“Born to Run”: A Biomechanical Analysis of Barefoot vs. Shod Running

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Outline

- The Biomechanics of Running
- Barefoot vs. Shod-Running
- Vibram Five-Finger Shoes
- Injuries
- Recommendations

Biomechanics of Running

- The Gait Cycle
  - Basic unit of measurement in gait analysis

Biomechanics of Running

- Two periods of double float
  - Neither foot is in contact with the ground
Running has been described as “essentially a series of collisions with the ground” (McMahon and Greene 1979)

Kinematics & Rearfoot Motions

- **Transverse Plane**
  - Pronation/Supination

  - **Pronation**
    1. Initial contact with lateral portion of the heel
    2. Rolling inward of the foot (pronation)
    3. Foot rolls slightly outward (supination)

  - **Supination**

Normal Pronator

- Heel-Toe Runner:
  - 1. Initial contact with lateral portion of the heel
  - 2. Rolling inward of the foot (pronation)
  - 3. Foot rolls slightly outward (supination)

- Pronation is a NORMAL foot movement

Underpronator -or- Supinator

- Typical in runners with higher arches
- Check the wear on shoes:
  - Wear on the lateral portion of the heel and toes

Vertical Ground Reaction Force
Overpronator

- Common in people with low to flat arches
- Wear of shoes on the first toe

Heel Striking Pattern

- Shoes:
  - Comfortable
  - Stable
  - Thicker cushion
- Heel pad
- Impact-large force

Midfoot Striking

- Foot and heel landing
- Continuum
  - Center of pressure
  - Stiffness in ankles/knees
  - Little impact
  - Impact transient
  - Forces distributed

Forefoot Striking

- Most common
- Minimal impact
- Avoid large force

Barefoot vs. Shod Running
Kinetics of Barefoot Running

- Effective mass at impact
- Change in velocity at impact
- Conversion of vertical momentum at impact
- Impact forces

Impact Force

Vibram Five-Finger Shoes

- Uses
- Promises/benefits
  - Decrease chronic injury

Injuries- Shod

- Research is lacking
- Acute
  - Ankle sprains
  - Stress fractures
  - Blisters
- Chronic
  - Plantar fasciitis
  - Achilles tendonitis
  - MTSS

Injuries- Barefoot

- Heel injuries
- Plantar fasciitis
- Cuts and abrasions
- Reduces the likelihood of knee pain and other chronic pain

Recommendations

- More empirical evidence needed for evidence based practice
- Progression
- Educate athletes
Questions?

Thank you to Gallagher Fitness Resources in Salem, OR

References

- Gallagher Fitness Resources
  1. 135 Commercial Street Northeast
  2. Salem, OR 97301-3402