

*An Investigation of the agreement between Three-dimensional and Two-dimensional Measurements of Frontal Plane Knee Angles*

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**Abstract - Purpose**

Non-contact injuries to the Anterior Cruciate Ligament are common in Netball. The landing constraints of netball could render the ACL susceptible to injury. Measuring netball landings using conventional 2D video cameras may not provide accurate information compared to the current 'gold standard' of 3D motion analysis. A comparison of the methods has not been previously undertaken.

**Relevance**

Identifying potentially injurious knee angles could help to form strategies to reduce injury risk. 2D Video analysis is being used in practice without a sound evidence base.

**Participants**

23 healthy students were recruited from the population of Cardiff University. Subjects were included provided no leg or back injury had been sustained in the previous 6 months.

**Methods**

Subjects performed three different landings on a force plate with 2D and 3D video footage captured simultaneously. Vicon and SiliconCOACH software analysed resultant angles. Intra-Class correlations were calculated to determine intra-tester reliability of 2D measurement.

**Analysis**

2D and 3D knee angles were compared using a Spearman's Rank correlation. Agreement between the 2 measures was determined using the Bland Altman method.

**Results**

Positive correlations between 2D and 3D measures were observed for each landing ( $r = 0.632, 0.654$  and  $0.467$  for 2-footed, 1-footed and run-on landings respectively). However the limits of agreement were wide for all landings; suggesting restricted agreement.

**Conclusions**

Although the two measurements show similarity, the degree of this comparability was not clinically relevant, i.e. the 2D measurement of frontal plane knee angles is not precise. Dynamic knee valgus is a composite movement consisting of multi-planar movement. This research acknowledges that 2D measurement will not account for each plane of movement and may explain some of the discrepancies observed between the measures.

**Implications**

3D measurements should be used when specific angles are required, but with further research 2D measurements could offer an inexpensive screening or feedback tool in the clinical environment.

**Keywords**

Knee Measurement Agreement

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**Ethics approval**

Cardiff University Ethics Board