

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

**Sharron Davis with Gretchen Sewczak-Claude PT, DPT
Honors Capstone**

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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

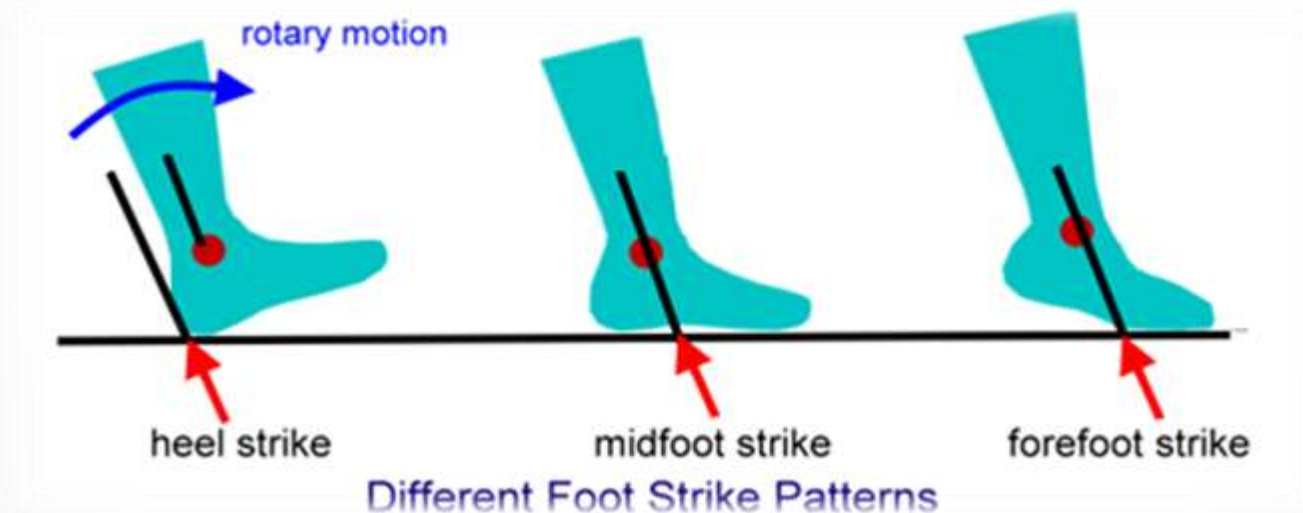
Running Technique: Upper Body

- 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
 - Accurate foot placement
- Hips are the center of mass
 - 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
 - Very stable joint
 - Knee valgus common error

Running Technique: Striking Patterns



Running Technique: Striking Patterns

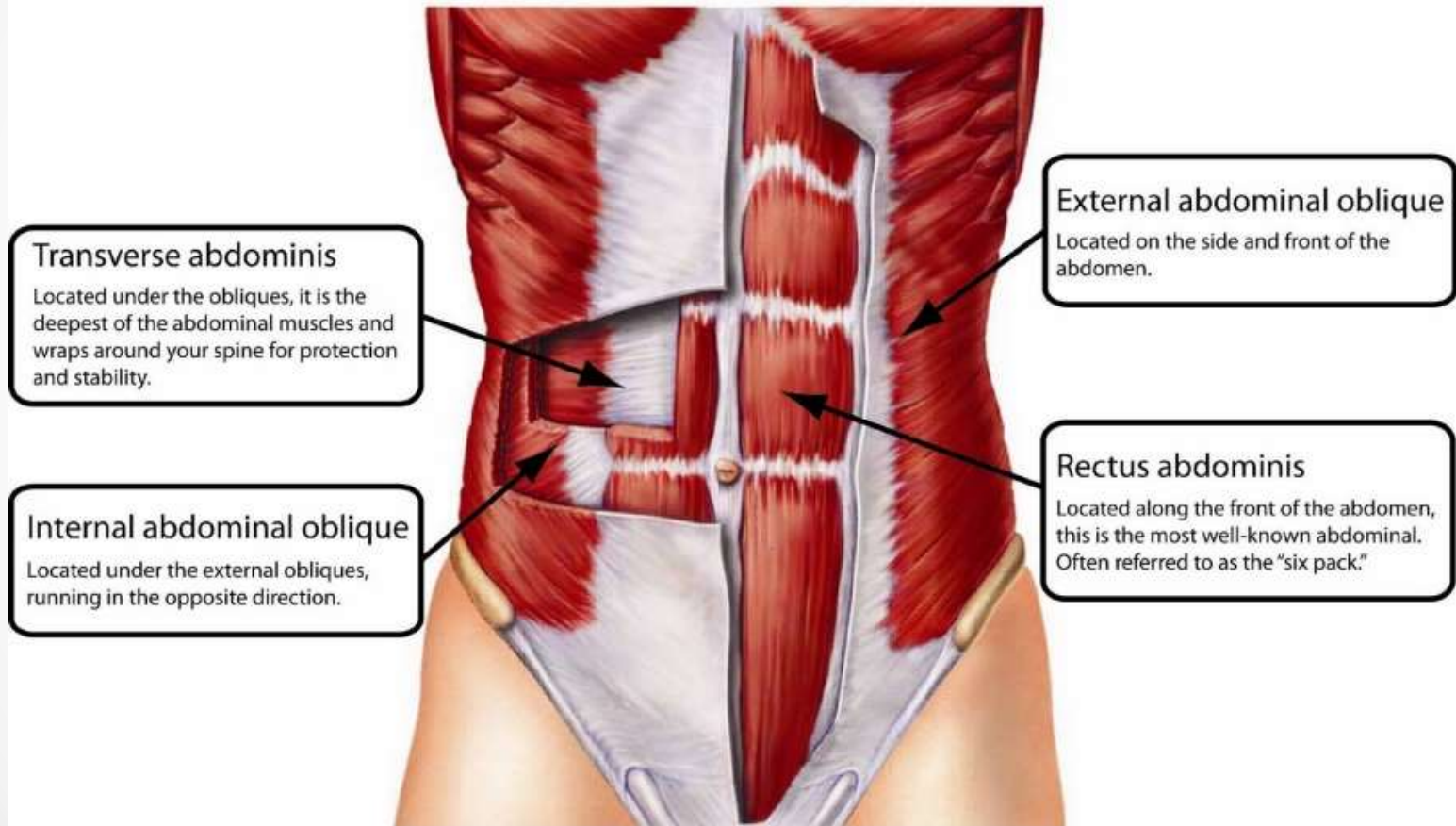
- **Heel Strike:** heel makes initial contact with ground
 - Most common
 - Greater dorsiflexion= greater concentric anterior tibialis activation
 - May have greater forces on joints
- **Midfoot Strike:** weight of load carried over medial aspect of foot
 - Shin perpendicular to the ground
 - Load is 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



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
 - 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
 - Medial side expanded, lateral side compressed
- Caused by:
 - Weak hip abductors, uncoordinated hip abductors and adductors
- Strengthening abductors and improving core and postural stabilization will help decrease knee valgus

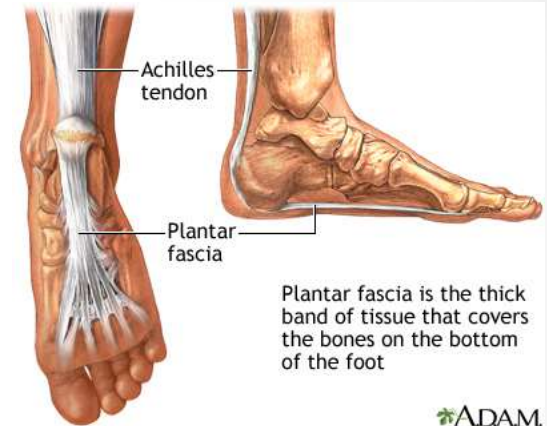


Common Injuries

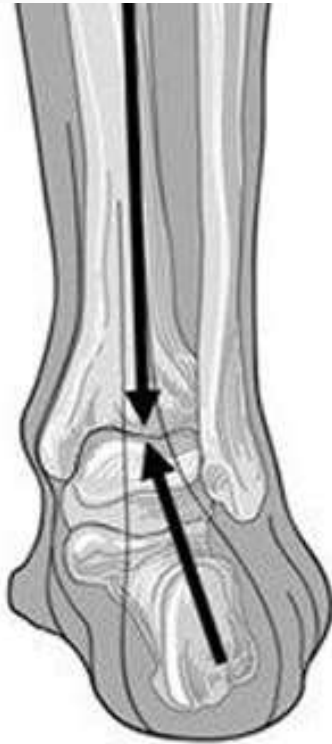
- **Plantar Fasciitis**
 - Inflammation in plantar fascia
 - Pain with dorsiflexion, heel pain
- **Achilles Tendonitis**
 - Acute inflammation in Achilles tendon
- **Iliotibial Band Syndrome**
 - Effects lateral side of leg
 - Irritated structures from repeated flexion and extension
 - Impingement zone

Cause: Multifactorial

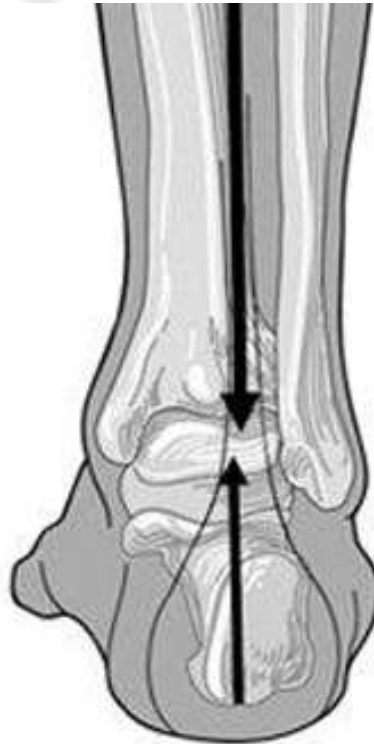
Treatment: See a professional



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
 - Postural stabilization, arm swing, foot strike pattern, foot alignment
- The cause of overuse injuries is often times multifactorial
 - 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?



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