



2005

Relationship Between Hip Abductor Strength and Endurance With Functional Performance

NATA RESEARCH & EDUCATION FOUNDATION

GRANT INFORMATION SUMMARY

PRACTICAL SIGNIFICANCE

When landing from a jump, individuals with weak hip abductors allow their hip to adduct and knee to move into more valgus, which places the knee in a potentially vulnerable position for injury.

STUDY BACKGROUND

Weakness of the hip abductors has been associated with chronic knee injuries such as patellofemoral pain syndrome (PFP). The proposed mechanism for PFP is increased hip adduction and internal rotation, which is thought to increase knee valgus and tibial external rotation. The combination of these rotations has also been described as a common mechanism of non-contact ACL injury, specifically when landing from a jump. During this activity, the hip abductors help maintain neutral pelvic and lower extremity alignment, which may reduce the risk of injury. It is unclear as to what role hip endurance, strength, and landing leg preference has on knee and hip alignment during landing.

OBJECTIVE

To compare hip and knee joint kinematics when landing from a jump in physically active individuals that have differing levels of hip abduction strength and endurance.

DESIGN AND SETTING

This clinical laboratory based protocol used two mixed model 2 x 2 repeated measures design. The independent variables were strength (strong, weak) and fatigue state (pre-fatigue, post-fatigue) for the first analysis. The independent variables were endurance (high, low) and fatigue state (pre-fatigue, post-fatigue) for the second analysis. The dependent variables analyzed in both analyses were hip and knee 3-D kinematics.

SUBJECTS

Thirty healthy subjects (15 women, 15 men; age=23.8±2.9 yrs).

MEASUREMENTS

Subjects completed 3 pre-exercise trials (L_{pre}) of a double-leg hop with a single-leg landing. (Figure 1) The length and height of the hop were controlled as a percentage of each subject's height. Mean peak joint displacement values for the hip and knee were collected during the trials. Hip abductor strength was then determined as the subjects performed 3 maximal voluntary isometric contractions (MVIC). Subjects then maintained 50% of their MVIC to the limits of their endurance.

Following 20 minutes of rest, subjects completed a 30 second bout of isometric hip abduction, again with 50% MVIC. From this, we determined the percent of maximal endurance utilized. Immediately following the bout of exercise, subjects completed 3 post-exercise landing trials (L_{post}). For statistical analysis, subjects were stratified into groups based on their hip abductor strength and endurance.

RESULTS

Subjects with strength values above the median landed with less hip adduction and knee valgus than the weaker subjects. (Figure 2) There were no differences in knee and hip motion when the subjects were stratified by endurance. There was a low, but significant inverse relationship between hip abductor strength and knee valgus displacement during both the L_{pre} ($r = -0.30$) and L_{post} trials ($r = -0.39$, $P < 0.05$).

CONCLUSIONS

The hip abductors contribute to neuromuscular control of the knee when landing from a jump. Strength of the hip abductors may play a more vital role in controlling knee motion than the endurance capacity of this muscle group.

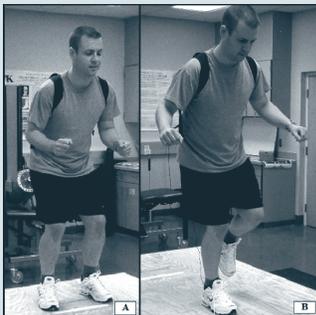


Figure 1. Subject performing the functional task of a double leg hop (A) with a single leg landing (B).

Publication and Presentation List:

Jacobs C, Mattacola CG, Uhl TL, Shapiro R, Rayens WS. The influence of hip abductor strength, endurance, and asymmetry on lower extremity landing kinematics. *Southeast Athletic Trainers' Association Clinical Symposium*, Atlanta, GA, 2005.

Jacobs C, Mattacola CG, Uhl TL, Shapiro R, Rayens WS. Relationship of hip abductor strength and endurance with the kinematics of landing. *Journal of Athletic Training*. 2005 (suppl);40:S65.

Printing by: Ellington Printery, Ellington, CT

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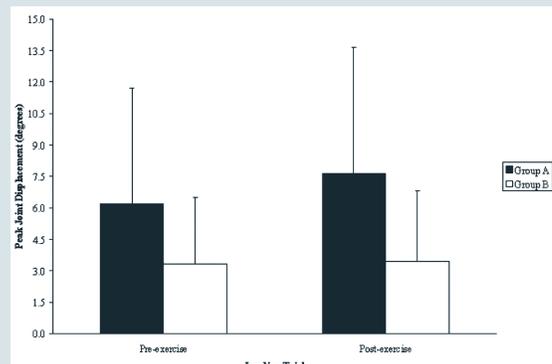


Figure 2. Differences in knee valgus peak joint displacement between groups of subjects stratified by peak torque of the hip abductors. Group A demonstrated peak torque values below the median level, Group B demonstrated values above the median level.

* denotes significant greater knee valgus in Group A over Group B ($P < 0.05$)



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Cale Jacobs has just completed his Doctorate in Exercise Sciences from the University of Kentucky in May of 2005. He is presently employed at the Lexington Clinic as a Clinical Researcher.

