

# THE EFFECTS OF SPORTS INJURY PREVENTION TRAINING ON THE BIOMECHANICAL RISK FACTORS OF ANTERIOR CRUCIATE LIGAMENT INJURY IN FEMALE ATHLETES

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**KEY WORDS:** anterior cruciate ligament, sports injury prevention, female athletes.

**INTRODUCTION:** The purpose of this study were to investigate the effects of sports injury prevention training (SIPT) on the biomechanical risk factors of ACL Injury in high school female basketball players.

**METHOD:** A total of 22 high school female basketball players were recruited and randomly divided into 2 groups (the experimental group and the control group, 11 participants each). The experimental group was instructed in the 6 parts (warm-up, stretching, strengthening, plyometrics, agilities, and alternative exercise-warm down) of the sports injury prevention training program and performed it during the first 20 minutes of team practice for the next 8 weeks, while the control group performed their regular training program. Both groups were tested with a rebound-jump task before and after the 8-week period. A total of 21 reflective markers were placed in pre assigned positions. In this controlled laboratory study, a 2-way analysis of variance (2 × 2) experimental design was used for the statistical analysis ( $P < .05$ ) using the experimental group and a testing session as within and between factors, respectively. Post hoc tests with Sidak correction were used when significant factor effects and/or interactions were observed.

**RESULTS:** A comparison of experimental group's pre- and post-training results identified training effects on all strength parameters ( $p=0.004\sim0.043$ ) and on knee flexion, which reflects increased flexibility ( $p=0.022$ ). Concerning biomechanical risk factors, the experimental group showed higher knee flexion angles ( $p=0.024$ ), greater inter-knee distances ( $p=0.004$ ), lower H-Q ratios ( $p=0.023$ ), and lower maximum knee extension torques ( $p=0.043$ ) after training. In the control group, no statistical differences were observed between pre- and post-training findings ( $p=0.084\sim0.873$ ). At pre-training, no significant differences were observed between the two groups for any parameter ( $0.067\sim0.784$ ). However, a comparison of the two groups after training revealed that the experimental group had significantly higher knee flexion angles ( $p=0.023$ ), greater knee distances ( $p=0.005$ ), lower H-Q ratios ( $p=0.021$ ), lower maximum knee extension torques ( $p=0.124$ ) and higher maximum knee abduction torques than the control group ( $p=0.043$ ).

**DISCUSSION:** We believe that these effects can be attributed to SIPT because all of the training sessions were observed and subjects were instructed by three well trained 3 coaches throughout the SIPT. It would appear that all successful programs contain one or several of the following components; traditional stretching and strengthening activities, aerobic conditioning, agilities, plyometrics, and risk awareness training. The SIPT has the advantage that it requires little additional time on the athlete's part because it only requires 20 minutes per training program (from warm-up to the warm-down exercises).

**CONCLUSION:** The sports injury prevention training program improved the strength and flexibility of the competitive female basketball players tested and biomechanical properties associated with anterior cruciate ligament injury as compared with pre-training parameters and with post-training parameters in the control group.