

POSTURAL CONTROL ENHANCEMENT IN FEMALE COLLEGIATE SOCCER ATHLETES

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INTRODUCTION

Individuals with postural control deficits during single leg stance have an increased risk of lower extremity injury [1] and this risk is doubled when postural deficits are present after a previous knee injury [2]. Postural control deficits have been shown to be reduced with neuromuscular training and ultimately reduce the risk of injury in female soccer athletes [3].

A novel neuromuscular training device named the ACL Tube™ (Topical Gear, Austin, TX) is an advanced form-fitting thigh sleeve that is worn bilaterally during training or conditioning. These sleeves are anatomically designed with 2 buttresses that apply focused topical pressure on the medial quadriceps and hamstring muscles. This topical pressure induces a neuromuscular effect that via proprioceptive pathways facilitates knee stability leading to enhanced postural control. The purpose of this study was to determine the neuromuscular effects of training with the ACL Tube on postural control.

METHODS

Upon signing a written informed consent approved from the University of Denver's Institutional Review Board, 15 female collegiate soccer athletes (19.1 ± 1.1 y; 63.3 ± 7.9 kg; 168.4 ± 8.0 cm) performed a single-leg landing task 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 another 2 seconds while wearing the ACL Tube with and without the buttresses; before and after completion of a 7 week pre-season training regimen supervised by the University of Denver's Strength and Conditioning and Sports Medicine Departments. The training consisted of 23 strength and conditioning exercise sessions and 18 on-field team practices while wearing the ACL Tubes with the buttresses (46 total hours per athlete).

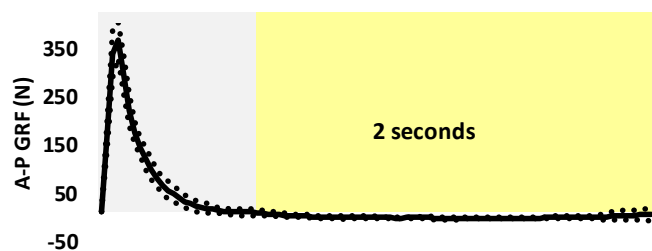


Figure 1. Mean (SD) anterior-posterior (A-P) ground reaction force (GRF) during single-leg landing and balance. The gray area indicates the landing duration to arrest forward momentum; whereas the yellow area indicates 2 seconds of single leg balance.

Three dimensional coordinates of 54 four retro-reflective markers (100 Hz) and force plate data (1000 Hz) were captured with a motion analysis system (Vicon, Englewood, CO). For purposes of this paper, the peak ground reaction forces and center of pressure (COP) variables are reported. The medial-

lateral, anterior-posterior and net COP velocities and displacement ranges were calculated during 2 seconds of single leg stance which commenced at the end of the landing phase, defined as the point where the participant brought their forward momentum to zero (Figure 1, yellow area). A two-way (with and without buttresses and pre- and post-training) repeated measures ANOVA and post-hoc comparisons were used to contrast the dependent variables ($p=.05$).

RESULTS AND DISCUSSION

Training + ACL Tube Effects. The 7 week training protocol with the ACL Tubes demonstrated 18% lower peak medial GRFs ($p=.005$), 12% lower medial-lateral COP velocities ($p=.032$) and 18% longer landing phase durations ($p=.001$). These results indicate that medial-lateral postural control was improved while wearing the ACL Tubes during training. Greater medial-lateral postural control in conjunction with lower peak medial GRF forces may indicate improved frontal plane knee stability with lower peak knee valgus moments and positions.

ACL Tube Effects. Landing and balance performance with, compared to without, the buttresses within the thigh sleeves demonstrated 2% lower peak vertical GRF ($p=.047$), 6% lower net COP velocities ($p=.044$) and 10% lower medial-lateral COP displacements ($p=.018$). These results indicate that the focused topical pressure of the buttresses, rather than the non-specific inward squeezing force exerted by the thigh sleeve, facilitated a neuromuscular effect from the medial quadriceps and hamstring muscles that promoted a 'softer' landing style with improved postural control.

ACL Tube Effects: Pre- vs. Post-Training. Similar neuromuscular and postural control effects were found while performing with the buttresses in the thigh sleeves pre- and post-training, however, the effects were much stronger after 7 weeks (46 hours) of athletic exposure. A stronger response from the athletes wearing the ACL Tubes post-training may indicate that the readiness of the athlete's neuromuscular system has improved over the course of the training regimen hence potentially more reactive to proprioceptive cues. It is likely that additional athletic exposures with the ACL Tubes would be advantageous for further refinement of the neuromuscular effects governing improved landing performance and postural control.

REFERENCES

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