

SYSTEMATIC REVIEW

OBSERVER RATING VERSUS THREE-DIMENSIONAL MOTION ANALYSIS OF LOWER EXTREMITY KINEMATICS DURING FUNCTIONAL SCREENING TESTS: A SYSTEMATIC REVIEW

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Background: Functional assessments are conducted in both clinical and athletic settings in an attempt to identify those individuals who exhibit movement patterns that may increase their risk of non-contact injury. In place of highly sophisticated three-dimensional motion analysis, functional testing can be completed through observation.

Hypothesis/purpose: To evaluate the validity of movement observation assessments by summarizing the results of articles comparing human observation in real-time or video play-back and three-dimensional motion analysis of lower extremity kinematics during functional screening tests.

Study Design: Systematic review

Methods: A computerized systematic search was conducted through Medline, SPORTSDiscus, Scopus, Cinhal, and Cochrane health databases between February and April of 2014. Validity studies comparing human observation (real-time or video play-back) to three-dimensional motion analysis of functional tasks were selected. Only studies comprising uninjured, healthy subjects conducting lower extremity functional assessments were appropriate for review. Eligible observers were certified health practitioners or qualified members of sports and athletic training teams that conduct athlete screening. The Quality Assessment of Diagnostic Accuracy Studies 2 (QUADAS-2) was used to appraise the literature. Results are presented in terms of functional tasks.

Results: Six studies met the inclusion criteria. Across these studies, two-legged squats, single-leg squats, drop-jumps, and running and cutting manoeuvres were the functional tasks analysed. When compared to three-dimensional motion analysis, observer ratings of lower extremity kinematics, such as knee position in relation to the foot, demonstrated mixed results. Single-leg squats achieved target sensitivity values ($\geq 80\%$) but not specificity values ($\geq 50\%$). Drop-jump task agreement ranged from poor ($< 50\%$) to excellent ($> 80\%$). Two-legged squats achieved 88% sensitivity and 85% specificity. Mean underestimations as large as 19° (peak knee flexion) were found in the results of those assessing running and side-step cutting manoeuvres. Variables such as the speed of movement, the methods of rating, the profiles of participants and the experience levels of observers may have influenced the outcomes of functional testing.

Limitations: The small number of studies used limits generalizability. Furthermore, this review used two dimensional video-playback for the majority of observations. If the movements had been rated in real-time three dimensional video, the results may have been different.

Conclusions: Slower, speed controlled movements using dichotomous ratings reach target sensitivity and demonstrate higher overall levels of agreement. As a result, their utilization in functional screening is advocated.

Level of Evidence: 1A

Keywords: 3D motion analysis; functional screening; lower extremity; observation.

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