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Effect of Treadmill-Based Resistance on Landing Strategy and Force Attenuation in Female Collegiate Lacrosse Players

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Female athletes have been recognized as at risk for non-contact anterior cruciate ligament (ACL) injuries. The role of hip musculature in attenuating ground force and maintaining neutral alignment through the knee during landing has recently emerged as a focus of ACL injury prevention research. Novel methods to target and condition hip extensors have been proposed, with closed kinetic chain resistance exercises widely considered most functional in achieving adaptations relevant to knee stability and coordinated landing strategies. However, the use of treadmill-based resistance training for developing hip-specific strength in this context has not been investigated. **PURPOSE:** To examine the effect of six weeks of modified incline treadmill-based resistance training on functional landing strategies, vertical ground force attenuation and knee and trunk flexion angles in female athletes, compared to active controls. **METHODS:** 15 healthy female intercollegiate lacrosse players (age = 19.5 ± 1.7 years, height = 1.65 ± .23m, weight = 59.33 ± 5.4kg) participated in a repeated measures, cross-sectional design and provided written informed consent. Independent variable was time (pre- and post- training). Dependent variables were reactive strength index (RSI), vertical ground force rate of loading (ROL), and knee and trunk flexion angles during drop jumps from a 30cm box. Training occurred on two non-consecutive days per week, over six weeks with treadmill set at 15 percent grade and progressive cable resistance load set initially at 40% of hip extensor strength average for a duration of 7 minutes per session. **RESULTS:** Paired samples t-tests showed a significant ($p = .007$) increase in RSI post training, specifically reflecting a 12.5% increase in RSI scores. No other group differences in ROL or knee or trunk flexion angles were statistically significant pre to post training. **CONCLUSION:** Calculated as vertical jump height divided by pre jump ground contact time, RSI differences reflect training adaptations to enhance transfer of eccentric landing force load to a propulsive outcome, demonstrating improved power and plyometric performance. Future research should investigate strength and neuromuscular stiffness changes associated with dynamic knee restraint mechanisms protective against ACL injury.

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