TACSM Abstract

Handgrip Peak Force and Rate of Force Development Measurements: Are They Reliable and Do They Correlate with Vertical Jump Power?

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ABSTRACT

Handgrip peak force and rate of force development (RFD) measurements have been shown to be effective parameters at characterizing the strength capacities of numerous muscle groups, including those of the lower extremities. However, the reliability of these measurements and their relationship with vertical jump (VJ) peak power remains uncertain. **PURPOSE**: The purpose of this study was to examine the reliability of handgrip peak force and RFD measurements. A secondary aim was to determine if these measurements are correlated with the peak power produced during a VJ test. **METHODS**: Twenty young, healthy women (age = 21 ± 3 years) volunteered for this study. Participants reported for testing on two different occasions, separated by 2-7 days at approximately the same time of day (± 2 hours). For each testing session, participants completed three VJs followed by three handgrip maximal voluntary contraction (MVC) assessments with the dominant hand. VJs were performed using a linear velocity transducer that was attached to the posterior portion of a belt fastened around the participants' waistline. 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. Prior to the VJ assessments, each participant's body mass was entered into the linear velocity transducer microcomputer. Estimated peak power output was calculated in watts (W) and displayed by the microcomputer at the conclusion of each jump. 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 assessment. The intraclass correlation coefficient (ICC) and coefficient of variation (CV) were calculated between sessions to assess the reliability of handgrip peak force and RFD variables. The relationships between these variables and VJ peak power were determined by Pearson correlation coefficients (r). **RESULTS**: Handgrip peak force, peak RFD, RFD100, and RFD200 were highly consistent between sessions, with ICCs ranging between 0.89 and 0.92 and CV values between 4.9 and 6.4%. There were significant correlations between VJ peak power and handgrip peak force (r = 0.612, P = 0.004), peak RFD (r = 0.731, P < 0.001), RFD100 (r = 0.671, P = 0.001), and RFD200 (r = 0.701, P = 0.001). **CONCLUSION**: The results of this study showed that peak force, peak RFD, RFD100, and RFD200 were reliable measures for assessing handgrip strength in young, healthy adults. These measurements were significantly correlated with VJ peak power and thus, could be effective parameters at predicting lower-body explosiveness. The predictive capacity of such parameters to determine a person's peak power may be important in the early stages of rehabilitation, especially if that person is unable to perform a VJ test.