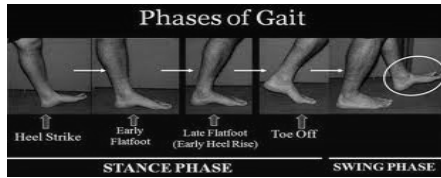




## Gait Biomechanics

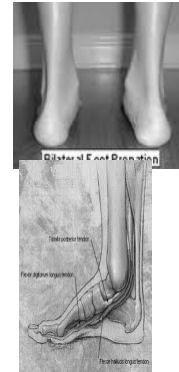
- 4 phases of gait
  - Heel Strike (supination) - Toe Off (supination)
  - Mid-stance (pronation) - Swing



- Heel Strike -Pronation -Mid-stance -Supination -Swing

## Pronation

- Very important—but too much is BAD
- Shock absorption
- Dissipates 300 mph of energy created from heel strike.
- Shin muscles control this motion.
- The million dollar question?
- Can the athlete control pronation with their own muscles?



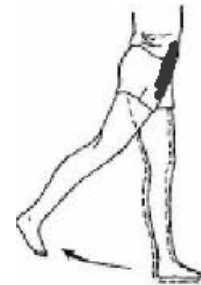
## Supination

- Rigid, High arch
- Prepares the foot for toe off and propulsion



## Hip Extension

- Allows for optimal use of Glute Max
  - Glute Max is most powerful muscle in the body
- Tight hip flexors (psaos, iliacus) prevent optimal use of the Glute Max.



## So what can go wrong?



## Injuries

- Hamstring Strain
- Shin Splints
- Plantar Fasciitis
- Ankle Sprains
- Shoulder... Rotator cuff, labrum

## Hamstring Strain

- Mostly overuse
  - Tight hip flexors → lack of Glute Max activity
- Quad dominate



## Hamstring Strain Prevention

- Balance Quad/Hamstring strength
- Stretch hip flexors (tri-planar)
- Eccentrically load of hamstring

## Shin Splints

Medial (inside)

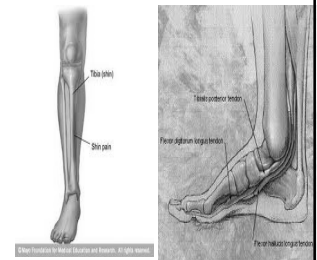
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Lateral (outside)



## Medial (Inside) Shin Splints

- Most common cause is from uncontrolled foot pronation (flat feet)
- Tibialis posterior muscle helps control pronation.



## Medial (Inside) Shin Splints Prevention

- #1 → proper shoes (addressed later)
  - May need orthotics
- #2 → proper shoes
- Short foot exercises
  - Ski jumpers
  - Rolling a towel with toes

## Lateral (Outside) Shin Splints

- Most common cause is from over supination of the foot.
- Tibialis Anterior gets fatigued trying to dissipate force.



### Lateral (Outside) Shin Splints Prevention

- #1 → Adjustments
- Proper shoes
- Active Release Technique (ART)

### Plantar Fasciitis

- Can occur in both over pronation and over supination feet.
- Tight calves



### Plantar Fasciitis Prevention

- Proper shoes
- Stretch Calfs (tri-planar)
- Tennis ball/golf ball roll
- ART works great

### Ankle Sprain

- Very common in over supination feet
  - 27,000 occur everyday
    - Orthopedic Research of Virginia
      - John F. Meyers M.D.
- Result from lack of dynamic ankle stability/balance.



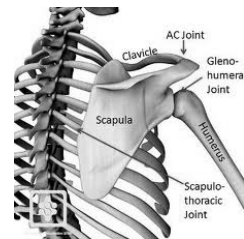
Image D:  
Over-Supination/High Arches

### Ankle Sprain Prevention

- #1 → need to have their foot adjusted
  - Keep it moving
- Proper shoes
- Balance training

### Shoulder...

- Non-traumatic shoulder injuries are almost exclusively because of poor scapula-thoracic stability.



## Shoulder

- Shooting a cannon off a surfboard?
- Shooting a cannon off a ship?



## Shoulder Injury Prevention

- Strengthen Serratus Anterior (boxers muscle)
  - No → push-up plus
  - Yes → functional training (eccentric)



## Finally, Shoes

- 3 types
  - Neutral
  - Stability
    - + Light
    - + Moderate
  - Motion Control

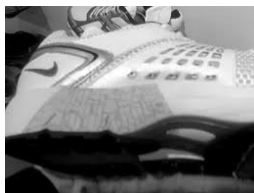
## Neutral

- No support
- Flat
- Used with over supination feet to allow for pronation



## Stability

- Used with over pronated feet
- Provides support to the foot



## Motion Control

- Most extreme form of support for the foot.
  - Before orthotic
- Used in excessive over pronation feet.



## Shoe Chart

\*Chart information provided by Dr. Brett Winchester

	Nike:	Brooks:	Asics: Nike:	Brooks: Nike:
	Mizuno: Nike:	Saucony: Nike:	Brooks: Nike:	Brooks: Nike:
	Nike:	Asics:		

## Take Home

- Head coach → CEO
- Delegate responsibilities
  - #1 → Find a functional doctor (DC, PT, ATC)
    - NO ONE is doing this!
    - Be careful, many are too focused
    - Get them to be on your team
  - #2 → Get your athletes in the right shoes

## My Goals with Athletes

- College scholarships
- District/State championships
- Teaching athletes what they can do to *help themselves* enhance performance and prevent injury.

## Thank you

- Questions?
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