

Reliability and Relationship between Ballistic Push-Up and Vertical Jump Peak Ground Reaction Force

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ABSTRACT

Ballistic push-up (BPU) assessments are commonly used to evaluate athletic ability in young adults. It has been hypothesized that the peak ground reaction force (GRF) produced during a BPU may be an important predictor of upper-body strength and explosive performance capacities. However, limited data exist regarding the reliability of BPU GRF and how it relates to peak force values during a countermovement vertical jump (CMJ) test. **PURPOSE:** The purpose of this study was to examine the reliability of BPU GRF and its relationship with vertical jump GRF values. **METHODS:** Seventeen young, healthy females (age = 22 ± 3 years; mass = 61 ± 8 kg; height = 163 ± 7 cm) volunteered for this study. Participants visited the laboratory 2 times, separated by 2-7 days at approximately the same time of day (± 2 hours). During each visit, participants performed 3 CMJs followed by 3 BPU assessments using a portable force plate. For the CMJs, participants were instructed to jump up as high as possible and explode off the force plate with maximal effort. For each BPU, participants adopted a prone position with hands positioned shoulder-width apart on the force plate. A wooden box of equal height to the force plate supported the participants' knees. Participants descended from the "up" position by flexing their elbows until they were at an angle of 90° . After reaching this position, participants performed an explosive push-up action to full arm extension with their hands leaving the force plate. Peak GRF was determined during the CMJ and BPU assessments as the highest value from the force-time curve. The intraclass correlation coefficient (ICC) and standard error of measurement expressed as a percentage of the mean (SEM%) were calculated across visits to assess the reliability for BPU and CMJ peak GRF. The relationship between BPU and CMJ peak GRF values was determined by a Pearson product-moment correlation coefficient (r). **RESULTS:** Means \pm SDs (averaged across both visits) were 266.89 ± 49.36 and 1325.78 ± 215.20 N, ICCs were 0.91 and 0.93, and SEM% values were 5.78 and 4.20% for the BPU and CMJ peak GRF data, respectively. A significant positive relationship was observed between BPU and CMJ peak GRF values ($r = 0.832$, $P < 0.001$). **CONCLUSION:** These findings demonstrated that BPU and CMJ peak GRFs may be reliable measures for assessing dynamic upper- and lower-body force production in young, healthy adults. The significant relationship observed between the two tests indicated that those who produced greater forces in the BPU also produced greater forces in the CMJ. Therefore, in addition to upper-body performance, BPU GRF measurements may also be used to predict lower-body explosive performance capacities as assessed during a vertical jump test.