TACSM Abstract

Validity of a Linear Velocity Transducer for Measuring Peak Ground Reaction Force during a Countermovement Vertical Jump Test

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ABSTRACT

Linear velocity transducers offer a portable and cost-effective means for quantifying peak ground reaction force (GRF) during a countermovement vertical jump (CMJ) test; however, their ability to provide valid vertical jump GRF measurements similar to those of a force plate ("gold standard") remains unclear. **PURPOSE**: The purpose of this study was to examine the differences and relationship between force plate and linear velocity transducer measurements of peak GRF during a CMJ test. **METHODS**: Seventeen healthy, young females (age = 22 ± 3 years; mass = 61 ± 8 kg; height = 163 ± 7 cm) performed three CMJ assessments on an elevated platform where peak GRF was measured simultaneously from a force plate and a linear velocity transducer. The linear velocity transducer was attached to the posterior portion of a belt fastened around the participants' waist. During the CMJs, participants stood on the force plate with feet shoulder width apart and hands positioned on the hips. Participants were not allowed to take any steps before performing the CMJ and a quick descending quarter-squat countermovement was allowed before the ascending take-off phase. For all CMJs, participants were verbally instructed to jump up as explosively as possible with both feet at the same time and land on the force plate in the starting position. Peak GRF from the force plate was determined as the highest value from the force-time curve. To calculate peak GRF using the linear velocity transducer, each participant's body mass was entered into the transducer's microcomputer. Estimated peak GRF was calculated and displayed by the microcomputer at the conclusion of each assessment. A Pearson product-moment correlation coefficient (r) was used to assess the relationship between the force plate and linear velocity transducer peak GRF values. The difference in peak GRF between the force plate and linear velocity transducer was analyzed by a paired samples t-test. **RESULTS**: Peak GRF values (mean ± SD) were 1309.93 ± 238.06 N for the force plate and 1338.24 ± 244.98 N for the linear velocity transducer. There was a significant positive relationship between the force plate and linear velocity transducer peak GRF values (r = 0.849, P < 0.001). No significant difference in peak GRF was observed between devices (P = 0.392). **CONCLUSION**: These findings provide support that the linear velocity transducer may be a valid device for measuring peak GRF during a CMJ assessment in healthy, young females. Vertical jump GRF has been shown to be a significant predictor of explosive-type performances and thus, may be of vital importance for determining athletic ability. The linear velocity transducer used in the present study may provide researchers and practitioners with a relatively accurate, cost-effective, and portable measurement tool capable of enhancing the practicality and utility of these (typically lab based) measurements when analyzing vertical jump performance capacities of athletes in the field.