

Development and Validation of a Portable and Inexpensive Tool to Measure the Drop Vertical Jump Using the Microsoft Kinect V2

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Background: Noncontact anterior cruciate ligament (ACL) injury in adolescent female athletes is an increasing problem. The knee-ankle separation ratio (KASR), calculated at initial contact (IC) and peak flexion (PF) during the drop vertical jump (DVJ), is a measure of dynamic knee valgus. The Microsoft Kinect V2 has shown promise as a reliable and valid marker-less motion capture device.

Hypothesis: The Kinect V2 will demonstrate good to excellent correlation between KASR results at IC and PF during the DVJ, as compared with a “gold standard” Vicon motion analysis system.

Study Design: Descriptive laboratory study.

Level of Evidence: Level 2.

Methods: Thirty-eight healthy volunteer subjects (20 male, 18 female) performed 5 DVJ trials, simultaneously measured by a Vicon MX-T40S system, 2 AMTI force platforms, and a Kinect V2 with customized software. A total of 190 jumps were completed. The KASR was calculated at IC and PF during the DVJ. The intraclass correlation coefficient (ICC) assessed the degree of KASR agreement between the Kinect and Vicon systems.

Results: The ICCs of the Kinect V2 and Vicon KASR at IC and PF were 0.84 and 0.95, respectively, showing excellent agreement between the 2 measures. The Kinect V2 successfully identified the KASR at PF and IC frames in 182 of 190 trials, demonstrating 95.8% reliability.

Conclusion: The Kinect V2 demonstrated excellent ICC of the KASR at IC and PF during the DVJ when compared with the Vicon system. A customized Kinect V2 software program demonstrated good reliability in identifying the KASR at IC and PF during the DVJ.

Clinical Relevance: Reliable, valid, inexpensive, and efficient screening tools may improve the accessibility of motion analysis assessment of adolescent female athletes.

Keywords: anterior cruciate ligament; injury prevention; Microsoft Kinect; knee-ankle separation ratio; drop vertical jump

An anterior cruciate ligament (ACL) tear is a major life event, requiring surgical reconstruction and months of rehabilitation.¹⁷ Biomechanical and neuromuscular

imbalances have been studied as factors influencing an increased risk of an ACL injury, especially in young female athletes.^{4,29} The primary mechanism of injury in female athletes

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