

COLLEGE OF HEALTH SCIENCE FACULTY GRANT-IN-AID REPORT  
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**PROJECT TITLE: The effects of a resistance band on gluteus medius activation and hip abduction torque during jump-landing**

**INVESTIGATOR: Boyi Dai**

**YEAR PROJECT WAS SUPPORTED: 2013-2014**

**Participants/Subjects**

Thirteen male and 15 female recreational athletes (age:  $21.1 \pm 2.4$  yr; mass:  $73.8 \pm 14.6$  kg; height:  $1.76 \pm 0.1$  m) participated in the study.

**Methods**

Subjects performed jump-landing-jump tasks with or without a resistance band applied to their lower shanks. Lower extremity biomechanics and gluteus medius electromyography (EMG) were collected.

**Results**

Applying the band increased the average hip abduction moment during pre-landing ( $p < 0.001$ , Cohen's  $d = 2.8$ ) and early-landing ( $p < 0.001$ ,  $d = 1.5$ ), and the average gluteus medius EMG during pre-landing ( $p < 0.001$ ,  $d = 1.0$ ) and early-landing ( $p = 0.003$ ,  $d = 0.55$ ). Applying the band decreased the initial hip flexion angle ( $p = 0.028$ ,  $d = 0.25$ ), initial hip abduction angle ( $p < 0.001$ ,  $d = 0.91$ ), maximum knee flexion angle ( $p = 0.046$ ,  $d = 0.17$ ), and jump height ( $p = 0.004$ ,  $d = 0.16$ ).

**Limitations**

We only quantified the immediate changes. Studies are needed to study the effects of long-term jump-landing training with a resistance band on lower extremity biomechanics as well as to compare the training effects with other training strategies. Only one resistance band and one band placement were evaluated. Different band stiffness and placements could affect jump-landing mechanics differently.

**Conclusions**

Applying a resistance band provides a potential strategy to train the strength and muscle activation for the gluteus medius during jump-landing. Additional instructions and feedback regarding hip abduction, hip flexion, and knee flexion may be required to minimize negative changes to other kinematic variables.

**Future Research & Dissemination**

*Journal Article:* Dai, B., Heinbaugh, E.M., Ning, X., & Zhu, Q. (2014). A resistance band increased internal hip abduction moments and gluteus medius activation during pre-landing and early-landing. *Journal of Biomechanics*, 47(15):3674-3680.

*Media Coverage:* Resistance is useful: Ankle band activates hip during landing, *Lower Extremity Review Magazine*, 2014: <http://lermagazine.com/news/in-the-moment-sports-medicine/resistance-is-useful-ankle-band-activates-hip-during-landing>

*Grant Submission:* Dai, B., Zhu, Q., Smith, D.T. (2015). Cost-effective self-implemented jump-landing to reduce biomechanical risks for ACL injury. Pre-proposal for the Pew Charitable Trust Scholar Program. (Pre-proposal, unfunded)