A Wearable Neuromuscular Device Reduces ACL Injury Risk in Female Soccer Athletes

Objectives
Female soccer athletes have a three-fold greater risk of sustaining an ACL injury compared with their male counterparts yet only 1 in 5 teams engage in ACL risk reduction programs due to several participation barriers. The purpose of this study was to determine the effects of a wearable neuromuscular (WNM) device on postural control, performance and ACL injury risk in female soccer athletes.

Methods
Seventy-nine elite youth and collegiate female soccer athletes (age range: 12-25 y) trained with a WNM device that applied bi-lateral, topical pressure to the medial quadriceps and hamstrings muscles (Topical Gear, Austin, TX). The athletes performed 7-9 weeks of pre-season training with the WNM device consisting of strength and conditioning exercises and on-field team practices (46-64 total hours of exposure). Postural control was measured in 15 athletes with and without the WNM device before and after the training program; and performance was measured in 25 athletes without the WNM device before and after the training program. Postural control was determined from a single-leg landing on a force plate from a horizontal distance normalized to leg length. The athletes were instructed to gain their balance as fast as possible upon landing and remain balanced for 5 seconds. The peak ground reaction forces (GRF) and the medial-lateral, anterior-posterior and net center of pressure (COP) velocities and displacement ranges were calculated during 2 seconds of single-leg stance. Performance measures including speed, power and endurance were measured from the 40 yard dash, vertical jump for height and the Beep test, respectively. A two-way repeated measures ANOVA and post-hoc comparisons were used to compare the postural variables; and t-tests were used to compare the performance tests (p=.05). ACL injury rates, the absolute risk reduction (ARR) and the number needed to treat (NNT) to prevent one ACL injury were calculated between the WNM intervention group and 11 control groups identified from 10 studies in the literature that followed female soccer athletes for an entire soccer season. The treatment effect of the WNM device was determined to be statistically significant at the .05 level if the 95% confidence interval for the ARR of an ACL injury did not include zero.

Results
Training with the WNM device demonstrated 18% lower peak medial GRFs (p=.005), 12% lower medial-lateral COP velocities (p=.032) and 18% longer landing phase durations (p=.001). Landing and balance performance with, compared to without, the WNM device demonstrated 2% lower peak vertical GRF (p=.047), 6% lower net COP velocities (p=.044) and 10% lower medial-lateral COP displacements (p=.018). Speed, power and endurance significantly improved 7, 22 and 14% after training with the WNM device (all p<.05). No athletes in the current study sustained an ACL injury during training or over the course of the season. The ARR was on average lowered 1.5% and statistically improved in 9 of the 11 control group comparisons (p<.05) and corresponded to a RRR of 100%. From the NNT analysis, it was determined that 92 female soccer athletes would need to be trained with the WNM device to prevent one ACL injury over the course of one competitive season.

Conclusion
Training with a WNM device improved postural control without limiting performance and reduced ACL injury risk in female soccer athletes. Wearable neuromuscular products may provide a solution to the current participation barriers of ACL injury risk reduction programs.