Injury Prevention Strategies for Shin Splints

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Overview and Objectives

- Review shin splints and associated biomechanical risk factors
- Understand the force length relationship and how joint angles contribute to force production in muscle
- Know how to train the athlete that is prone to shin splints

What are *shin splints*?

- Shin splints
- Medial Shin Pain
- Exercise Induced Leg Pain
- Tibial Stress Syndrome
- Stress Fracture
- Compartment Syndrome
- Anterior Tibial Stress Syndrome
- Medial Tibial Stress Syndrome

Definition of MTSS

- Exercise induced pain on the posteromedial border of the distal two thirds of the tibia (Moen et al., 2012)

- Very common occurring as much as 35% in active populations (Yates & White, 2004)

The Problem

- Chronic injury
- Treatment is ineffective
- Athletes loose training and competition time
- Mental burn out

Running Mechanics

Biomechanical Risk Factors

- Low physical fitness/ high BMI (Yagi et al., 2013)
- Muscle imbalance/weakness (Yuksel et al., 2011; Madeley, Munteanu, & Bonanno, 2006)
- Previous history of MTSS or stress fracture (Hubbard et al., 2009)
- Increased magnitude of pronation (Moen et al., 2012a; Raissi et al., 2009; Rathleff et al., 2012; Sharma et al., 2011; and Yates & White, 2004; Ostrom unpublished, 2015)

Hypotheses about pronation

- Pronation = abduction, eversion, and dorsiflexion
- Pronation and MTSS are associated but underlying pathophysiology is unclear (no causation yet)
- Muscle traction (Stickley et al., 2009)
- Compressive/ torsional forces on tibia (Moen et al., 2009)
  - Abnormal Bone Scans (Magnusson et al., 2001)

Other Biomechanical Risk Factors

- Li (1990) Impact forces related to heel strike velocities and shank/knee angle are related to magnitude and direction of ground reaction forces

- Lieberman et al. (2010) Ground reaction forces and heel strike versus toe strike

Muscle Mechanics

Muscle Mechanics

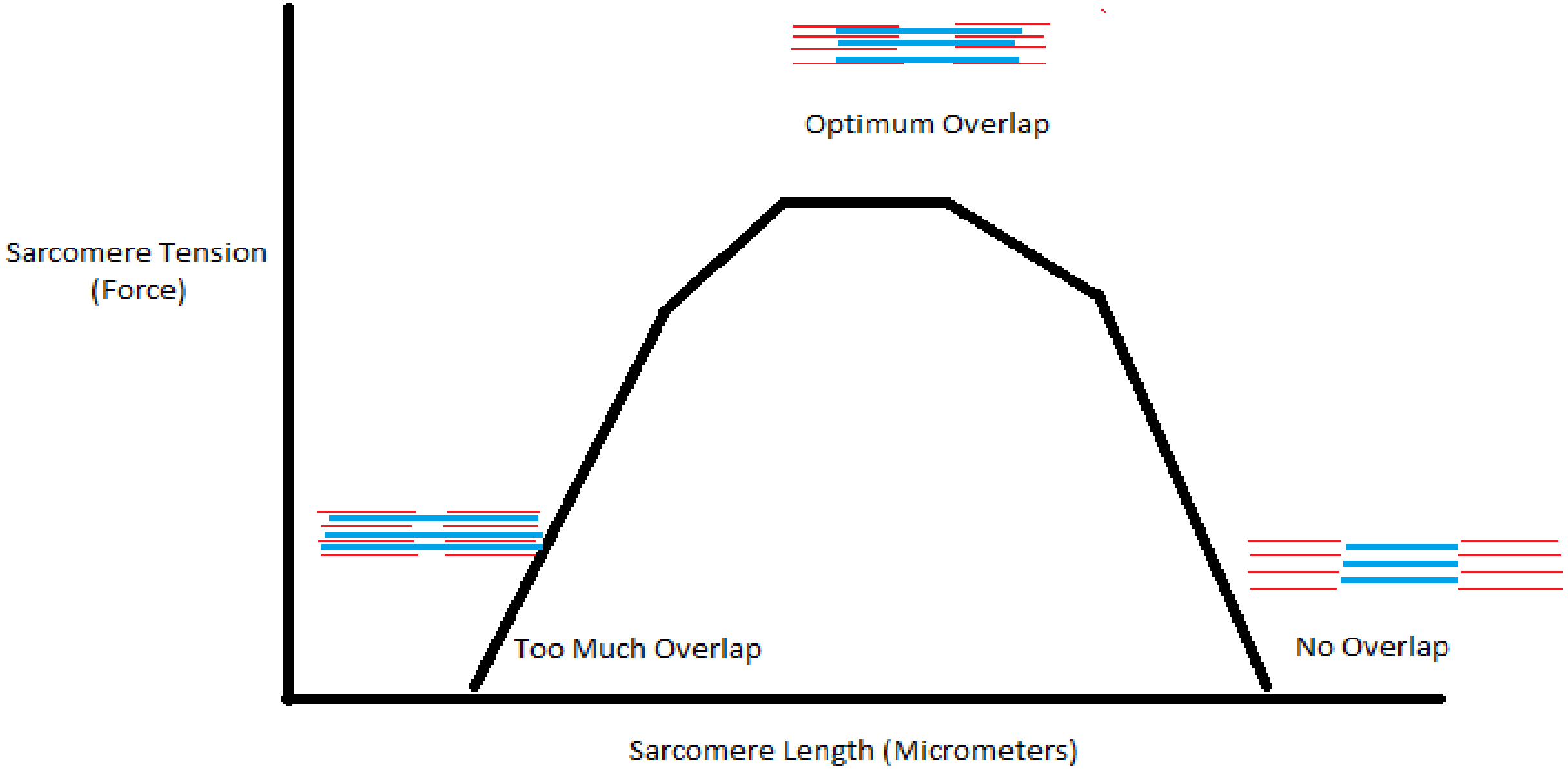
- Motors (overcoming inertia- concentric contractions)
- Brakes (resisting inertia-eccentric contractions)
- Struts (resist compressive force- isometric contractions)
- Springs (store and return elastic energy- burst contractions)

How should we use our lower leg muscles during running?

- Struts and springs are more efficient (Ryschon et al., 1997; Sano et al., 2013)

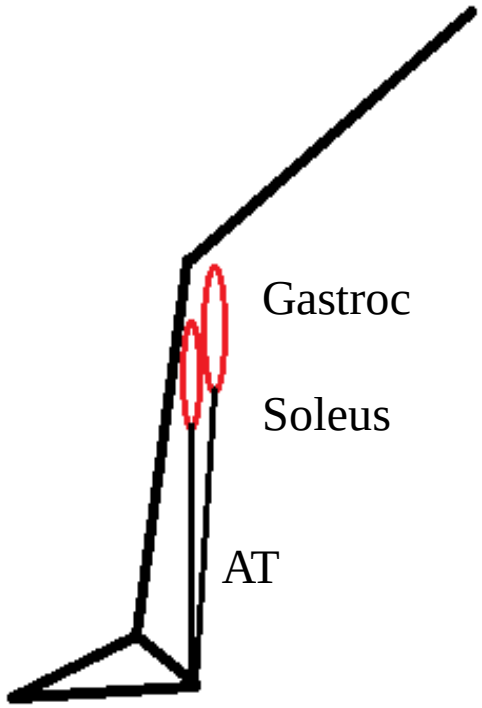
- Isometric contractions (in lower leg)
  - Metabolically more efficient
  - Muscle tendon unit can store and release elastic energy

- MTSS and pronation

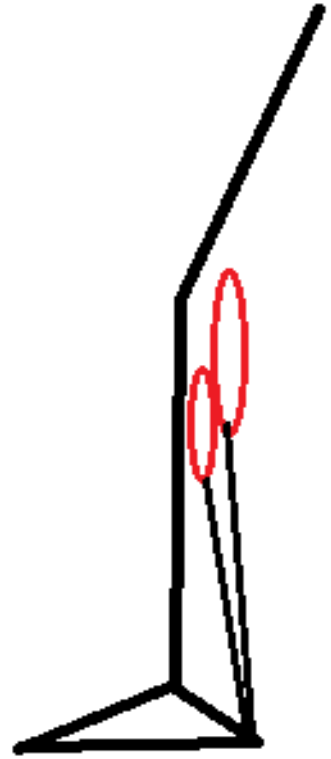

Optimum Overlap
Sarcomere Tension
(Force)
Too Much Overlap
No Overlap
Sarcomere Length (Micrometers)

Joint Angle and Force Length Curve

KNEE ANGLE ~145 DEGREES



KNEE ANGLE ~160 DEGREES



Prevention

- Prevention is key because once they have MTSS it is extremely difficult to treat

- How?

Gait Re-training

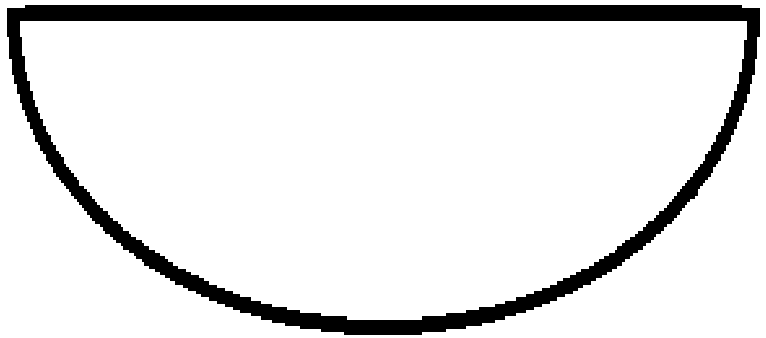
- Utilizing over pronation as a measure to identify at risk athletes and **begin preventative training before symptoms occur**!
(Sharma et al., 2014)

Coaching Cues

- Good posture
- Neutral hip position
- Foot strike- just behind the ball of the foot

Foot Strike

- Correct position loads muscle tendon units linearly allowing MTUs to “catch” the load



- Puts the athlete in a better position to take advantage of elastic recoil

- Reduces unwanted movement

Exercise Protocol

- Progressive loading
- Static to dynamic
- Balance and coordination
- Re-learning simple running drills (reinforce cues)

Specific Exercises

STATIC

- Single leg balancing task
- Balancing on Dynadisc (or Bosu)
- Isometric calf contractions (on step or ledge)
- Weighted isometric calf contractions
- Toe grabs/ lean forward

DYNAMIC

- Toe taps
- Ankle pumps (theraband)
- Jump rope
- Speed ladder
- **Single Leg Squats**
- Core strengthening

Conclusion

- Athletes with MTSS display larger magnitudes of pronation
- Pronation may reduce their ability to use their muscles as struts and springs
- Utilizing coaching cues with exercises can reduce an athletes risk

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