ABSTRACT

Introduction: Assessing readiness of return to sport after procedures such as anterior cruciate ligament (ACL) reconstruction is a complex process, complicated by the pressures that athletes face in returning to sport as quickly as possible. Advances in motion analysis have been able to demonstrate movements that are risk factors for initial ACL injury and subsequent reinjury after reconstruction. An inexpensive, objective measure is needed to determine when athletes are ready to return to sport after ACL reconstruction.

Purpose: The aim of this study was to compare the use of a single camera, markerless motion capture technology to 3D motion capture during lower extremity movements that pose as risk factors for ACL injury.

Study Design: Cross Sectional Study

Methods: This study assessed the validity of the Microsoft Kinect™ against an established 3-dimensional motion analysis system in 20 healthy subjects. Knee kinematics were assessed during impact activity in the coronal and sagittal plane specifically evaluating peak knee valgus and peak knee flexion during single leg hop and jump from box exercises. Intraclass correlation coefficients and 95% limits of agreement (LoA) were determined for each kinematic variable.

Results: For the single leg hop, the mean absolute difference in the sagittal plane was 10.4° (95% LoA [-11.7°, 26.8°]), and in the frontal plane was 5.31° (95% LoA [-8°, 13.9°]). Similarly, for the jump from box landing on one leg, there was a difference of 7.96° (95% LoA [-17.7°, 21.3°]) and 4.69° (95% LoA [-6.3°, 12.6°]) respectively. For the jump from box, two-foot land, turn and pivot, the mean absolute difference between the systems was 7.39° (95% LoA [-17.8°, 19.7°]) in the sagittal and 4.22° (95% LoA [-5.9°, 11.6°]) in the frontal plane respectively. Intraclass correlation coefficients for each activity ranged from 0.553 to 0.759.

Conclusion: The results from the Microsoft Kinect™ were found to be in poor agreement with those from a standard motion capture system. Measuring complex lower extremity movements with the Microsoft Kinect™ does not provide adequate enough information to use as an assessment tool for injury risk and return to sport timing.

Level of Evidence: Level III

Key Words: Anterior cruciate ligament, knee, motion analysis, movement system, rehabilitation