

## **Individuals Following Anterior Cruciate Ligament Reconstruction Respond Differently To Limb Loading Instruction: A Clustering Analysis**

WILLA MA, & SUSAN SIGWARD

Human Performance Laboratory; Division of Biokinesiology and Physical Therapy; University of Southern California; Los Angeles, CA

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*Category: Doctoral*

*Advisor / Mentor: Sigward, Susan (sigward@pt.usc.edu)*

### **ABSTRACT**

Individuals following anterior cruciate ligament reconstruction (ACLR) demonstrate altered loading strategies such as shifting mechanical demand away from the surgical knee. Previous work found that individuals can restore limb loading symmetry with instruction to equalize weight distribution between limbs during a squat task. However, when looking at individual responses to these instructions, it appears that not all individuals responded similarly. **PURPOSE:** To use k-means clustering to describe the variation in response to instruction to equalize weight between limbs in individuals 3-4 months post-ACLR. **METHODS:** We performed a secondary analysis of a dataset including two groups: individuals 110.4 days (18.4 days) post-anterior cruciate ligament reconstruction (ACLR; n = 20) and healthy matched controls (CTRL; n = 19). Kinematic and kinetic data were collected (3D motion capture system, force platforms) while participants performed squats in natural (no instruction; N) and instructed (instructed to evenly distribute their weight between limbs; IN) conditions. Limb and knee loading symmetry were calculated as the ratio of vertical ground reaction force and knee extensor moment impulse, respectively, between surgical (Sx):matched and non-surgical (non-Sx):matched limbs (ACLR:control). K-means clustering created three clusters based on natural and instructed LLS and KLS and the between condition difference of LLS and KLS. **RESULTS:** Three clusters were defined describing various responses to limb loading instruction: 1) non-responders, 2) symmetrical responders, and 3) overloading responders. A random forest algorithm was used to find the most influential variables and identified natural KLS to be the most important variable in clustering. **CONCLUSION:** Only 20% of participants in our sample of individuals following ACLR improved knee loading to be symmetrical when given instruction to equalize weight between limbs. This instruction may not be effective in restoring knee loading in the post-ACLR population.