

# THE EFFECT OF TRAINING ON A COMPLIANT SURFACE ON MUSCLE ACTIVATION AND CO-CONTRACTION AFTER ANTERIOR CRUCIATE LIGAMENT INJURY

Zakariya H. Nawasreh, PT, MSc, PhD<sup>1</sup>

Adam R. Marmon, PhD<sup>3</sup>

David Logerstedt, MPT, PhD<sup>2,3</sup>

Lynn Snyder-Mackler, PT, ScD, FAPTA<sup>3</sup>

## 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.

<sup>1</sup> Division of Physical Therapy, Department of Rehabilitation Sciences, Faculty of Applied Medical Sciences, Jordan University of Science and Technology, Irbid, Jordan

<sup>2</sup> University of the Sciences, Department of Physical Therapy, Philadelphia, PA, USA.

<sup>3</sup> Department of Physical Therapy, College of Health Sciences, University of Delaware, DE, USA

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## CORRESPONDING AUTHOR

Zakariya H. Nawasreh,  
Jordan University of Science and Technology  
(JUST)  
P.O.Box 3030, Irbid 22110, Jordan  
E-mail: zhnawasreh@just.edu.jo