

KNEE SEPARATION DISTANCE AND QUADRICEPS AND HAMSTRINGS STRENGTH DURING DROP VERTICAL JUMP LANDINGS

Orna Donoghue, Lorraine Steel, Rachel Collins, Harriet Young and Simon Coleman

Dept of Physical Education, Sport & Leisure Studies, Moray House School of Education, University of Edinburgh, Edinburgh, UK

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INTRODUCTION: Non-contact anterior cruciate ligament (ACL) injury is common particularly in female athletes during jump landing tasks. Ligament dominance occurs when the muscles cannot control knee movement sufficiently thus increasing medial knee motion. Preferential use of the quadriceps during landing and greater strength compared to the hamstrings also increase the load placed on the ACL (Dugan, 2005). Noyes et al. (2005) measured knee separation distance during jump landings finding an increase after neuromuscular training. The aim of this study was to examine the relationship between knee separation distance during drop jump landing and hamstrings and quadriceps strength in female athletes.

METHODS: Ethical approval was obtained from the university ethics committee. Females were recruited from high risk i.e. volleyball, netball (n=18, mean \pm SD: age 19.9 \pm 1.2 yrs, mass 69.3 \pm 5.5 kg, height 1.72 \pm 0.06 m) and low risk i.e. running, cycling (n=19, mean \pm SD: age 21.1 \pm 1.8 yrs, mass 63.8 \pm 9.4 kg, height 1.67 \pm 0.06 m) university clubs. Markers were placed on both greater trochanters, lateral femoral condyles and lateral malleoli. Participants performed two-footed drop vertical jumps from a height of 30 cm. A Canon digital camera recorded frontal plane marker coordinates at 50 Hz. Knee separation distance (absolute and normalised to hip separation distance) was calculated during landing using Ariel Performance Analysis System. Eccentric quadriceps (Qecc) and concentric hamstrings (Hcon) strength was measured at 60°/s and 180°/s using a Biodex isokinetic dynamometer; Hcon:Qecc ratios were subsequently obtained. A one-way independent t-test with $\alpha=0.05$ was carried out in SPSS v15. Pearson's correlations were calculated to examine relationships between knee separation distance and strength measures.

RESULTS: Concentric hamstrings strength in the dominant ($p=0.001$) and non-dominant ($p=0.026$) legs was significantly lower for participants in high risk sports. Both groups displayed similar knee separation distances. All correlations between knee separation distance and Qecc, Hcon or Hcon:Qecc ratio were low ($r<0.4$).

DISCUSSION: Female landing strategies in jumping based sports may result in preferential training of the quadriceps accounting for the current findings. However, as in Bennett et al. (2008), peak strength values were unable to predict dynamic loading during landing.

CONCLUSION: Hamstrings and quadriceps strength levels were not correlated with knee separation distances displayed during jump landings. Further analysis is required.

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