INTRODUCTION

• Females are four to six times more likely to suffer from a non-contact anterior cruciate ligament (ACL) injury than their male counterpart. Non-contact ACL injury usually occurs during a cutting or landing movement where deceleration of the lower extremity may increase ACL loading (Boden 2000).
• Increased knee abduction moment during landing is a significant predictor of increased ACL injury risk in female athletes (Hewett et al. 2005).
• Females have lower external hip flexion moment (internal hip extensors) than males indicating that males tend to favor a hip strategy during landing (Ford 2010).

PURPOSE

To determine if female soccer players who perform a drop vertical jump (DVJ), Figure 1) with a preferred hip strategy have differences in risk factors associated with non-contact knee injury and whether the preferred hip strategy is consistent with a single leg landing (SLL, Figure 2) task.

METHODS

PARTICIPANTS

• Twenty-three Division I female soccer players participated in the study (Figure 3).
• Subjects were dichotomized into a hip strategy group (HIP, n=9, hip 38.6%, knee 32.7%, ankle 28.7%) or knee/ankle strategy group (KA, n=14, hip 28.7%, knee 42.1%, ankle 29.2%) based on the percentage distribution of each lower extremity joint relative to summed moment during the DVJ (Figure 4).

PROCEDURES & ANALYSIS

• Participants wore spandex shorts, sports bra, and athletic shoes and were instrumented with 43 retroreflective markers for 3-D biomechanical data collection (Figure 3).
• A 24-camera motion analysis system (Eagle cameras, Motion Analysis Corporation) was used to collect three DVJ trials and 3 SLL trials.
• During the collection vertical ground reaction force (vGRF) was sampled at 1200 Hz and collected by in-ground, multi-axis force platforms (AMTI).

RESULTS

• The percent distribution of lower extremity sagittal plane moments during DVJ at the hip and knee were different between HIP and KA groups (Figure 5).
• During SLL the hip and knee sagittal plane moments were significantly different between groups. (Figure 6).
• Significantly decreased knee abduction moments were found during DVJ in HIP (-18.8Nm) compared to KA (-34.8Nm, p=0.045) (Figure 7).

SUMMARY AND CONCLUSIONS

• These findings indicate that there is a significant difference in the percent distribution about knee and hip during a single leg landing.
• Athletes that preferentially utilize a hip strategy during landing have lower knee abduction moments during DVJ.
• Targeting the hip extensor muscles, specifically the hamstrings and the gluteal muscle groups, may be useful in reducing risk of non-contact ACL injuries.

REFERENCES

Boden B.P. et al. (2000). Orthopaedics, 23