Treatment of running injuries using gait analysis

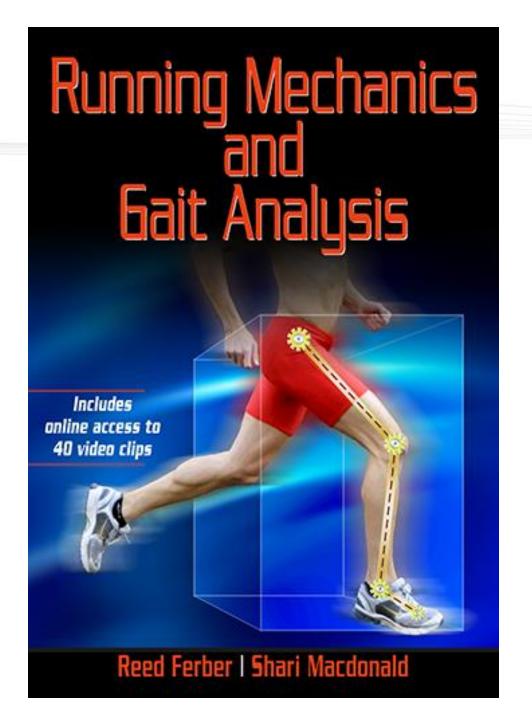
Reed Ferber PhD, ATC

Associate Professor University of Calgary Faculties of Kinesiology & Nursing

Director and Founder Running Injury Clinic







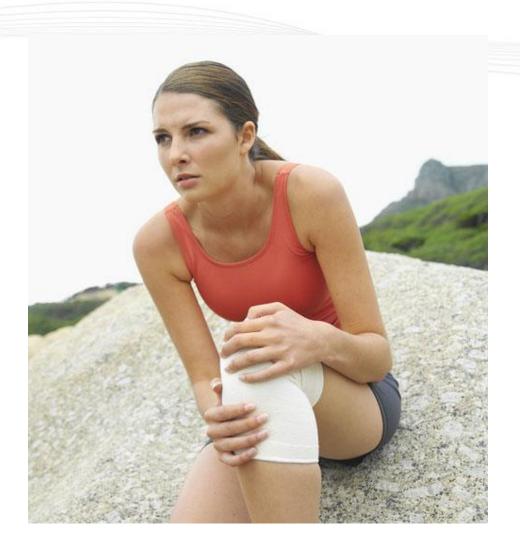






Running Injuries

• 50% of runners get injured each year



Most Common Injuries

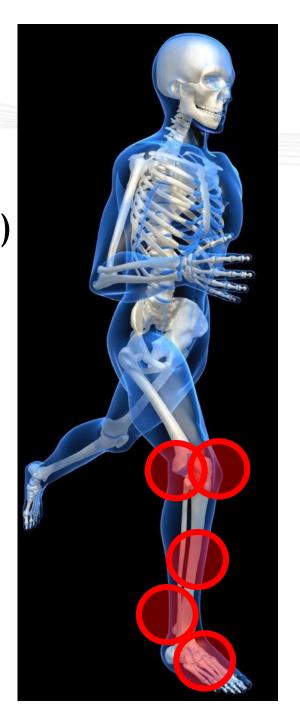
Patellofemoral Pain (PFP: runner's knee)

Iliotibial Band Syndrome (ITBS)

Plantar fasciitis

Shin Splints (medial tibial stress syndrome)

Achilles tendinitis



Overall Paradigm



INJURY THRESHOLD

Training

Training

Flexibility

Alignment

Strength

Mechanics



Flexibility

Alignment

Strength

Mechanics

Training

Flexibility

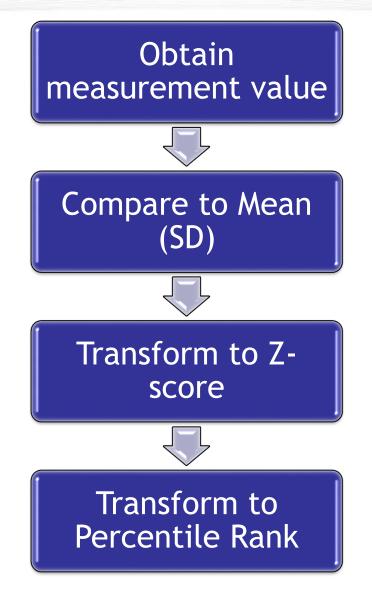
Alignment

Strength

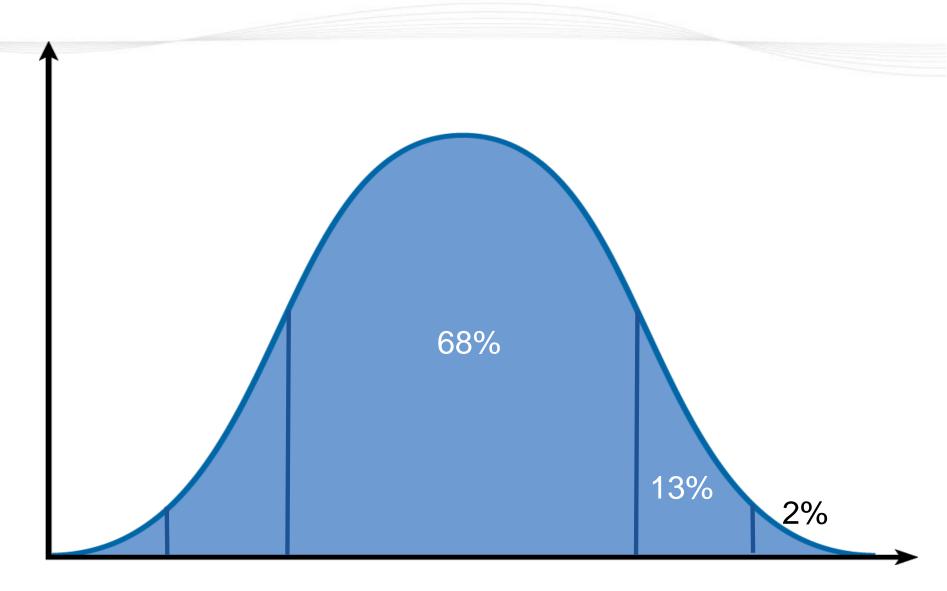
Mechanics



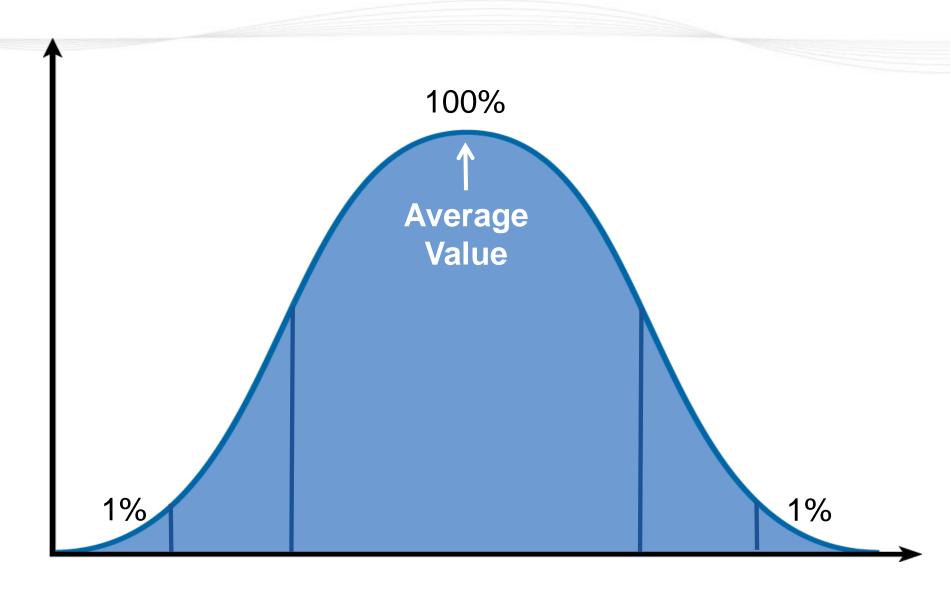
Evidence-Based Approach



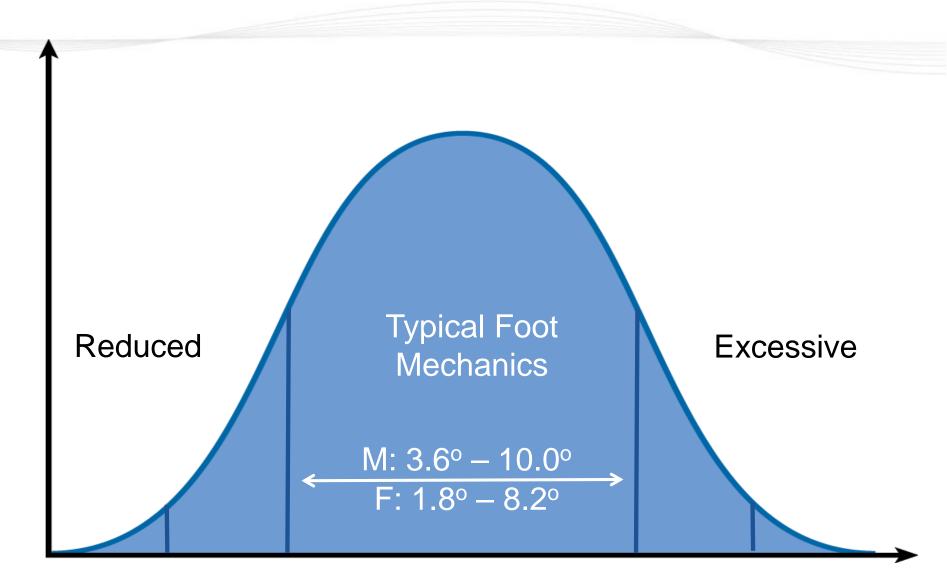
Bell Curve



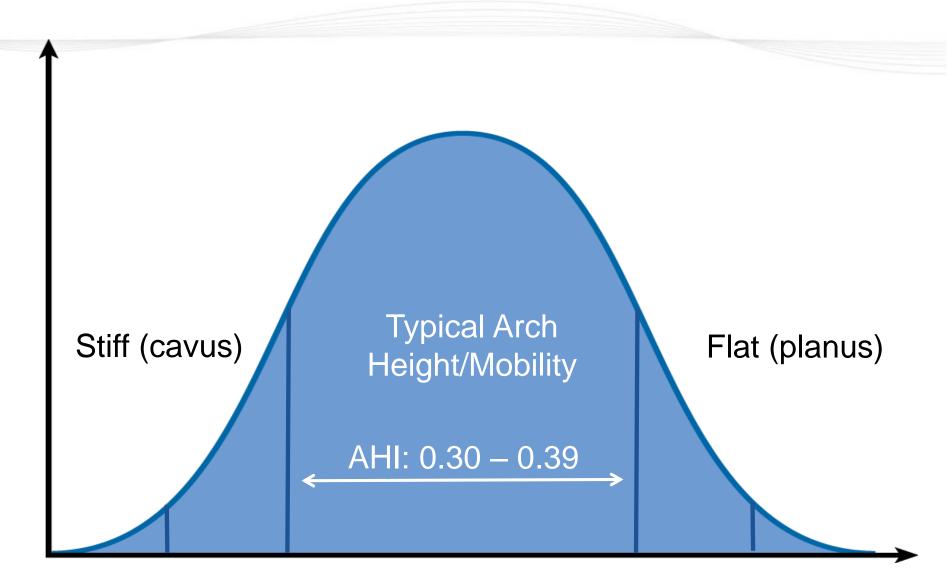
Bell Curve



Foot Mechanics



Arch Structure



Biomechanical Assessment



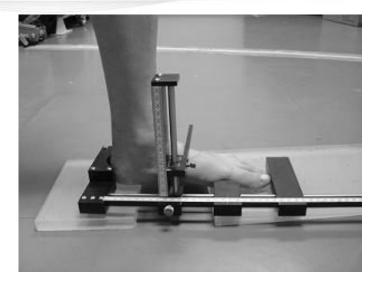
Strength

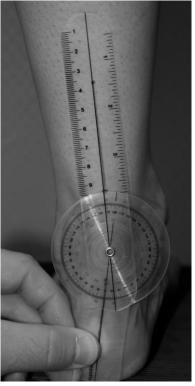


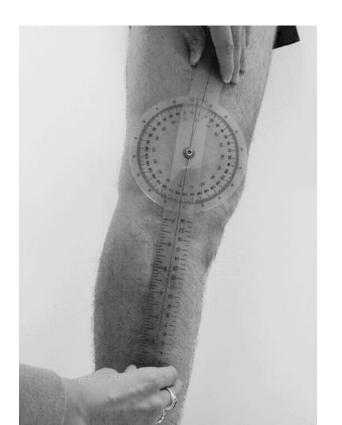
Flexibility

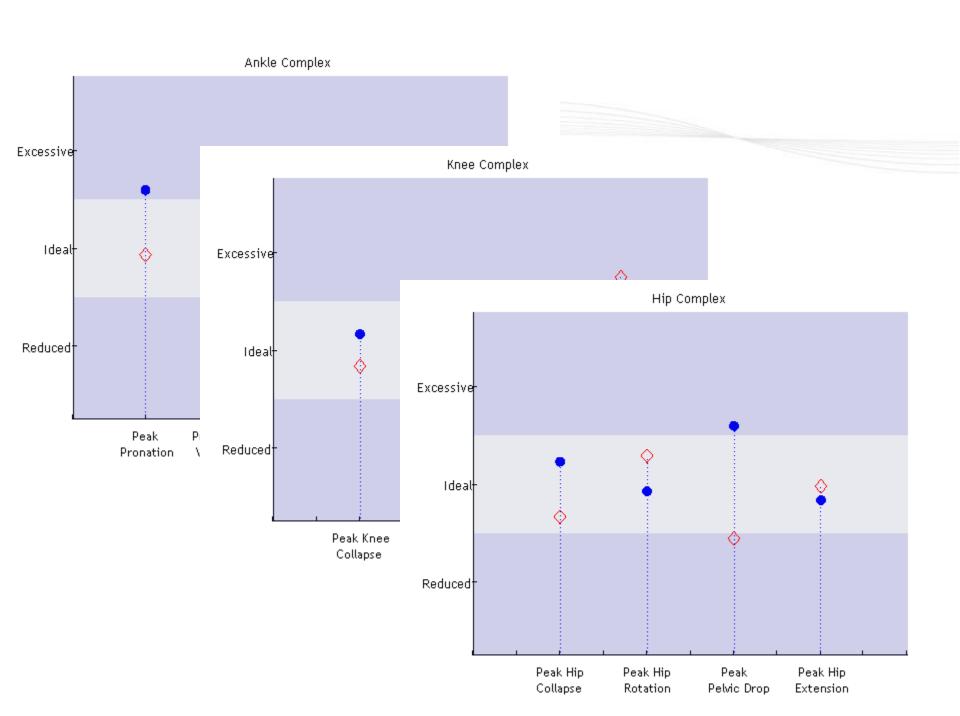


Anatomical Alignment

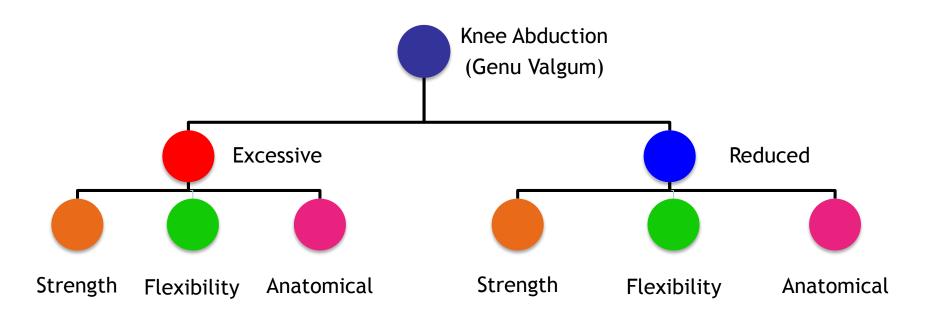








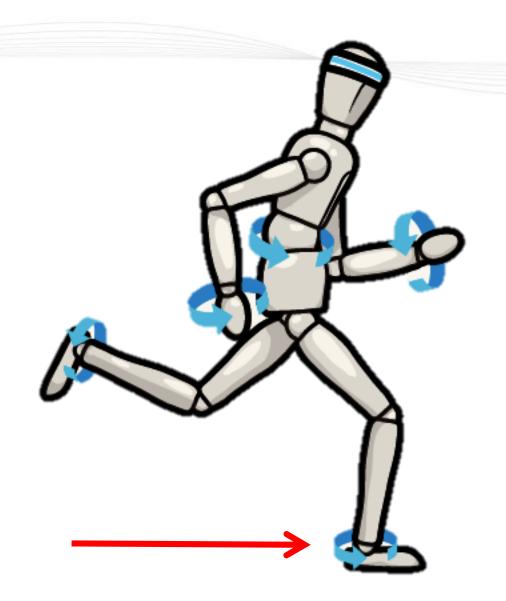
Chapter 8 - Interpretation



Free Moment

 Summation of axial rotational of the body

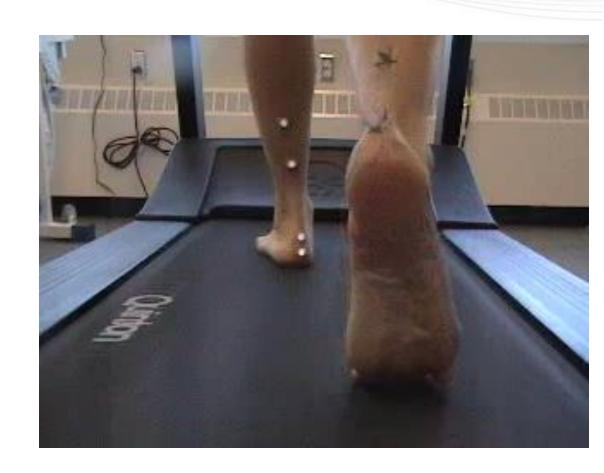
 Measured via force plate



Torsional Forces

- Heel whip
- Surrogate to free moment

(Macdonald, 2013)



Torsional Forces

- Heel whip
- Surrogate to free moment

(Macdonald, 2013)



Other Clinical Clues

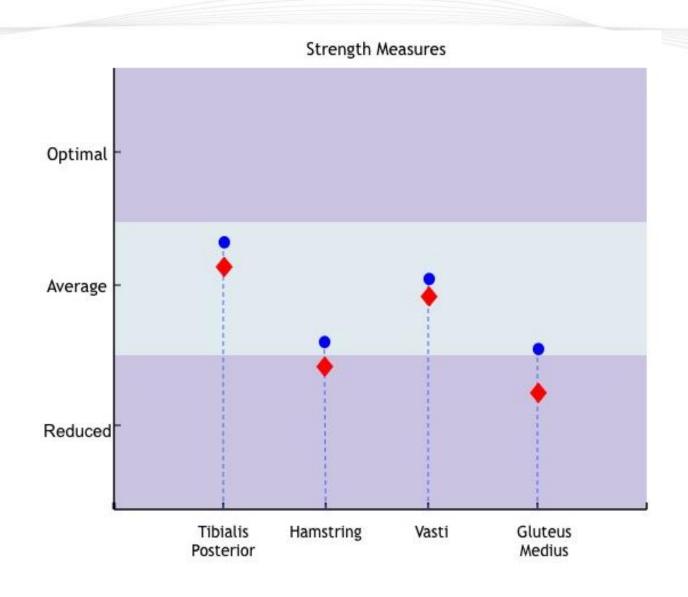




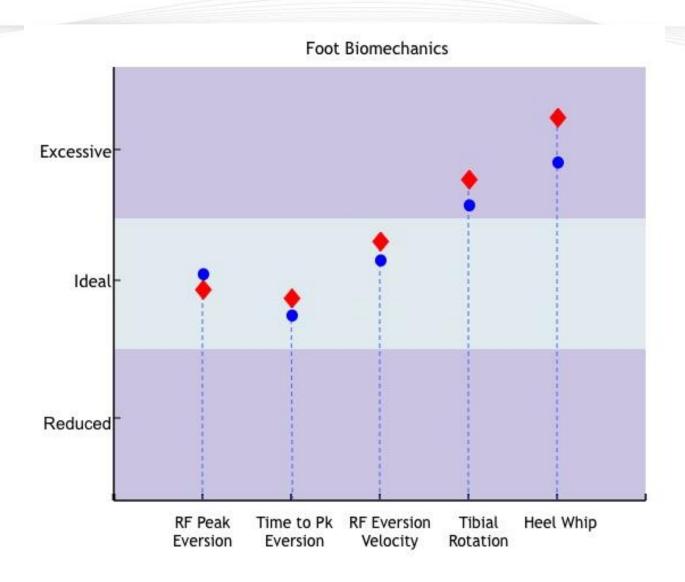
Case Study (Chapter 6) - Torsional Forces

- Pain/symptoms past 2 months
 - Assn with increase in mileage
- Retro and latero-patellar pain near 7km
- Increased crepitus w/ patellar grind test
- Negative patellar apprehension test
- VMO atrophy not visually observed
- Posted orthoses as treatment

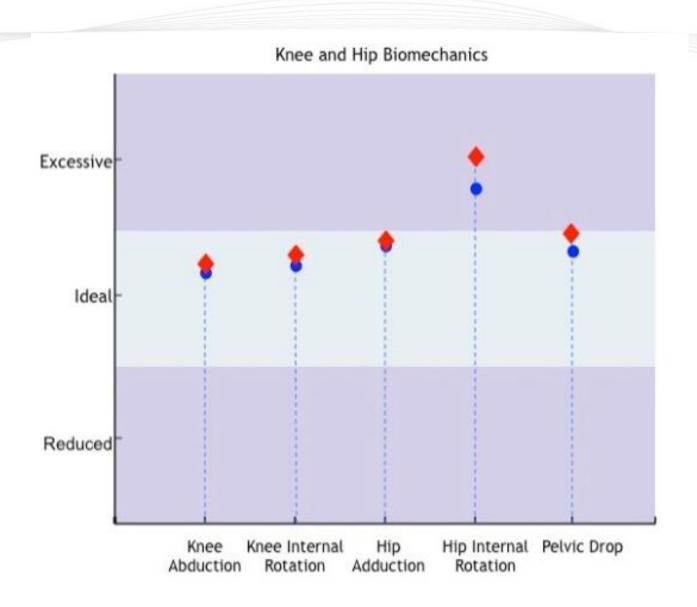
Evaluation



Evaluation



Evaluation



Chapter 8 - Interpretation

Excessive Peak Hip Adduction

Anatomical alignment	Increased Q-angle
Strength	Weakness of gluteus medius muscle
Flexibility	_
Biomechanics	Associated with excessive peak knee abduction and contralateral pelvic drop Can be associated with excessive peak hip internal rotation and excessive or prolonged rearfoot eversion

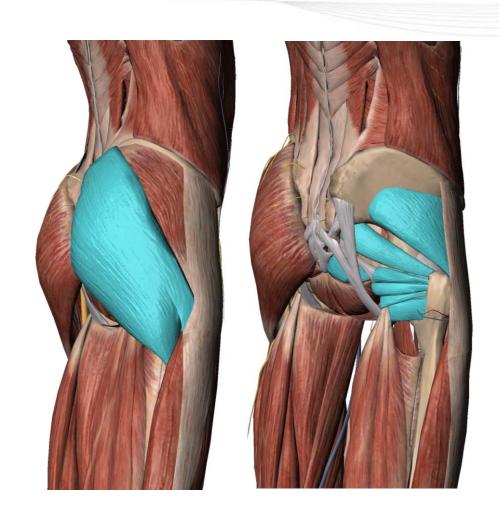
Excessive Peak Hip Internal Rotation

Anatomical alignment	_
Strength	Weakness of hip abductor and external rotator muscle
Flexibility	Increased hip internal rotator range of motion
Biomechanics	Associated with increased heel whip and foot progression angle Associated with excessive peak hip adduction and tibial or knee internal rotation

Clinical Hypothesis

Excessive rotational forces = aetiology

 Strengthen rotator musculature



Other Clinical Clues

- Evidence-based assessment
- Atypical mechanics during squat, running, and jumping

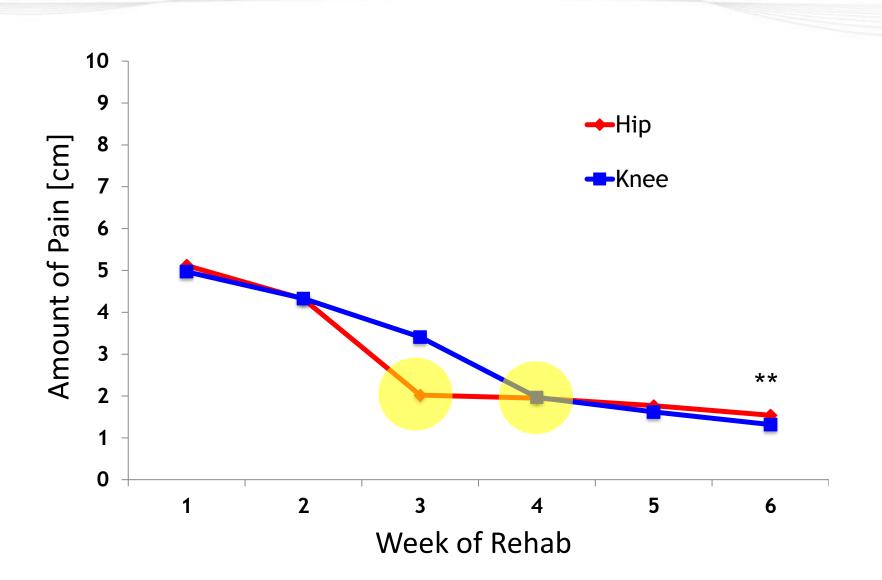






Recent Research

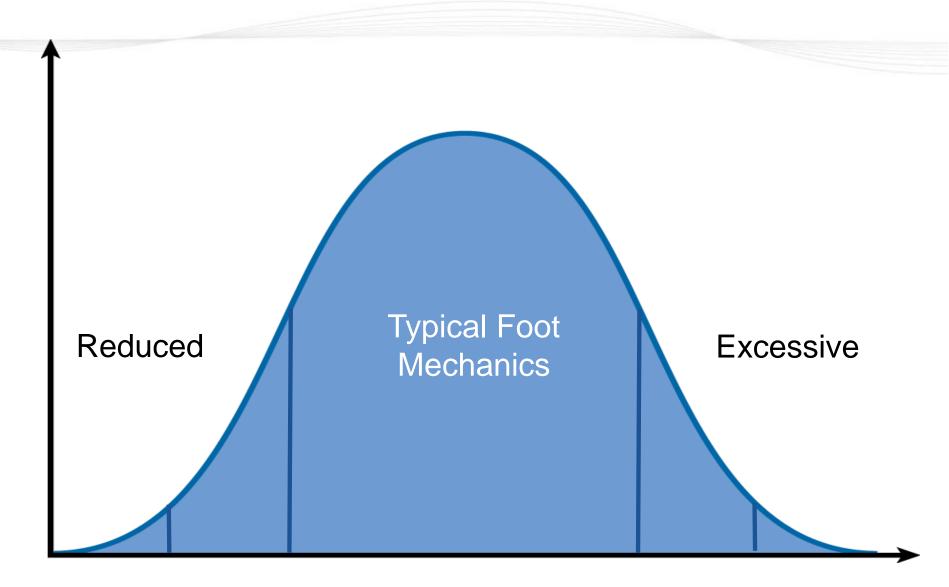
Ferber et al., JAT; 2014



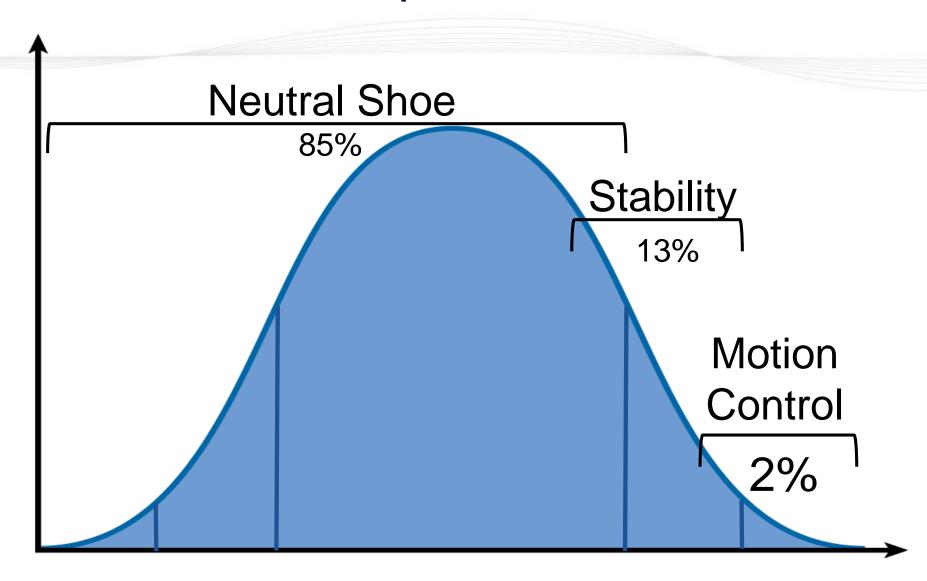
Treatment

- Strengthening everyday 3 sets of 10 reps
 - Gluteus medius
 - Hamstring
- Always AFTER a run or workout
- Footwear recommendation: Neutral shoe
 - Discontinue orthoses gradually
 - Switch to non-posted orthoses
- Limit mileage to max 7km/run for next 2 weeks

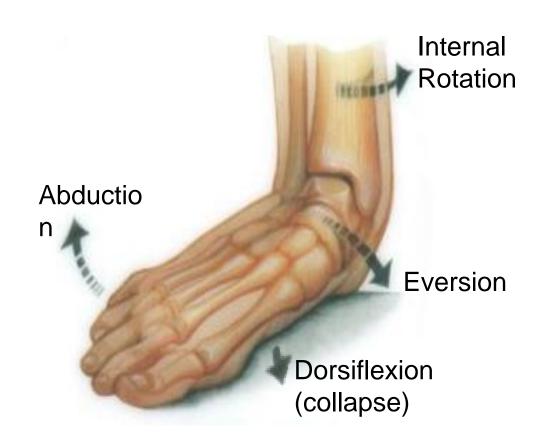
Foot Mechanics



Footwear Prescription



Foot Mechanics



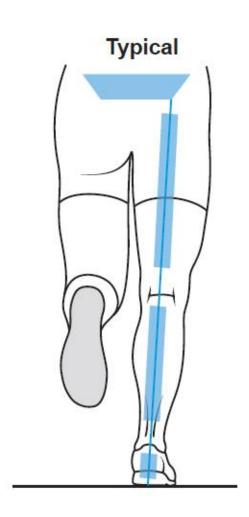
Rearfoot Eversion

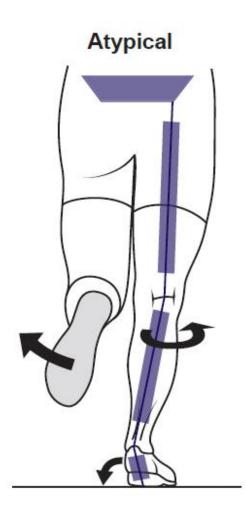
Strong predictor of free moment

(Macdonald, 2013)



Foot-Shank Coupled Motion





Summary

- Torsional forces should be considered for PFPS pain and symptoms
 - Research to support this clinical hypothesis and measurements (Noehren et al. 2010; Ferber et al. 2010; Ferber et al., 2014)
- Objective assessment to determine root cause of injury
- Treatment based on the data

What can we conclude from this?

- Evidence-based approach necessary to understand pathomechanics
- Optimal treatment based on current literature
- "Running Mechanics and Gait Analysis"
 - >260 references
 - 33 video clips



Thank you!





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