of each MVC. Independent samples *t*-tests were used to compare VJ power and hip extension peak torque and RTD characteristics between the young and older women. Pearson correlation coefficients (*r*) were calculated to examine the relationships between VJ power and hip extension peak torque and RTD. **RESULTS:** The older women exhibited significantly lower VJ power (older = 1264 ± 311 W; young = 2986 ± 839 W; $P < 0.001$), peak torque (older = 79 ± 28 Nm; young = 134 ± 45 Nm; $P = 0.005$), peak RTD (older = 450 ± 210 Nm s⁻¹; young = 783 ± 326 Nm s⁻¹; $P = 0.014$), RTD100 (older = 448 ± 210 Nm s⁻¹; young = 778 ± 321 Nm s⁻¹; $P = 0.014$), and RTD200 (older = 298 ± 117 Nm s⁻¹; young = 481 ± 195 Nm s⁻¹; $P = 0.021$) than the younger women. Significant correlations were observed between VJ power and peak RTD (young: $r = 0.719$, $P = 0.019$; older: $r = 0.649$, $P = 0.042$), RTD100 (young: $r = 0.720$, $P = 0.019$; older: $r = 0.656$, $P = 0.040$), and RTD200 (young: $r = 0.664$, $P = 0.036$; older: $r = 0.635$, $P = 0.049$). There were no significant correlations between VJ power and peak torque (young: $r = 0.509$, $P = 0.133$; older: $r = 0.529$, $P = 0.116$). **CONCLUSION:** We found lower VJ power and hip extension peak torque and RTD characteristics in older compared to younger women. These findings provide support that jump performance and hip extension strength are both negatively affected by age. The significant correlations observed between VJ power and RTD characteristics suggest that hip extension rapid strength may be an effective predictor of one's jumping performance.