ABSTRACT

Background: Performing physical activities on compliant surfaces alters joints kinematics by decreasing joint motions. However, the effect of administering a training program on a compliant surface on muscle activities after anterior cruciate ligament (ACL) injury is unknown.

Hypothesis/Purpose: To compare the effects of training on a compliant surface and manual perturbation training on individual muscle activation and muscle co-contraction indexes after an ACL injury. It was hypothesized that patients who received training on the compliant surface would demonstrate higher individual and combined muscle activities compared to the manual group.

Method: Sixteen patients (participated in level I/II sports) who sustained an ACL injury and had not undergone reconstructive surgery participated in this preliminary study. Eight patients received training on a compliant surface (Compliant group) and data of eight patients matched by age and sex from a previous study who received manual perturbation training were used as a control group (Manual group). Patients in both groups completed standard three-dimensional gait motion analysis with surface electromyography (EMG) of several lower extremity muscles during gait. Muscle co-contraction index and individual muscle activations were computed during weight acceptance (WA) and mid-stance (MS) intervals. A 2x2 analysis of variance (ANOVA) was used with an alpha level of $p \leq 0.10$ to account for the high EMG variability.

Results: The compliant group significantly increased muscle co-contraction of vastus lateralis-lateral hamstring (VL-LH), vastus medialis-gastrocnemius medialis (VM-MG), and vastus lateralis (VL) muscle activity during WA ($p \leq 0.035$) and manual group significantly decreased VM-MG muscle co-contraction during WA ($p = 0.099$) after training.

Conclusion: Administering training on a compliant surface provides different effects on muscle activation compared to manual perturbation training after an ACL injury. Training on a compliant surface caused increased muscle co-contraction indexes and individual muscle activation, while manual perturbation training decreased the VM-MG muscle co-contraction index.

Level of evidence: 2b

Keywords: ACL rehabilitation, compliant surface, EMG, Mechanical perturbation, Movement system, Muscle co-contraction.

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Acknowledgments: We thank the National Institutes of Health (NIH/ Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) for funding this pilot study. We also thank the physical therapy clinic at the University of Delaware (http://sites.udel.edu/pclinic/) for facilitating the patients' recruitment and management, and we thank Angela Smith and Martha Callahan for research coordination.

Declaration of Conflict of Interest: All authors certify that there are no affiliations with or financial involvement, conflict of interest, or personal relationships with other people or organizations that could inappropriately influence (bias) the subject matter or materials discussed in the manuscript.

Funding source: This work was supported by National Institutes of Health (NIH/ Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) (grant number 5R44 HD068054). The funding source had no involvement in the study design; data collection, analysis, and interpretation of data; writing of the report; and in the decision to submit the article for publication. Registration of clinical trials: this study was not registered as it began in April 2011, before the NIH's implementation date and it was a feasibility study for Small Business Innovation Research (SBIR) grant.

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