Can two-dimensional measured peak sagittal plane excursions during drop vertical jumps help identify three-dimensional measured joint moments?

http://researchonline.ljmu.ac.uk/id/eprint/968/

Dingenen, B, Malfait, B, Robinson, MA, Verschueren, SMP, Staes, FF and Vanrenterghem, J (2015) Can two-dimensional measured peak sagittal plane excursions during drop vertical jumps help identify three-dimensional measured joint moments? The Knee, 22 (2). pp. 73-79. ISSN 0968-0160

LJMU has developed LJMU Research Online for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact researchonline@ljmu.ac.uk

http://researchonline.ljmu.ac.uk/
Are two-dimensional measured sagittal plane kinematics related to three-dimensional joint loading during the drop vertical jump test?

B Dingenen1 B Malfait1 J Vanrenterghem2 M Robinson2 S Verschueren1 F Staes1

1 KU Leuven Musculoskeletal Rehabilitation Research Group, Department of Rehabilitation Sciences, Faculty of Kinesiology and Rehabilitation Sciences, Leuven, Belgium;
2 Research Institute for Sport and Exercise Sciences, Faculty of Science, Liverpool John Moores University, Liverpool, United Kingdom

10.1136/bjsports-2014-093494.70

Background Acute and overuse knee injuries are common in sports involving jump-landing movements, especially in female athletes. More erect sagittal plane movement patterns are believed to increase injury risk. Whilst three-dimensional (3D) measurements are considered to be the gold standard, they are complex and two-dimensional (2D) video analysis may be a valuable alternative to screen athletes in clinical practice.

Objective The purpose of the present study was to investigate the relationship between 2D sagittal plane kinematics and 3D joint loading during the drop vertical jump (DVJ) test.

Design Cross-sectional.

Setting Controlled laboratory study.

Participants Fifty injury-free elite female athletes were tested.

Risk factor assessment Two-dimensional sagittal plane video analysis and 3D motion analysis were used during the DVJ test.

Main outcome measurements Hip flexion, knee flexion and ankle dorsiflexion angles were measured at the deepest landing position (2D analysis). External hip flexion moments (HFM), knee flexion moments (KFM) and knee abduction moments (KAM) were measured across the entire support phase (3D analysis). One-dimensional statistical parametric mapping was used to examine the temporal relationship between 2D angles at the deepest landing position and 3D moments across the entire support phase. Significance was set at P<.0055.

Results The amount of hip flexion was significantly related to HFM, KFM and KAM during the time frames corresponding with highest 3D moments, while the amount of knee flexion was only significantly related to HFM during these time frames. No significant results were found for ankle dorsiflexion.

Conclusions These results indicate that 2D measured sagittal plane hip and knee flexion angles at the deepest landing position are associated with sagittal plane peak joint loading during a DVJ. Furthermore, the significant association of hip flexion with frontal plane knee loading provides evidence that assessment of knee joint injury risk could benefit from measuring maximal hip flexion.