

**Taking the Run out of Running:
Cross-training and Fitness for
the Runner**

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Disclosures

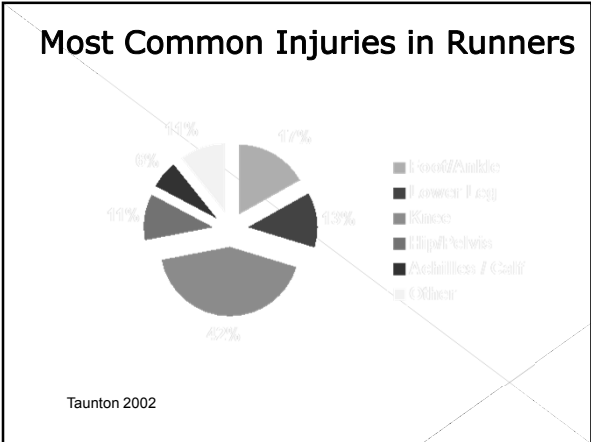
- ⦿ No relevant financial relationships exist

Objectives

- ⦿ Identify common risk factors for lower extremity overuse injuries in runners
- ⦿ Understand the glute progression algorithm
- ⦿ Understand the Runners quick-8 exercise program
- ⦿ Understand the XTR (cross training for runners) program

Running Injuries

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**Risk Factors for Lower
Extremity Overuse
Injury in Runners**

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Best Evidence of Injury in Runners

- History of Injury
- Weekly Mileage, patterns of increase
- Lower Extremity Movement Patterns
- Q Angle
- Impact Forces
- Body Mass Index

Taunton 2003; Marti 1988; Macera 1989
 Macera 1989; Walter 1989; Brill 1995; Lysholm 1987; Jacobs 1996
 Ryan 2009; McCrory 1999; Donoghue 2008; Yates 2005; Warren 1990
 Hamill 1999; Heiderscheit 2002; Hubert 1984; Powers 2010
 Messier 1991; Rauh 2006
 Ferber 2002; Hreljac 2004; Gerlach 2005

Why Cross Train?

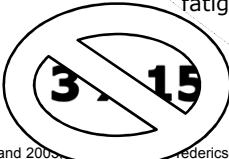
Strength / Endurance / NM Control

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Can We Stop the Injuries?!

- History of Injury
- **Weekly Mileage, patterns of increase**
- **Lower Extremity Movement Patterns**
- Q Angle
- Body Mass Index
- **Impact Forces**

Strengthening (hip)	Endurance
<ul style="list-style-type: none"> • Decreases Injury • Resolves ITBS, PFPS 	<ul style="list-style-type: none"> • Movement abnormalities ↑ with fatigue



Leetun 2004; Ireland 2005; Fredericson 2000; Dierks 2008; Powers 2003, 2010; Noehren 2007


Need to get Runner Buy-In?

No Purchase Necessary

- ↑ economy in distance runners
- ↑ VO₂ max
- Core strength program ↓ 5K time

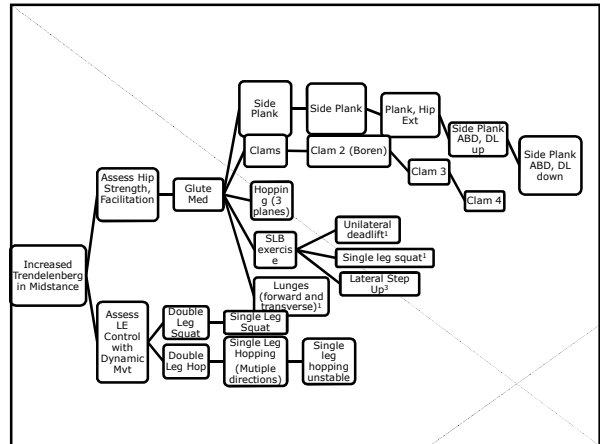
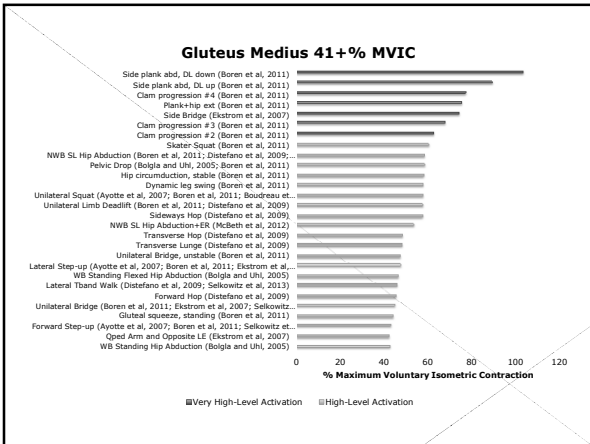
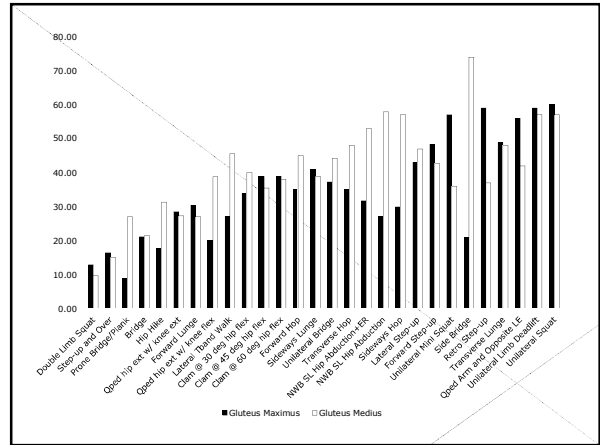
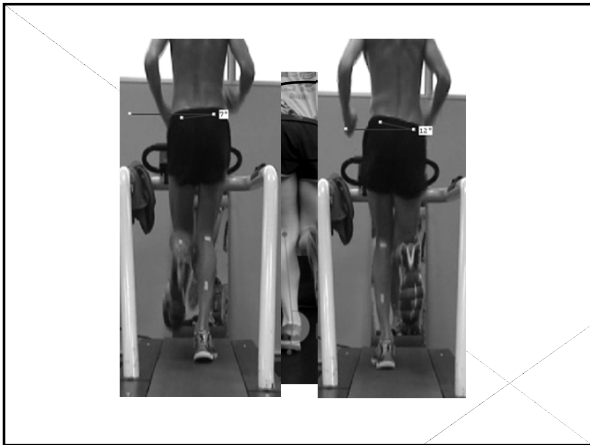
Sato 2009
 Stkren 2008; Millet 2002

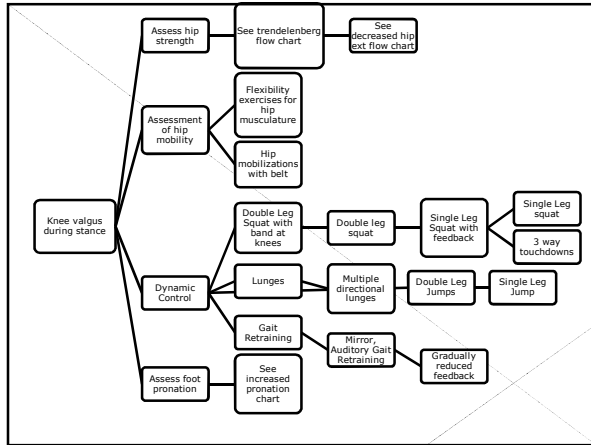
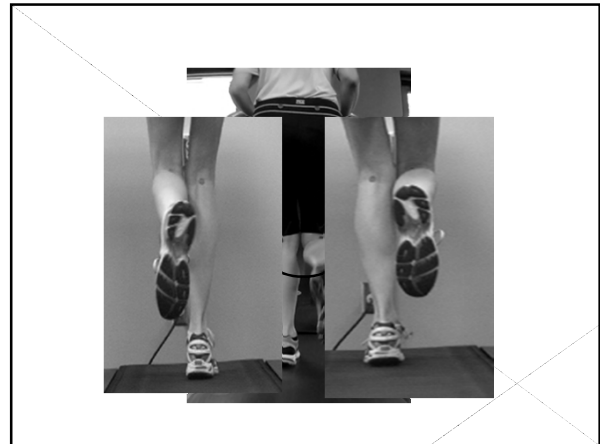
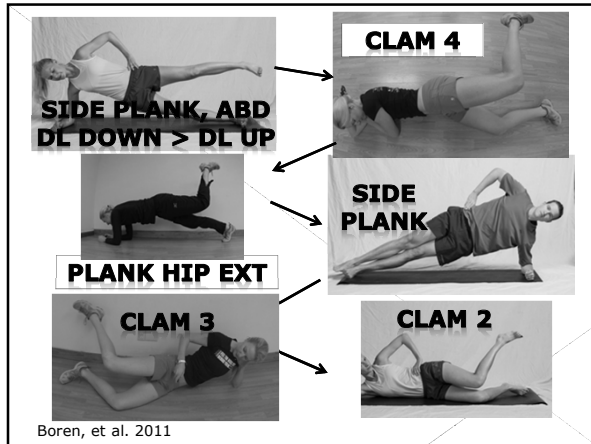
How to Choose Intervention



Runner-Specific Algorithms

- What dysfunctional movements do you commonly see?
- How do you choose interventions?





Gait Retraining

- Visual and Auditory FB
- Reduced pain
- Improved mechanics
- Gradually reduced FB

Impact

- Cadence (5-10%)
- "Hip Flexion Drive"

Willy, et al 2012, 2013; Hunter, et al. 2013; Noehren, et al 2011; Schmitz, et al. 2014; Heiderscheit, et al

Gait Retraining – ITBS

- "keep the knee pointing forward"
- "reduce the arm swing"
- "keep the foot pointing forward"

Willy, et al 2012, 2013; Hunter, et al. 2013; Noehren, et al 2011; Schmitz, et al. 2014; Heiderscheit, et al

Gait Retraining – Ant Knee

- "Knees Out"
- "Knee caps pointed straight ahead"
- "Squeeze buttocks"

Glute Run! Try It

Willy, et al 2012, 2013; Hunter, et al. 2013; Noehren, et al 2011; Schmitz, et al. 2014; Heiderscheit, et al

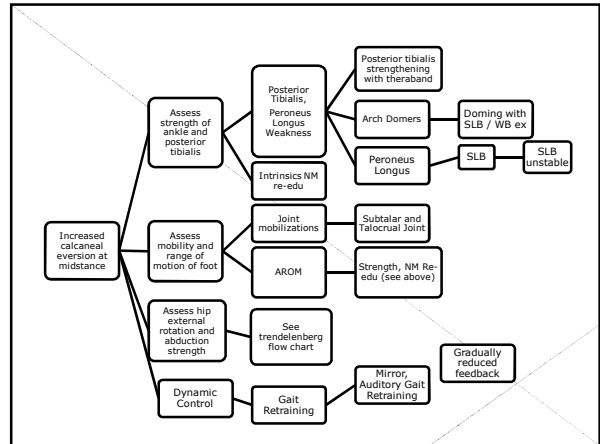
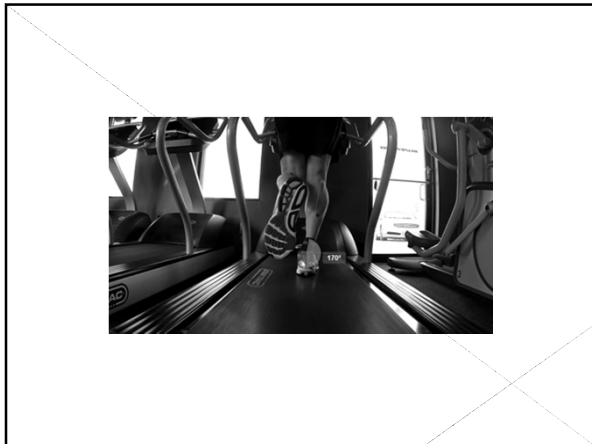
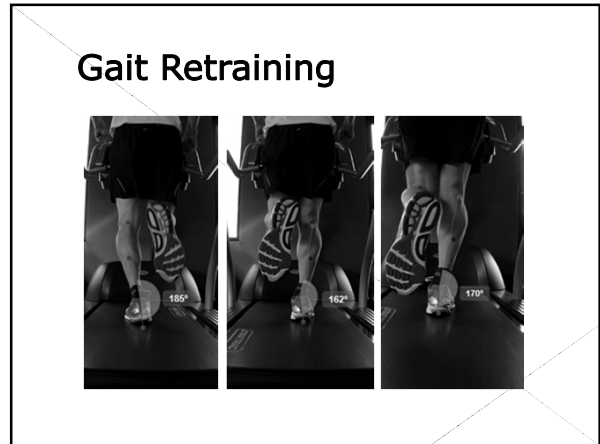
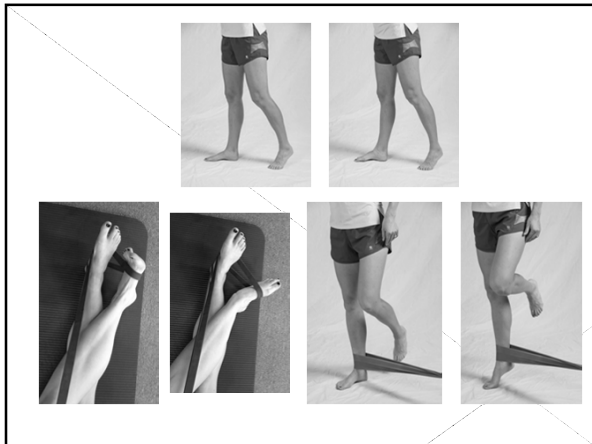
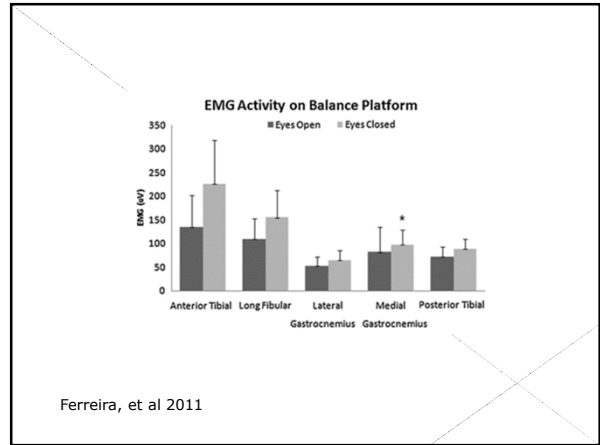


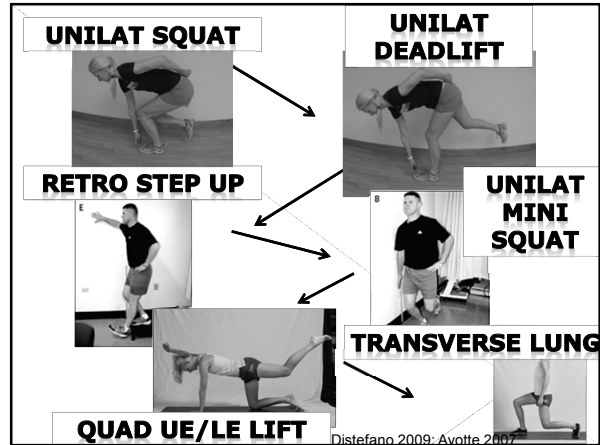
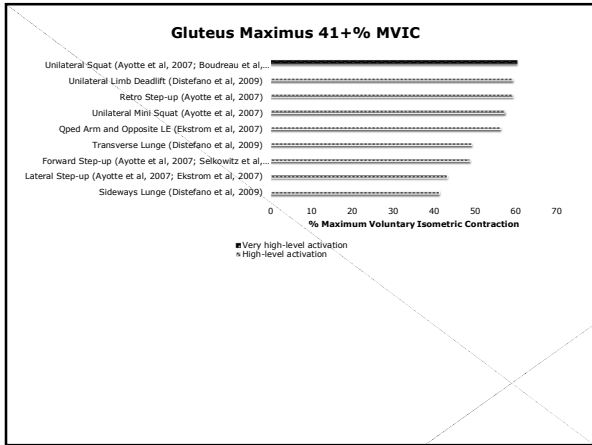
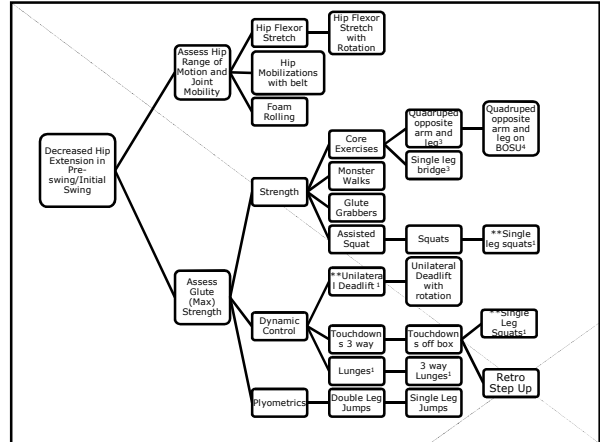
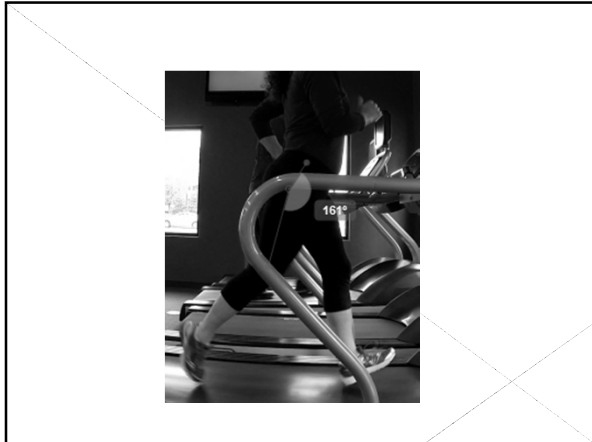
TABLE 1 DESCRIPTIVE STATISTICS FOR MUSCLE ACTIVATION LEVELS FOR 8 EXERCISES PERFORMED ON 2 BALANCE PLATFORMS*

Muscle/Exercise	Compliant Surface	Rigid Surface
Tibialis lunge		
Forward lunge	8.2 ± 1.1 (0.9, 10.5)	10.6 ± 1.2 (8.1, 13.1)
Side lunge	10.6 ± 1.4 (8.2, 13.0)	10.1 ± 1.6 (8.0, 12.3)
Single leg stance	10.5 ± 1.4 (8.1, 12.9)	10.1 ± 1.6 (8.0, 12.3)
Step		
Tibialis anterior		
Forward lunge	14.9 ± 1.4 (12.5, 17.3)	12.8 ± 1.3 (10.5, 15.1)
Side lunge	22.7 ± 2.3 (18.4, 28.0)	25.1 ± 2.4 (20, 30.2)
Single leg stance	19.6 ± 2.1 (15.3, 23.9)	14.2 ± 1.7 (10.6, 17.7)
Single leg squat	28.1 ± 3.8 (20.3, 36.0)	26.1 ± 3.6 (18.5, 33.7)
Medial gastrocnemius		
Forward lunge	5.3 ± 0.8 (3.6, 6.9)	6.3 ± 0.8 (4.6, 7.9)
Side lunge	4.1 ± 0.5 (3.1, 5.2)	4.5 ± 0.6 (3.1, 5.8)
Single leg stance	18.1 ± 1.5 (17.7, 18.5)	26.3 ± 1.9 (22, 31.4)
Single leg squat	17.1 ± 1.9 (11, 23.2)	17.7 ± 1.9 (12, 23.2)

*n = 23. Values are mean ± SD (95% confidence interval) percent maximum voluntary isometric contraction.

Harpur, et al. 2013;





Not "only" Strength

- Must also address
 - > **Proximal Motor Control**
 - > **Neuromuscular Facilitation**
 - > **Proprioception**
 - > **Gait Retraining**

Zech 2009, 2011; Noehren 2011; Willy 2011

Algorithm Summary

Runners get injured. A lot.

Intervention based on gait analysis
 Best running – specific ex with max MVIC

Thank you!

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Core

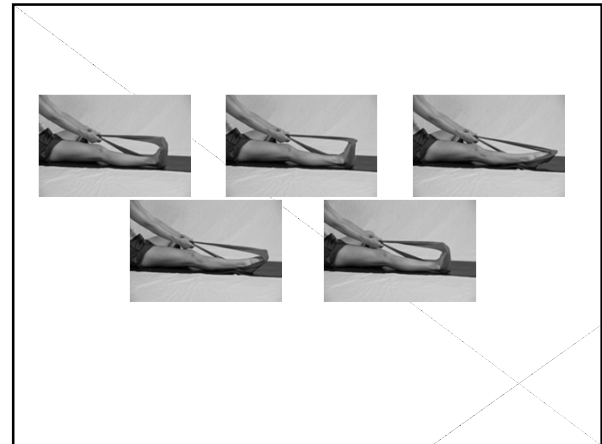
- Test and Control Groups
- Runners in marathon training
- 4 sessions of 5 core exercises
- 6 weeks
- Pre- and post- 5000m time trial
- Crunch on Stability Ball
- Back extension on Stability Ball
- Supine UE/LE lift (dead bug)
- Hip raise on Stability Ball (bridge)
- Russian Twist on Stability Ball

● Results:

- > No change in GRF or SEBT
- > Significant reduction in 5000m time

	Experimental group, n = 12	Control group, n = 8
Pretraining (mins)	29:29 \pm 2:38	26:30 \pm 1:59
Posttraining (mins)	28:42 \pm 2:23	26:13 \pm 1:54
Difference (pre-post)	-0:47	-0:17

Sato 2009



Impact Factors in Runners

External

- Running Speed
- Shoe
- Surface properties and gradient

Internal

- Body Mass
- Touchdown kinematics
- Kinematics throughout gait cycle

Heiderscheit 2011,2012