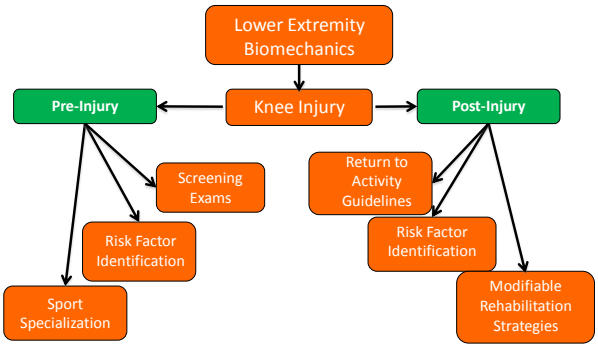
Hip Strength Compensations in ACL Reconstructed Patients with Quadriceps Deficits

David R. Bell, PhD, ATC
University of Wisconsin
Athletic Trainers' Osteoarthritis Consortium
June 23, 2015

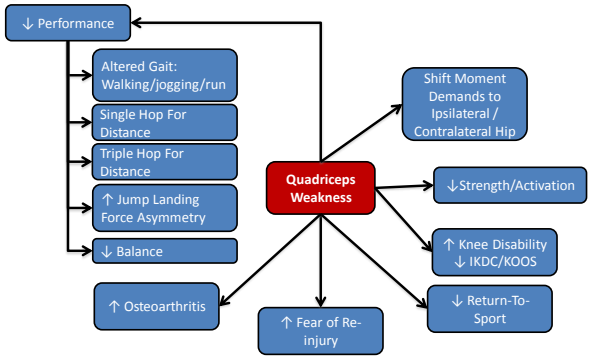
WISL Research Interests



https://kinesiology.education.wisc.edu/kinesiology/research/laboratories/wisconsin-injury-in-sport

ACL Injuries

- 250,000 individuals per year (Flynn 2005)
- Medical costs: Diagnosis, reconstruction, postoperative rehabilitation = $3 billion (Brophy 2009)
- Knee Osteoarthritis causes
  - Biochemical process (Pelletier 2001)
  - Biomechanical alterations (Kaufman 2001)
  - Deficits in neuromuscular function (Kessler 2008)



Gap / Purpose

- **Gap:** limited understanding of hip strength changes/compensations after ACL Reconstruction
- **Purpose:** To determine if quadriceps strength influences hip muscle strength in ACL reconstructed patients

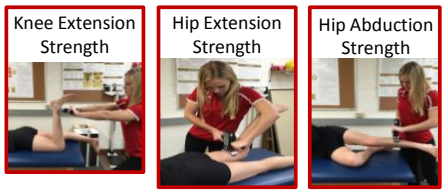
Wisconsin Injury in Sport Laboratory

Selection Criteria

- From Larger Database of ACLR subjects
  - Primary ACL reconstruction
  - "Healthy" limb to test
  - ACLR + Meniscus (no additional ligament surgery)

Wisconsin Injury in Sport Laboratory

Methods



Additional Tests:

- Knee Flexion (Hamstring) Strength
- Hip Internal Rotation Strength
- Hip External Rotation Strength
- Single Hop for Distance
- Triple Hop for Distance

Wisconsin Injury in Sport Laboratory

Subjects

55 ACLR Patients

$$\text{Limb Symmetry Index} = \frac{\text{Reconstructed Limb}}{\text{Healthy Limb}} \times 100$$

Low Quad: LSI ≤ 85%	High Quad: LSI ≥ 90%
F = 17	F=31
M = 1	M=6
Age = 18.7 ± 1.6 yrs	Age = 19.1 ± 1.6 yrs
IKDC = 73.3 ± 6.7%	IKDC = 74.5 ± 7.9%
22.6 ± 10.6 months from surgery	34.9 ± 19.0 months from surgery
BPTB = 6	BPTB = 20
Hamstring = 6	Hamstring = 10
Allograft = 2	Allograft = 7

7 Patients: >85% + <90%

Statistical Approach

- Repeated Measures ANOVA
  - Limb (Healthy vs reconstructed)
  - Group (High vs Low Quad)
  - Controlling for time from surgery
  - SPSS

Results

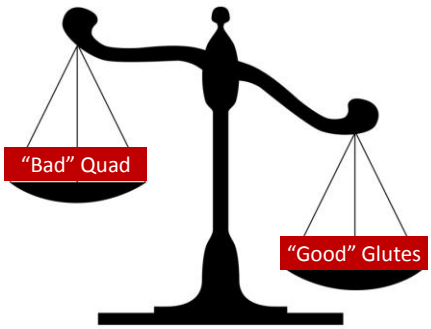
- Quad Strength
  - The reconstructed limb in the Low Quad group was weaker than the reference limb & both limbs of the High Quad group. This indicates our grouping strategy was successful.
- Hip Extension Strength (Glute Max)
  - Glute Max strength was stronger in the Low Quad Group (both limbs)
- Hip Abduction Strength (Glute Med)
  - *Tended* to be greater in the Low Quad group compared to the High Quad group (both limbs)

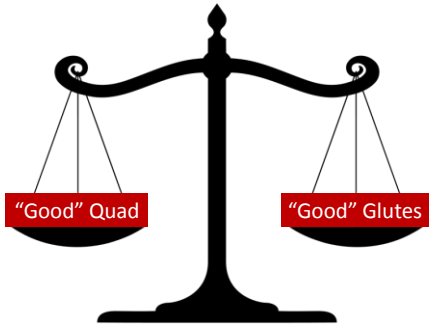
Results

- No differences were observed in normalized single hop for distance or triple hop for distance.
- No differences were observed in:
  - Hamstring strength
  - Hip Internal rotators / external rotator strength

Discussion

- ACLR individuals with poor between limb quadriceps strength symmetry have increased hip extension (Glute Max) and abduction (Glute Medius) strength
- Compensation to counteract quadriceps weakness
- These compensations may explain why SHD and knee function was not different
- Agrees with previous research (Schmitt 2012 & 2014)





Limitations

- Unable to control:
  - Rehabilitation protocols
  - Insurance plans
  - Surgeons

Acknowledgements

- Stephanie Kulow
- Eric Post
- Other students
- Funding
  - Sports Medicine Classic
  - UW Graduate School

Wisconsin Injury in Sport Laboratory

Thank You

Contact Information:

David R. Bell, PhD, ATC
Assistant Professor | Department of Kinesiology
Department of Orthopedics and Rehabilitation
Director: Wisconsin Injury in Sport Laboratory

drbell2@wisc.edu
Phone: (608) 265-2891
@davebell102

THE UNIVERSITY of WISCONSIN MADISON