TACSM Abstract

Age-related Differences in Handgrip Strength Characteristics and Vertical Jump Performance

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ABSTRACT

Handgrip strength characteristics, such as peak force and rate of force development (RFD), have been shown to be significantly associated with the performance capacities of the lower-body musculature. Declines in lower-body performance are commonly reported as a consequence of aging. However, few studies have investigated the influence of age on handgrip peak force and RFD. **PURPOSE:** The purpose of this study was to examine age-related differences in handgrip peak force and RFD between young and older women and the relationships of these characteristics with lower-body performance during a vertical jump (VJ) test. **METHODS**: Twenty young (age = 21 ± 3 years) and twenty older (67 ± 5 years) healthy women completed three VJs followed by three handgrip maximal voluntary contraction (MVC) assessments with the dominant hand. All VJs were performed on a jump mat. The jump mat assessed lower-body performance by measuring VJ height (cm). Handgrip MVCs were performed using a novel strength testing device. This device consisted of a microcomputer and a load cell that was equipped with two semi-cylindrical handles for gripping. For each MVC, participants sat in an upright position and were instructed to squeeze the handles of the load cell "as hard and fast as possible" for 3-4 seconds. Handgrip peak force, peak RFD, and RFD at 0-100 (RFD100) and 0-200 (RFD200) milliseconds from contraction onset were calculated and displayed by the device at the conclusion of each MVC and were normalized to body mass. Independent samples *t*-tests were used to compare VJ height and handgrip peak force and RFD characteristics between the young and older women. Pearson correlation coefficients (*r*) were calculated separately for the young and older women to examine the relationships between VJ height and handgrip peak force and RFD. **RESULTS**: The older women exhibited significantly lower VJ height (older = 20.3 ± 3.8 cm; young = 34.4 ± 5.9 cm; $P < 0.001$), peak force (older = 2.4 ± 0.4 N·kg^{-1}; young = 2.7 ± 0.5 N·kg^{-1}; $P = 0.028$), peak RFD (older = 13.6 ± 2.6 N·s^{-1}·kg^{-1}; young = 16.4 ± 2.9 N·s^{-1}·kg^{-1}; $P = 0.003$), RFD100 (older = 13.2 ± 3.0 N·s^{-1}·kg^{-1}; young = 15.7 ± 3.3 N·s^{-1}·kg^{-1}; $P = 0.016$), and RFD200 (older = 9.3 ± 1.6 N·s^{-1}·kg^{-1}; young = 10.8 ± 1.6 N·s^{-1}·kg^{-1}; $P = 0.003$) than the younger women. Positive correlations were observed between VJ height and handgrip RFD200 ($r = 0.502$, $P = 0.024$) and peak RFD ($r = 0.453$, $P = 0.045$) for the younger women. Positive correlations were also observed between VJ height and handgrip RFD200 ($r = 0.446$, $P = 0.049$) and peak RFD ($r = 0.408$, $P = 0.074$) for the older women, although the latter correlation did not reach statistical significance. There were no significant correlations between VJ height and handgrip peak force (young: $r = 0.389$, $P = 0.090$; older: $r = 0.311$, $P = 0.183$) or RFD100 (young: $r = 0.366$, $P = 0.113$; older: $r = 0.382$, $P = 0.096$) for either age group. **CONCLUSION**: These findings demonstrated that VJ height and handgrip peak force and RFD characteristics decrease in old age. The significant correlations observed between VJ height and RFD200 in the young and older women suggest that handgrip rapid strength (0-200 milliseconds) may be an effective predictor of one's jumping ability.