

ORIGINAL RESEARCH

TWO-DIMENSIONAL VIDEO ANALYSIS IS COMPARABLE TO 3D MOTION CAPTURE IN LOWER EXTREMITY MOVEMENT ASSESSMENT

Stacy A. Schurr, M.Ed, ATC¹Ashley N. Marshall, M.Ed, ATC¹Jacob E. Resch, PhD, ATC¹Susan A Saliba, PhD, ATC, PT¹

ABSTRACT

Background: Although 3D motion capture is considered the “gold standard” for recording and analyzing kinematics, 2D video analysis may be a more reasonable, inexpensive, and portable option for kinematic assessment during pre-participation screenings. Few studies have compared quantitative measurements of lower extremity functional tasks between 2D and 3D.

Purpose: To compare kinematic measurements of the trunk and lower extremity in the frontal and sagittal planes between 2D video camera and 3D motion capture analyses obtained concurrently during a SLS.

Study Design: Descriptive laboratory study.

Methods: Twenty-six healthy, recreationally active adults volunteered to participate. Participants performed three trials of the single leg squat on each limb, which were recorded simultaneously by three 2D video cameras and a 3D motion capture system. Dependent variables analyzed were joint displacement at the trunk, hip, knee, and ankle in the frontal and sagittal planes during the task compared to single leg quiet standing.

Results: Dependent variables exhibited moderate to strong correlations between the two measures in the sagittal plane ($r = 0.51-.093$), and a poor correlation at the knee in the frontal plane ($r = 0.308$) at ($p \leq 0.05$). All other dependent variables revealed non-significant results between the two measures. Bland-Altman plots revealed strong agreement in the average mean difference in the amount of joint displacement between 2D and 3D in the sagittal plane (trunk = 1.68°, hip = 2.60°, knee = 0.74°, and ankle = 3.12°). Agreement in the frontal plane was good (trunk = 7.92°, hip = -8.72°, knee = -6.62°, and ankle = 3.03°).

Conclusion: Moderate to strong relationships were observed between 2D video camera and 3D motion capture analyses at all joints in the sagittal plane, and the average mean difference was comparable to the standard error of measure with goniometry. The results suggest that despite the lack of precision and ability to capture rotations, 2D measurements may provide a pragmatic method of evaluating sagittal plane joint displacement for assessing gross movement displacement and therein risk of lower extremity injury.

Level of Evidence: 3

Key Words: Movement pattern, sagittal plane, screening, single leg squat

CORRESPONDING AUTHOR

Ashley N. Marshall

Exercise and Sport Injury Laboratory

University of Virginia

P.O. Box 400407

Charlottesville, VA 22904

Phone: 434-924-6184

Fax: 434-924-1389

E-mail: ans3t@virginia.edu

¹ Exercise and Sport Injury Laboratory, University of Virginia, Charlottesville, VA, USA