

Running Biomechanics

The goal is to run with the most efficient running pattern.

The Spine and Neck:

- The efficiency of limb movement is the product of good spinal control. Unequal rotation through the spine will cause compensation at some other level of the body.
- Maintain an upright position—don't round through the thoracic spine.
- Chin tucked in. Don't let the chin poke forward. Ears over shoulders. Keep your position relaxed.

The Shoulders, Elbows and Hands:

- Keep shoulder down and scapulae retracted.
- Elbows bent to 90 degrees. Don't move through this joint like a bicep curl. Move through a motion about the shoulder like drawing a gun from a holster.
- Avoid rotational motions across the body. Keep the elbows close to your body to avoid excessive rotation.
- Keep thumbs resting gently

on the index finger. Imagine gripping an egg to avoid a tight grip. Tight grip increase your heart rate and will give you a false perception of running at a higher intensity.

The Lower Half:

- Don't run on your toes. Foot placement when contacting the ground should occur directly under the hip or just slightly in front of the hip.
- Tight calf muscles, quads and hips will lead to an early toe off and a shorter stride.
- Knee should bend to approximately 100 degrees when driving the leg through on the swing phase. This will vary depending on your speed.
- Hip should bend to approximately 45 degrees when during the leg through on the swing phase.
- The pelvis should maintain a level position during the entire running cycle. Excessive pelvic dropping increases the weight bearing load on the foot, knee, hip and excessive rotation of the spine.
- Avoid lumbar hyperextension when extending the hip.

- Don't lean forward when extending your leg, this is a sign of tight hips.
- Don't over stride or under stride – both cost energy.

Stride Rate:

- Greater than 88 foot strikes per minute is ideal. Increasing your stride rate will improve your efficiency but doing so without over striding.
- **Minimize your vertical motion** – you want to move forward, not up and down. Skipping rope is a very effective exercise to train your body to get off the ground quickly while minimize your vertical motion.
- **Minimize the sound that you make when you impact.** A quiet runner will have less resistance from the ground. Less resistance means less energy needed to propel yourself forward.
- Use a video camera to see if you can find any faults in your pattern.

Strong yet flexible muscles are the key to an optimal running pattern.

Getting Started

Running

Training Guide



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Common Injuries



Plantar Fasciitis:

*Pain to the bottom of the foot
Tightening of the plantar fascia
(connective tissue)*

Causes:

Inadequate arch support in the shoe
High torsion shoes on a hypermobile foot
Over use – too much, too soon
Stiff ankle- lack of dorsiflexion

Prevention and Treatment:

Rest, ice, gentle stretching, physio, modify activities, proper footwear, sound training schedule

Iliotibial Band Syndrome:

Pain to the lower lateral leg and/or outside portion of the knee or hip

Causes:

Poor footwear

Running on cambered tracks or streets
Not stretching – muscles becoming too tight
Overuse – lack of rest time or too much, too soon
Weakness of the knee and hip stabilizers, weak core abs

Prevention and Treatment:

Rest, ice, stretching, modify activities, physio, proper footwear, cross training and strengthening, hip and core strengthening

Achilles Tendonitis:

Pain, swelling and redness in the back of the ankle where the tendon attaches to the heel

Causes:

Loose heel support in the shoe
Excessive pronation and supination
Inadequate stretching
Overuse – too much, too soon
Too much hill and speed training
Weakness to the calf muscles
Inadequate warm-up

Prevention and Treatment:

Rest, ice, gentle stretching, modify activities, physio, proper footwear, sound training schedule, core and balance exercises

Shin Splints:

A common name for pain on the front of the shin.

Pain can be due to:

Muscular imbalance between the calf and shin muscles
Small stress fractures to the shin bone

(tibia)

Swelling to the compartment of muscles in the front of the leg
Poor running technique
Too much, too soon

Prevention and Treatment:

Rest, ice, gentle stretching, physio, modify activities, proper footwear, sound training schedule, strengthening and stabilization exercises.

Hamstring Strain:

Muscular injury to the back of the thigh

Causes:

Decreased flexibility
Decreased strength
Pelvic Malalignment
Fatigue
Poor hydration and nutrition
Improper warm-up and cool down

Prevention and Treatment:

RICE, stretching and strengthening exercises

Low Back Pain:

Causes:

Poor running biomechanics
Poor posture
Old Shoes
Muscular imbalance at the low back, hip, knee and foot
Too much rotation of the arm and trunk

Prevention and Treatment:

Improve running technique, practice postural correction daily, strengthening and stretching, don't over train.

Injury Prevention

- Ensure a proper warm up and stretch before your run to prepare your body for the run.
- Cool down with a 5 minute warm after run. Follow the cool down with static (30 seconds) stretch for all the major muscle groups.
- Incorporate strengthening and stabilization exercise into your exercise regime.
- Drink water before, during and after your run to ensure adequate hydration.
- Don't run too fast or too slow. Run at a pace that is comfortable for you. You should be able to carry on a light conversation as you run.
- Listen to your body. Take an extra rest day if needed. Don't progress on with the scheduled program if you are having difficulty. Repeat a session or two if needed to allow your body to adjust to the new activity of running.
- Train on the road if you are planning on running a road race. You need time to allow your body to get use to the impact of running on cement.
- Wear proper running shoes.

What do I do if I experience an injury??

RICE

Rest – take a break from running until the injury heals. Find other activity to perform to maintain your fitness level while allowing your injury to heal.

Ice - if there is heat, redness, swelling. 10 minutes on, 20 minutes off before reapplying the ice.

Compress – using a tensor bandage, gently apply the tensor around the area that is swollen. Don't wear it at night.

Elevate – elevate your limb above your heart to reduce swelling in the limb.

Consult professional advice (i.e. physio or doctor) if the injury is serious or does not respond to RICE. Don't wait!



Coaching TIPS:

- If you are starting to feel pain when running, check your shoes. They might be getting too old.
- Stretching dynamically BEFORE running to prepare your body for running motion. This means stretching with movement.

Did You KNOW:

- You can substitute a water running session without losing any of the benefit of your weekly runs. It is no impact and will help your body recover faster.