


Musculoskeletal Biomechanics Research Lab 

Dynamic Stabilization of the Patellofemoral Joint: *Stabilization from above & below*

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Dynamic Q-Angle

- Proximal factors
 - Femoral adduction
 - Femoral internal rotation
- Distal factors
 - Pronation
 - Tibial internal rotation



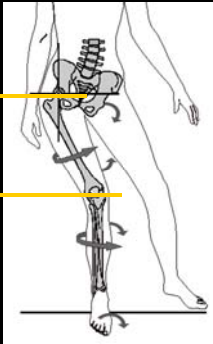
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Control of Hip Adduction & Internal Rotation



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Half of the PFJ is the Femur!!



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Females with PFP Have Weak Hip Muscles: A Systematic Review
Prins & van der Wurf, *Austr J Physiother*, 2009


- 6 studies evaluated
- Conclusion: “Strong evidence that females with PFP have impaired strength of the hip extensors, abductors and external rotators”

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Paradigm shift in the treatment of PFP

Control of femoral rotation and adduction

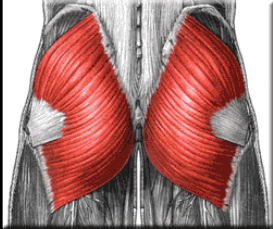
Emphasis on gluteus maximus & medius strengthening




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Gluteus Maximus: "The Tri-planar Muscle"


- Extensor
- Abductor
- External Rotator

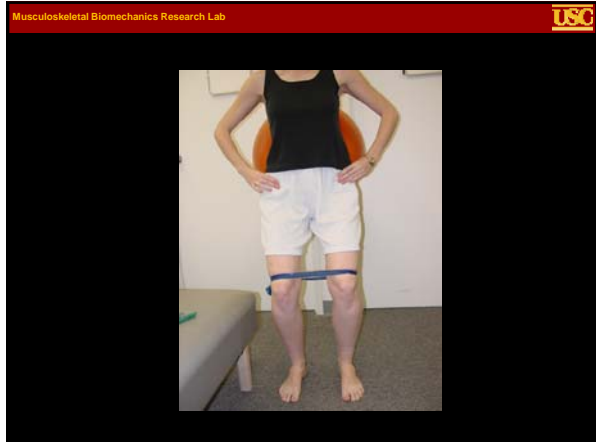


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Hip Strengthening & PFP

- Case Series (N=2)
 - Excessive hip adduction, IR during a step down
 - 14 week intervention of hip, pelvis, trunk strengthening
 - Outcome variables
 - Pain, muscle strength, LE kinematics

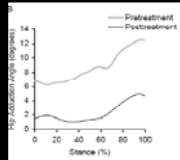
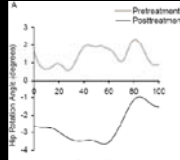



Mascal et al., JOSP, 2003

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Hip Strengthening & PFP

- Results
 - ↓ Pain
 - Improved kinematics
 - ↓ hip adduction, IR
 - 70% ↑ in Glut Med strength
 - 83% ↑ in Glut Max strength

Mascal et al., JOSP, 2003

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Hip Strengthening as a Treatment for Patellofemoral Pain

Nakagawa et al. Clin Rehab, 2009
Fukada et al. JOSPT, 2010

- The combined use of hip and quadriceps strengthening was better than quadriceps strengthening alone.
- The influence of hip muscle strengthening on PFP has not been evaluated in isolation

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Femoral strapping to improve lower limb alignment & control

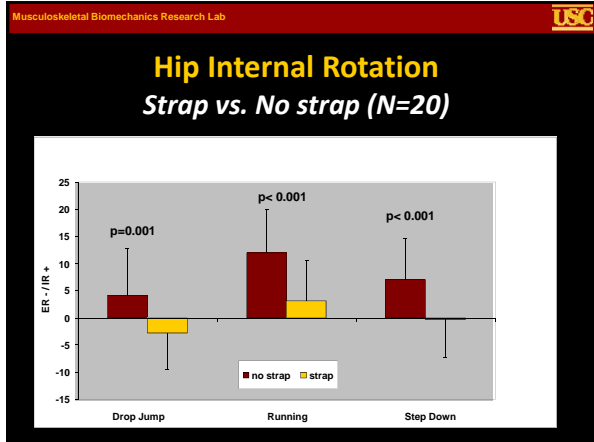
www.serfstrap.com (DJ Orthopaedics)

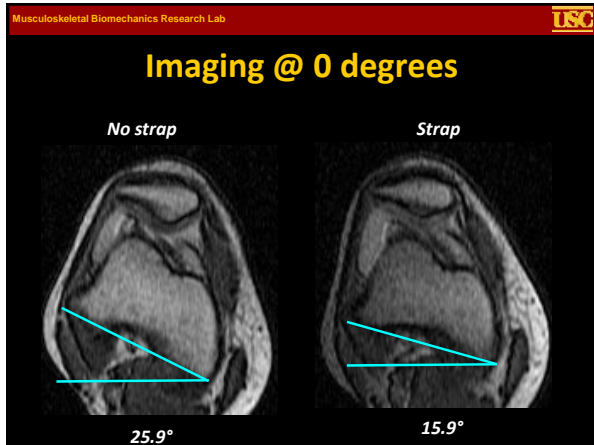
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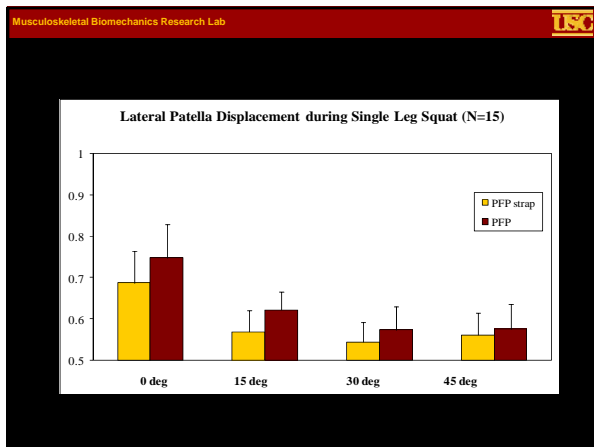
Pain Response

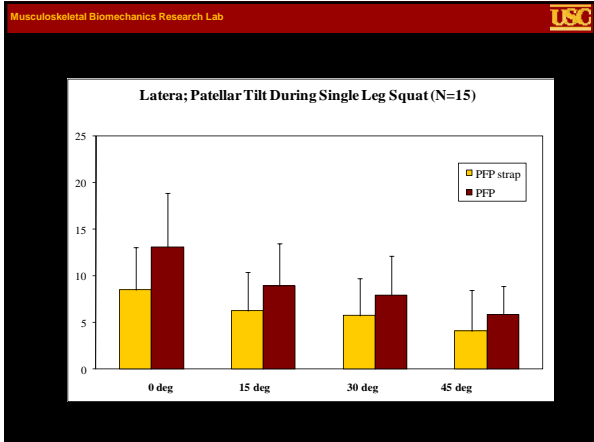
Strap vs. No strap (N=20)

Activity	No Strap (Mean Pain)	Strap (Mean Pain)	p-value
Drop Jump	~3.8	~3.0	$p < .001$
Running	~5.2	~4.0	$p = .002$
Step Down	~4.0	~2.5	$p = .001$

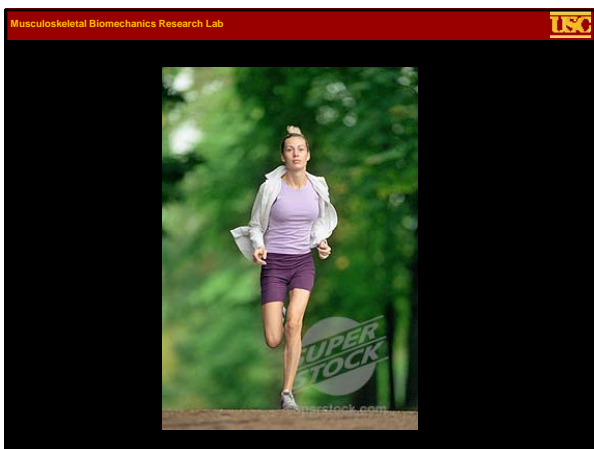













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Can Orthotics Change Lower Extremity Kinematics?


- **Medial wedging changed frontal & transverse plane knee kinematics 1-2°**
 - Nester et al., *Gait & Posture*, 2003
 - Eng & Pierrynowski, *Phys Ther*, 1994
- **Over-the-counter orthotic caused a 2° decrease in hip internal rotation**
 - Jenkins et al., *J Appl Biomech*, 2009

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Orthotics as a Treatment for Patellofemoral Pain

Collins et al. Br J Sports Med, 2009 (N=179)

- The use of orthotics was no better than physical therapy
- The combined use of orthotics and physical therapy was no better than physical therapy or the orthotic intervention alone.

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Questions?