The Running Atlas: A Literature Review of Running Form and Technique

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Honors Capstone
Overview

Purpose: To examine how the musculature, nervous, and skeletal systems coordinate to produce an economical running technique.

• Technique
• Improving Technique
• Common injuries associated with running
• Footwear
Running Technique: Upper Body

- Head neutral, aligned with spinal column, and eyes facing forward
- Shoulders relaxed
- Arms fall slightly inside of shoulders WITHOUT crossing the midline of the body
  - Some rotation in thoracic column necessary to allow for adequate arm swing
  - Decreased thoracic mobility/pelvic instability = chicken wings
- Uncoordinated arm swing may promote uncoordinated movements in kinetic chain
  - Pelvic and core instability
  - Altered lower leg kinematics
- Arm swing acts as mass dampener
  - Decrease shoulder and head rotation
Running Technique: Torso, Hips, and Knees

• Torso neutral, slightly leaned forward
  o Accurate foot placement

• Hips are the center of mass
  o Excessive spinal flexion/extension causes the pelvis to tilt causing extra pressure on lumbar spine

• Pelvis remain relatively neutral, some rotation necessary

• Knee= hinge joint within minimal rotation
  o Very stable joint
  o Knee valgus common error
Running Technique: Striking Patterns

- Heel strike
- Midfoot strike
- Forefoot strike

Different Foot Strike Patterns
Running Technique: Striking Patterns

- **Heel Strike**: heel makes initial contact with ground
  - Most common
  - Greater dorsiflexion = greater concentric anterior tibialis activation
  - May have greater forces on joints
- **Midfoot Strike**: weight of load carried over medial aspect of foot
  - Shin perpendicular to the ground
  - Load is able to dissipate over entire foot
  - Energy in Achilles more usable
- **Forefront Strike**: ball of the foot makes initial contact
  - Sprinters
  - Barefoot running
Running Technique: Gait Cycle and pacing

https://www.youtube.com/watch?v=1Pqpp3Qu2uo
Improving Technique: Core and Postural Stabilization

**Transverse abdominis**
Located under the obliques, it is the deepest of the abdominal muscles and wraps around your spine for protection and stability.

**External abdominal oblique**
Located on the side and front of the abdomen.

**Rectus abdominis**
Located along the front of the abdomen, this is the most well-known abdominal. Often referred to as the “six pack.”

**Internal abdominal oblique**
Located under the external obliques, running in the opposite direction.
Improving Technique: Core and Postural Stabilization

Postural Stabilization: integration of information from visual, somatosensory, vestibular, and musculoskeletal systems to maintain the body’s position in space (Alberts et al., 2015).

Postural and Core Stabilization:

• Aids in decreasing extra movements
• Effects the swing of the pendulum
  o Alters the center of mass
• Increasing sedentary lifestyles= core instability
Improving Technique: Valgus Collapse

• Adducted and internally rotated
• May be more prevalent in women due to hip alignment, however, still common in men as well
• Pain on medial and lateral sides not uncommon
  o Medial side expanded, lateral side compressed
• Caused by:
  o Weak hip abductors, uncoordinated hip abductors and adductors
• Strengthening abductors and improving core and postural stabilization will help decrease knee valgus
Common Injuries

- **Plantar Fasciitis**
  - Inflammation in plantar fascia
  - Pain with dorsiflexion, heel pain

- **Achilles Tendonitis**
  - Acute inflammation in Achilles tendon

- **Iliotibial Band Syndrome**
  - Effects lateral side of leg
  - Irritated structures from repeated flexion and extension
    - Impingement zone

**Cause:** Multifactorial

**Treatment:** See a professional
Footwear: pronation and supination

- Pronated
  - (right foot)

- Normal
  - (right foot)

- Supinated
  - (right foot)
Footwear: pronation and supination

- Pronation is a NORMAL movement, but OVERPRONATION may increase risk of injury
- Pronation allows arch to drop, contour to the ground, and absorb shock
  - Pes Planus = flat foot
    - Excessive arch drop
    - Consider each INDIVIDUAL’s foot characteristic: Is the arch normally always flat, even when non-weight bearing? Or does the arch collapse only when weight bearing?
- GENERAL shoe recommendations:
  - Overpronation/low arch: motion control shoe
  - Under-pronates/high arch: cushioned shoe
Footwear: Barefoot/minimalist
Footwear: minimalist

- Minimal amount of coverage
  - Barefoot toe drop= zero
- Limited research
  - Possible association of different injury types and rates
- GRADUAL and CONSERVATIVE transition plan!
  - Different kinematics associated with barefoot running
  - 10%-15% rule, lower leg strengthening, pelvic/core stabilization, switching between traditional and minimalist shoes
Conclusion

• Proper running form can help economy and reduce the risk of injuries
  o Postural stabilization, arm swing, foot strike pattern, foot alignment

• The cause of overuse injuries is often times multifactorial
  o Best treatment option: See a professional

• A shoe does not make a runner, but can help aid with form based on an individual’s foot characteristics.
Questions?


Gonser, S. (2013, October 15). How should my foot land when running. [video file].


References

Images