



Grant Information Summary:

Effects of Lower Extremity Posture on Hip Strength and Their Influence on Lower Extremity Motion during a Single Leg Squat

Practical Significance Statement

Select lower extremity alignment measures were predictive of differences in isometric hip strength, and these differences, separately and in combination, were predictive of lower extremity motion during a single leg squat.

Study Background

Decreased strength of the hip musculature has been postulated as a potential contributor to dynamic knee motions found to be predictive of ACL injury. However, the underlying causes for decreased hip strength have received little attention. Differences in lower extremity alignment, which have also been proposed as an ACL injury risk factor, may alter hip strength and contribute to at risk joint positions. Further research is therefore needed to understand the effects of lower extremity alignment measures on hip strength and their influence on lower extremity joint kinematics during dynamic activities.

Objective

To examine the effects of static lower extremity alignment measures (LEA) on hip strength and their collective influence on knee and hip joint kinematics during a single leg squat.

Design And Setting

This study utilized a descriptive-cohort design and data collection took place in the Applied Neuro-mechanics Research Laboratory.

Subjects

Sixty (30M, 30F) healthy college-aged subjects (23.1+3.2yrs, 170.5+11.6cm, 71.2+17.8kg) participated in this study.

Measurements

Six LEA variables were measured using clinical measurement methods. Hip abduction and extension MVIC torques were measured using an instrumented dynamometer (figures 1 & 2). Kinematic hip and knee joint motions were collected during single leg squat trials performed to a depth of 60° of knee flexion (figure 3). Structural equation modeling using separate path analyses determined the extent to which LEA explained isometric hip torque, and the extent to which LEA and hip strength collectively explained lower extremity motion during a single leg squat.

Results

Greater hip anteversion predicted decreased hip abduction torque ($t = -2.18$), while greater tibiofemoral angle predicted decreased hip extension torque ($t = -2.83$). Greater hip anteversion ($t = 2.09$) and genu recurvatum ($t = 2.07$) and decreased hip abduction torque ($t = -2.42$) predicted greater knee external rotation; greater navicular drop ($t = 2.86$), greater hip anteversion ($t = -2.12$), greater hip extension torque ($t = 2.44$) and decreased pelvic angle ($t = -2.12$) predicted greater hip internal rotation; and decreased hip extension torque predicted greater knee valgus during the single leg squat ($t = -2.56$).

Conclusions

Findings revealed that greater hip anteversion and tibiofemoral angle predicted decreased hip abduction and extension strength, respectively. Further, several alignment and hip strength measures, separately and in combination, predicted greater hip and knee motions during the single leg squat.

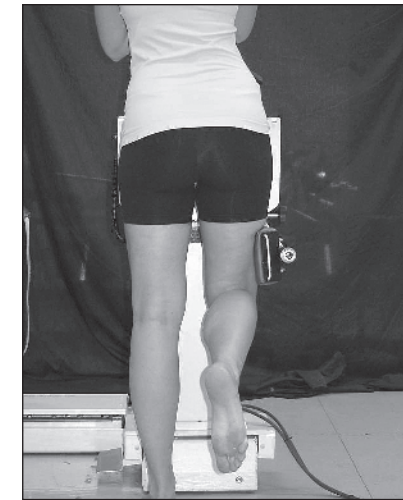


Figure 1

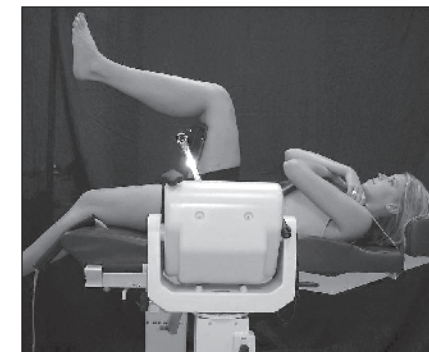


Figure 2

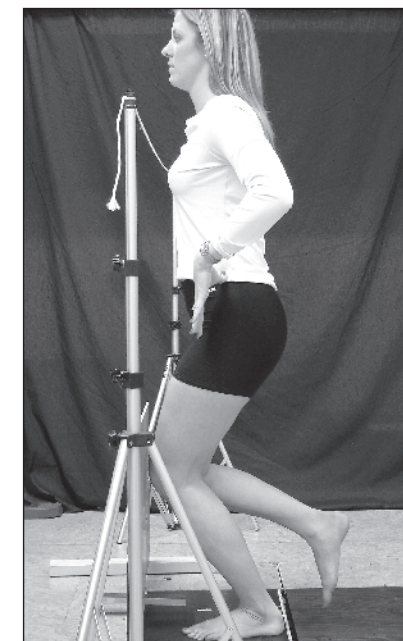


Figure 3

Principal Investigator:

Anh-Dung Nguyen, PhD, ATC



Dr. Anh-Dung "Yum" Nguyen is currently a Post Doctoral Research Associate in the Department of Exercise and Sport Science at the University of North Carolina at Greensboro. Dr. Nguyen received his B.S. in Physical Education and Sport with an Athletic Training emphasis from Indiana University of Pennsylvania (1997), M.S. Ed. in Athletic Training at Old Dominion University (2000), and Ph.D. in Sports Medicine at the University of North Carolina at Greensboro (2007). Prior to obtaining his doctorate, he was the Clinical Education Coordinator in the Athletic Training Education Program at Sacred Heart University in Fairfield, Connecticut. Dr. Nguyen has been a Board Certified Athletic Trainer since 1998. Dr. Nguyen's primary research interests focus on identifying risk factors associated with lower extremity injury, particularly the anterior cruciate ligament. Current research includes the evaluation of lower extremity alignment and its role in neuromuscular and biomechanical responses during dynamic motion. Dr. Nguyen has authored or co-authored 7 papers published or in press in athletic training and sports medicine journals and 2 book chapters. In 2006 and 2007 Dr. Nguyen was awarded the NATA REF Free Communication Doctoral Oral Presentation Award and earned an NATA REF Doctoral Scholarship in 2007. Dr. Nguyen is a member of the National Athletic Trainers' Association and the American College of Sports Medicine.

Publication & Presentation List

Nguyen A, Schmitz RJ, Perrin DH, Shultz SJ. Single leg squat as a functional assessment of hip strength. 2008. National Athletic Trainers' Association Annual Meeting & Clinical Symposium St. Louis, MO.

Printing by:

Ellington Printery, Ellington, CT

Funded by NFL Charities



2952 Stemmons • Dallas, TX 75247
214-637-6282

Supporting and advancing the Athletic Training profession through research and education.