THE INFLUENCE OF SEX AND MATURATION ON KNEE VALGUS MOMENTS DURING CUTTING: IMPLICATIONS FOR ACL INJURY

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INTRODUCTION

Non-contact anterior cruciate ligament (ACL) injury rates are 3-8 times greater for female athletes when compared to their male counterparts. To better understand the biomechanical and neuromuscular risk factors associated with ACL injuries in females, numerous studies have examined sex differences in lower extremity biomechanics during athletic tasks. Studies in this area consistently have reported that females perform athletic maneuvers with decreased knee and hip flexion, increased knee extensor moments and quadriceps activation and greater knee valgus moments when compared to males. Taken together, this biomechanical profile is thought to put females at an increased risk for ACL injury.

With respect to injury risk, the greater knee valgus moments observed in females are thought to be most problematic as it has been reported that this variable is a predictor of ACL injury. Although females have been shown to exhibit higher knee valgus moments when compared to males, it is not known at what age this gender difference emerges. To assess differences in the average knee valgus moment between the sexes and across maturation levels, a 2 x 4 (group x maturation level) ANCOVA was performed. Cutting speed was used as the co-variate. In the event of a significant main effect for maturation, LSD post-hoc testing was performed. Statistical analyses were performed using SPSS software. Significance levels were set at P ≤ 0.05.

RESULTS

Significant main effects for sex and maturation were found (Figure 1). There was no sex x maturation interaction. When collapsed across stages of maturation, females had higher average knee valgus moments compared to males (0.74 vs. 0.61 Nm/kg*ht). The largest sex difference occurred in the pre-pubertal group (1.04 vs. 0.72 Nm/kg*ht).
When collapsed across gender, the highest average knee valgus moments were observed in the pre-pubertal athletes followed by the pubertal, post-pubertal and young adult groups. Post-hoc testing revealed significant differences between all groups with the exception of the post-pubertal and young adults. Our findings have implications with respect to the implementation of ACL injury prevention training programs that aim to improve lower extremity biomechanics in order to reduce injury risk. Given that sex differences in cutting were evident pre-puberty, the implementation of injury prevention programs should be considered at this stage of maturational development.

**CONCLUSIONS**

The higher knee valgus moments observed in females during cutting reflects a biomechanical pattern that places greater mechanical loads on the knee joint and perhaps the ACL. Interestingly, the tendency of females to exhibit a higher knee valgus moment compared to males did not emerge post-puberty and was most pronounced in pre-pubertal athletes.

**REFERENCES**


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