

SHIN SPLINT PREVENTION FOR DISTANCE RUNNERS



STRENGTH AND CONDITIONING

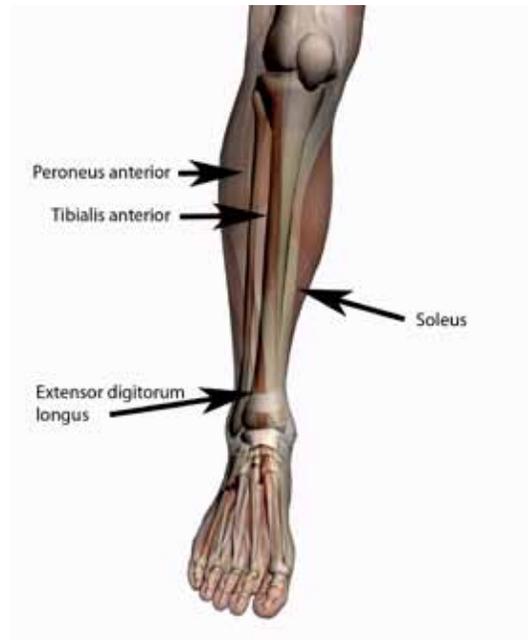
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SHIN SPLINT PREVENTION BASICS

WHAT ARE SHIN SPLINTS?

Before we get into the causes of shin splints, it might be a good idea to clarify exactly what shin splints are and what they aren't. In the past, shin splints was a generic term used to refer to virtually any pain or injury in the lower leg. They were loosely organized into one of several categories that described the location of the injury. The categories were called anterior (front of leg), posterior (back of leg), medial (inside of leg), and lateral (outside of leg).

Most athletes and many coaches still use the term "shin splints" when describing lower leg injuries, but health professionals no longer use the term because it is too vague. Shin splints are now separated into 4 categories. The current categories are: medial tibial stress syndrome, tibial periostitis, anterior compartment syndrome, and stress fractures.



MEDIAL TIBIAL STRESS SYNDROME

Medial tibial stress syndrome (MTSS) is the most common form of shin splints. Pain from this injury is located along the inner part of your lower leg. The posterior tibial muscle is located on the back of your lower leg bone. It wraps around the inner part of your ankle and attaches to the top of the arch of your foot. A primary function of this muscle is to support and hold up the arch of your foot. Each stride you take places stress on the tendons and connective tissues of this muscle. The stress travels up the muscle to its origin on the back/inside of your lower leg. This inside area of the muscle and attachments are where the pain of this injury is felt.

Excessive pronation (rolling inward of the foot) is a major risk factor for MTSS. When your foot pronates, this muscle must work harder to hold up the arch of your foot. In addition to excessive pronation, other risk factors include: heel striking, high arches, running on your toes, overtraining and running on slanted surfaces. Running on hard surfaces can also be a factor, but is not a common cause of this injury. Running on very soft surfaces, such as grass or sand, can actually be more of a factor because of the potential increase in pronation.

TIBIAL PERIOSTITIS

There is a covering of the lower leg bone called the periosteum. The impact of your foot striking a very hard running surface can irritate the front of your shin bones. This irritation can be transferred to the periosteum which results in pain and inflammation. The pain from this form of shin splints is usually felt on the front of your shin bone, directly under the skin. It usually starts about 3 inches above the ankle and extends up the bone for 2 to 3 inches. The primary risk factors for this injury are running on hard surfaces such as concrete, running with heavy, high impact strides and heel striking.

ANTERIOR COMPARTMENT SYNDROME

The muscles on the front of your lower leg are encased within a “compartment” made of membranous walls. As you exercise, these muscles can become enlarged as they swell with blood. The compartment resists this swelling and pressure builds up within the compartment. This restricts blood flow to the muscles, which results in pain. The pain is usually located on the front of the lower leg, just to the outside of the shin bone. The muscle usually involved is the tibialis anterior muscle, which is responsible for flexing or raising the front of your foot.

Risk factors include: overtraining, rapid increases in training volume, a small anterior compartment and running on hard surfaces. In addition, there are mechanical risk factors involved. Calf muscles that are too tight will cause the muscles on the front of your lower leg to work harder to flex your foot. That increases the stress put on them and increases the chance of suffering this injury. This added stress happens at two phases of your running stride. The first is at toe off. Immediately after toe off, your foot dorsi-flexes so that your toes will clear the ground during knee lift. The second is just before, during and just after foot contact. At this point, the anterior muscles are working to slow down and stop the downward motion of the front of your foot.

Runners that over stride or land heavily on their heels are especially vulnerable to this injury because the anterior muscles must work especially hard to stop the downward “slapping” motion of the front of the foot.

STRESS FRACTURES

Stress fractures are small cracks or micro fractures in the lower leg bone. These fractures are caused by the repetitive low grade impacts of running and other activities such as dancing and aerobics. A couple of theories have surfaced to explain why these fractures occur.

- **Overload Theory** – When muscles contract they pull and put stress on the areas in which they connect to the bone. This stress may cause the bone to “bend” slightly with each impact. It is thought that this repeated bending and straightening may cause the cracks to appear.
- **Fatigue Theory** – As muscles fatigue during exercise they become less efficient at supporting the bones, which is one of their functions. The decreased amount of support to the bones may be a cause of the stress fractures.

Pain from a stress fracture is usually localized to a small portion of the bone. This is op-

posed to other forms of shin splints which are more spread out. Diagnosis of a stress fracture should be confirmed with an X-Ray or a bone scan. If left untreated, a stress fracture can progress to a full fracture.

CAUSES OF SHIN SPLINTS

As you have seen, each of the four types of shin splints carry their own causes and symptoms. But these are only symptoms. What is really causing the epidemic of shin splints? I mentioned earlier that I believe the problem starts with lack of conditioning and over protective running shoes. I developed that opinion though many years of coaching and running, but does the scientific community agree with me? There isn't a lot of definitive information that points to a direct cause, but some recent studies back up the fact that lack of conditioning is a primary cause of MTSS.

The primary muscles involved in shin splints are your ankle dorsi flexors and plantar flexors. The primary purpose of these muscles are to move your foot away from (plantar flex) your shin and towards your shin (dorsi flex). That is not their only duty. They get involved in lateral ankle motions, rotary ankle motions, foot stabilization and also in preventing excessive pronation.

A study done at the Geelong Foot Clinic in Victoria, Australia, looked at the conditioning or endurance of the plantar flexor muscles. The researchers found that "...athletes with MTSS have endurance deficits of the ankle joint plantar flexor muscles, Rehabilitation of athletes with MTSS should comprise training designed to enhance endurance of the lower limb musculature, including the ankle joint plantar flexors."¹

How did this weakness of lower leg muscles come about in today's distance runners? I think it is at least partially caused by the highly marketed and over engineered modern running shoe. Today's shoe manufacturers are constantly pushing the latest shoe that provides tons of cushioning and completely supports your foot. That sounds great except for one rather critical thing. The shoes are so supportive they are like a cast on your foot. As a result, the muscles in your lower leg no longer have a job to do. They don't need to work as hard to stabilize your foot. They do less work during your running stride. So, your lower leg muscles get weaker and weaker. The result – a higher incidence of shin splints.

REVERSING THE TREND

So, how do you stop the shin splint epidemic? There is nothing you can do to completely prevent MTSS, but you certainly do something to reduce your chances of suffering from shin splints. If you strengthen your lower leg muscles and improve their endurance you have a great chance of eliminating this debilitating injury from your running life.

This shin splint prevention plan is designed to help you increase the injury resistance of your lower leg muscles and decrease your risk from MTSS. Note that this strength training plan focuses solely on prevention of MTSS and should be used in conjunction with your general running strength training program. This plan concentrates on lower leg and foot strengthening but also includes exercises for some secondary supporting muscles and motions.

In addition to this strength training and flexibility plan you should also focus on developing or maintaining proper running mechanics. Just a small inefficiency in your running stride can cause excessive, injury producing stress in your lower leg muscles.

¹ Endurance of the ankle joint plantar flexor muscles in athletes with medial tibial stress syndrome: a case-control study, Madeley LT, Munteanu SE, Bonanno DR, J Sci Med Sport 2007 Dec; 10(6):356-62

FOOT PLANT

One of the most important phases of running mechanics is the position of your foot when it lands on the ground. When your foot strikes the ground it will land either; toes first, ball of the foot first, flat footed or heel first. Many runners make the mistake of reaching out in front of their body and landing heel first. That type of foot plant is inefficient and can be the cause of a long list of injuries. When you land on your heel, your leg is straight and extended in front of your body. The combination of a straight leg and a hard heel landing transfers a lot of impact through your heel and up through your knee to your hip. The excessive stress a heel strike places on your joints can cause pain and injury to your hips, knee, ankle and foot. A heel first foot plant also means you are over striding. You are reaching out in front of your body with each step you take. When you reach out in front of your body, you will land heel first and will be putting on the brakes with each step. It is like trying to drive your car while pressing on both the gas pedal and brake pedal at the same time. You are wasting energy and making your training run harder than it should be. Landing toes first is not an efficient style for distance running. Toe first landings result in a lot of up and down motion and puts a lot of stress on the calf muscles. Toe running is more appropriate for sprinting than for distance running.

As a distance runner, your most efficient foot plant is one in which your foot lands directly under your hips or your center of gravity. You may land on the ball of your foot or flat footed. The ideal landing position is slightly toward the outside edge of your foot, just behind your little toe. Your foot would then naturally roll slightly inward while pushing off over your big toe. The slight inward roll of your foot is called pronation and provides some cushioning during the running stride. A small amount of pronation is normal and desirable, but excessive pronation can also be the cause of injury and stride inefficiencies. Excessive pronation can be prevented through the use of motion control shoes. That type of shoe has strong heel inserts that stop the inside rolling motion of pronation. While motion control shoes will temporarily solve the problem, it is like putting a band aid on a cut that will never heal. It solves the immediate problem but it not a long term cure. Pronation can be caused by weak muscles in your lower leg or stride inefficiencies. Doing some barefoot walking and running will help strengthen the ankle and foot stabilizing muscles in your lower leg. Doing exercises and drills on an unstable surface such as a wobble board or stabilization pads can also help with this problem. If you pronate severely I would suggest consulting with a physical therapist to find out if there are alternatives to motion control shoes in your specific case.

POSTURE

Years ago, when I was first learning how to run, I was taught to run with a very upright and straight posture. I was told not to lean forward or backward. Nearly every coach taught that same technique. They coached that way because it was the way they learned to run. I ran successfully using that technique in the early stages of my career but as I advanced to longer, more difficult training runs and higher levels of competition, that technique was no longer adequate. I began suffering from back pain and leg injuries. Running became more difficult and my enjoyment level plummeted. So, I made changes. If you watch world class runners on television, you will notice that they appear to run with no effort. They seem to be gliding smoothly along the road or track. I watched the most successful runners. Nearly all of them run with a straight and erect back, but they lean forward very slightly. This very slight forward lean gives them a completely balanced posture. Balance is the key word. You should always feel as if your upper body is in balance above your hips.

When you are standing still your upper body is very straight and balanced on top of your

hips. Go ahead and try this. Stand up and feel your body. Lean your body forward and backward. When you lean forward you begin to lose your balance in that direction. When you lean backward you feel your balance shift to your rear. Only when you are standing with a straight upper body do you feel in balance.

Now start to walk forward. When you begin to move shift your upper body very slightly forward. You are leaning into your movement. In a way when you walk you are actually falling forward and catching yourself with your legs. Running is the same. When you run you need to lean forward to keep your body balanced over your hips. If you kept your body straight your balance would be shifted to the rear of your body. You would not be able to continue the action of “falling forward”. You would have to reach out in front of your body and pull your legs back to create forward motion. That would make your running more difficult and inefficient.

The most efficient posture is one that is upright and relaxed with a slight forward lean. Your chest should be out and your shoulders back. If you lean too far forward you will begin a stumbling, high impact stride. You will also put excessive stress on your knees and back. A backward lean will cause you to over stride and land heavily on your heel, which will also stress your knees, hips and back. A visualization that may help is to imagine your hips and legs being a motor. You just want to keep your upper body balanced over your motor.

Keep your hips pressed forward and your butt tucked in. Visualize standing face first against a wall. Press your hips forward so that the bones of your hip touches the wall. Running with your hips forward will help your knee lift higher, with less effort.

Another common form error is called “sitting in the bucket”. This is especially common among beginning runners. This style is caused by the hip and butt being pushed back, into a slight sitting position. This causes your feet to be in front of your body with a very weak push off behind your body. Keeping your hips pressed forward will eliminate this form fault. Keep your body as relaxed as possible. Tense muscles will slow you down and force you to work harder. Concentrate on keeping your shoulders, jaw, torso and legs nice and loose.

STRIDE LENGTH

The most common form flaw I have observed in runners I have coached is over striding. Forcing a long stride length will not improve speed or running efficiency. Just the opposite happens. Over striding will result in reaching out in front of your body with your foot and landing heavily on your heel. This will cause the braking action that I mentioned earlier. In a proper stride, your foot should land directly under your body with every step. Concentrate on running with a quick and light stride. Your stride should be like a rotary motion with your foot landing directly under your center of gravity at the bottom of each cycle. Over striding is a form flaw, but in order to run as efficiently as possible, you must extend your stride to its maximum, without over striding.

You should increase your stride length by opening up your stride or making “bigger circles” with your feet and legs. Do not reach out with your forward foot, but allow the forward momentum of your body to “catch up” with your forward foot so that no braking action is initiated. Your forward foot should land directly under your body. If you reach out with the forward foot, you will land on your heel and initiate a braking action with each step. This will excessively stress your knees, hips and back, in addition to slowing you down.

STRIDE MECHANICS

All of your effort should be directed forward. There should be very little up and down motion. Runners that bounce or hop when they run are wasting energy. They are also putting exces-

sive stress on the knees, hip and back. You should feel as if you are gliding along. Imagine you are running with a beanbag on your head. If you bounce too much the beanbag will fall off.

Your stride should be quick and light. Visualize trying to sneak up on someone while you are running. Your steps should be light and quiet. If your steps are heavy and noisy, you are running with too much up and down motion, or are leaning forward too much.

You should not exaggerate your knee lift when running long distances. A high knee lift is much more important when sprinting or when running hard for the finish line. An exaggerated knee lift will require the use of too much energy to maintain for a long period of time. Knee lift is a very misunderstood term. Many believe that knee lift means to lift your knee straight up, which results in a bouncy, up and down motion which wastes a lot of energy. A proper knee lift should feel like you are driving your knee forward, not up. A forward knee drive will result in a low to the ground and efficient forward running motion.

To initiate your foot plant, slightly pull your lead foot back gently so that it will match the speed of the ground moving under your body. That way you will avoid any braking action and will run very smoothly and efficiently. Immediately after your foot plant concentrate on quickly picking your foot up to continue the cycling motion. It may help to think of your legs moving in a continuous cycling motion, very similar to pedaling a bike. A rather amusing mental cue is sometimes use is imagining I am moving like the cartoon “road runner”. I imagine my legs spinning in a continuous circular motion and my body is just going along for the ride.

ARMS

The main purpose of an arm swing is to provide balance and coordination with the legs. The arms should hang loose and relaxed, close to the body. Avoid excessive movement. You want to avoid any tenseness in the shoulders. Your wrists should be loose and floppy. Do not clench your fists. Your hands should be held in a relaxed manner. You may try imagining that you are holding a butterfly in your fingers. Do not crush the butterfly. Any tightness in your hands will transfer all the way up your arm.

During the arm swing, your hands should not travel above your chest or behind the midline of your body. Try to avoid crossing your hand in front of your body. Keep your arm swing compact and your elbows at about a 90 degree angle. Do not drive your arms forward. A forward arm drive will encourage over striding. There is only one direction for arm drive - backwards. Driving your elbows back when you run will help you run with a quick, light and efficient stride.

THE SHIN SPLINT PREVENTION PLAN

This shin splint prevention plan is composed of a 4 week build up strength training and flexibility schedule that focuses on gradually and progressively building the functional strength of your lower leg muscles, followed by a weekly rotating maintenance plan. All strength and flexibility exercises are body weight based, so you can do them at home, the park, the trail or the track. No specialized equipment or access to a gym is needed. Barefoot strides are also included. These barefoot strides and even some additional barefoot running is important for shin splint prevention because it allows your foot to work and strengthen naturally, without the cast like suppression of natural motion that most running shoes cause. Barefoot running also encourages a more efficient flat footed or ball of foot first foot strike, which helps prevent shin splint injuries.

4 WEEK BUILD UP SCHEDULE

Week 1	
Monday	Alphabet Drill - One set with each foot Towell Pull - One set with each foot Barefoot Strides - 2 x 100 meters with 30 seconds rest between repeats Basic Plank - 2 x 20 seconds with 30 seconds rest between exercises Two Leg Calf Raise - One set of 10 repetitions Two Leg Bent Knee Calf Raise - One set of 10 repetitions Shin Stretch - One set of 20 seconds Calf Stretch - One set of 20 seconds
Tuesday	Rest
Wednesday	Alphabet Drill - One set with each foot Towell Pull - One set with each foot Barefoot Strides - 2 x 100 meters with 30 seconds rest between repeats Basic Plank - 2 x 20 seconds with 30 seconds rest between exercises Two Leg Calf Raise - One set of 10 repetitions Two Leg Bent Knee Calf Raise - One set of 10 repetitions Shin Stretch - One set of 20 seconds Calf Stretch - One set of 20 seconds
Thursday	Rest
Friday	Alphabet Drill - Two sets with each foot Towell pull - Two sets with each foot Barefoot Strides - 3 x 100 meters with 30 seconds rest between repeats Basic Plank - 3 x 20 seconds with 30 seconds rest between exercises Two Leg Calf Raise - One set of 15 repetitions Two Leg Bent Knee Calf Raise - One set of 15 repetitions Shin Stretch - One set of 20 seconds Calf Stretch - One set of 20 seconds
Saturday	Rest
Sunday	Rest

Week 2	
Monday	<p>Alphabet Drill - Two sets with each foot Heel Walking - One set Towell pull - Two sets with each foot Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Basic Plank - 3 x 30 seconds with 30 seconds rest between exercises Two Leg Calf Raise - Two sets of 10 repetitions Two Leg Bent Knee Calf Raise - Two sets of 10 repetitions Shin Stretch - One set of 20 seconds Calf Stretch - One set of 20 seconds</p>
Tuesday	Rest
Wednesday	<p>Alphabet Drill - Two sets with each foot Heel Walking - One set Towell pull - Two sets with each foot Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Reverse Downhill Walking - 2 sets One Leg Hops in Place - 1 set Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds</p>
Thursday	Rest
Friday	<p>Alphabet Drill - Two sets with each foot Heel Walking - One set Towell pull - Two sets with each foot Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Basic Plank - 3 x 30 seconds with 30 seconds rest between exercises Two Leg Calf Raise - Two sets of 15 repetitions Two Leg Bent Knee Calf Raise - Two sets of 15 repetitions Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds</p>
Saturday	Rest
Sunday	Rest

Week 3	
Monday	Heel Walking - Two sets Lateral Foot Walk - One set Medial Foot Walk - One set Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Intermediate Plank - 2 x 20 seconds with 30 seconds rest between exercises One Leg Calf Raise - Two sets of 10 repetitions One Leg Bent Knee Calf Raise - Two sets of 10 repetitions Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Tuesday	Rest
Wednesday	Heel Walking - Three sets Lateral Foot Walk - Two sets Medial Foot Walk - Two sets Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Reverse Downhill Walking - 3 sets One Leg Hops in Place - 2 sets Double Leg Lateral Hops - 2 sets Calf Raise Stride - 2 sets of 15 Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Thursday	Rest
Friday	Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 4 x 100 meters with 30 seconds rest between repeats Intermediate Plank - 2 x 30 seconds with 30 seconds rest between exercises One Leg Calf Raise - Two sets of 20 repetitions One Leg Bent Knee Calf Raise - Two sets of 20 repetitions Double Leg Lateral Hops - 2 sets Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Saturday	Rest
Sunday	Rest

Week 4	
Monday	Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 5 x 100 meters with 15 seconds rest between repeats Advanced Plank - 2 x 20 seconds with 30 seconds rest between exercises One Leg Calf Raise - Three sets of 15 repetitions One Leg Bent Knee Calf Raise - Three sets of 15 repetitions Double Leg Lateral Hops - 3 sets Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Tuesday	Rest
Wednesday	Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 5 x 100 meters with 15 seconds rest between repeats Reverse Downhill Running - 2 sets One Leg Hops in Place - 3 sets Bench Drops - 5 repetitions Lateral Hill Drill - 2 repetitions Box Drill - 2 sets Calf Raise Stride - 2 sets of 20 Single Leg Lateral Hops - 2 sets Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Thursday	Rest
Friday	Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 5 x 100 meters with 15 seconds rest between repeats Advanced Plank - 2 x 20 seconds with 30 seconds rest between exercises One Leg Calf Raise - Three sets of 15 repetitions One Leg Bent Knee Calf Raise - Three sets of 15 repetitions Single Leg Lateral Hops - 3 sets Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Saturday	Rest
Sunday	Rest

ROTATING MAINTENANCE SCHEDULE

Weekly Rotating Maintenance Schedule	
Monday	Alphabet Drill - Three sets with each foot Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 6 x 100 meters with 10 seconds rest between repeats Advanced Plank - 2 x 20 seconds with 10 seconds rest between exercises One Leg Calf Raise - Three sets of 20 repetitions One Leg Bent Knee Calf Raise - Three sets of 20 repetitions Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Tuesday	Rest
Wednesday	Barefoot Strides - 6 x 100 meters with 10 seconds rest between repeats Reverse Downhill Running - 3 sets One Leg Hops in Place - 3 sets Bench Drops - 10 repetitions Box Drill - 3 sets Lateral Hill Drill - 3 repetitions Calf Raise Stride - 2 sets of 20 Single Leg Lateral Hops - 3 sets Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Thursday	Rest
Friday	Heel Walking - Three sets Lateral Foot Walk - Three sets Medial Foot Walk - Three sets Barefoot Strides - 6 x 100 meters with 10 seconds rest between repeats Advanced Plank - 2 x 20 seconds with 20 seconds rest between exercises One Leg Calf Raise - Three sets of 20 repetitions One Leg Bent Knee Calf Raise - Three sets of 20 repetitions Shin Stretch - One set of 30 seconds Calf Stretch - One set of 30 seconds
Saturday	Rest
Sunday	Rest

SHIN SPLINT PREVENTION EXERCISES

ADVANCED PLANK

- Position yourself on the ground in a prone position with your body supported by your elbows and your toes.
- Keep your body very straight with your pelvis tucked in so that your hips are pressed forward. Hold for 30 seconds.
- From the basic plank position raise your right arm about 12 inches off the ground and hold for 30 seconds.
- Return your right arm to the basic position then raise your left arm and hold for 30 seconds.
- Return your left arm to the basic position and raise your right leg about 12 inches off the ground. Hold for 30 seconds.
- Return your right leg to the basic position and raise your left leg. Hold for 30 seconds.
- Return your left leg to the basic position. Now raise your left arm and right leg at the same time and hold for 30 seconds.
- Return your left arm and right leg to the basic position. Now raise your right arm and left leg at the same time. Hold for 30 seconds.



ALPHABET DRILL

- This is a simple, entry level lower leg conditioning workout that is surprisingly effective at strengthening the muscles that control and stabilize your foot and ankle.
- Sit on a bench or on the ground with your right leg extended in front of you.
- With your toes pointed out, trace all of the letters of the alphabet with your toes.
- Switch legs and repeat this exercise with your left foot.
- Repeat for your desired number of repetitions with each foot.
- Don't move your leg at your hip or knee. All of the movement should be at your foot and ankle.



BAREFOOT STRIDES

- While this exercise is more of a running drill than a strength training exercise, it's included in this section because running barefoot uses nearly every muscle in your lower leg. This barefoot drill is very effective at lower leg conditioning, injury prevention and stride improvement.

- The best place to do this drill is on the artificial surface infield of a running track. You can do these anywhere but make sure the surface is relatively soft and is free from any sharp objects or other debris that could injure your bare feet.

- This exercise is simple to perform. Just run 100 meter barefoot acceleration strides in which you start out at a moderate pace. Smoothly accelerate to full sprint pace at about 80 meters and then "float" or "coast" for the final 20 meters.

- Repeat for your desired number of repetitions.



BASIC PLANK

- Position yourself on the ground in a prone position with your body supported by your elbows and your toes.

- Keep your body very straight with your pelvis tucked in so that your hips are pressed forward.

- Hold this position for about 30 seconds

- Repeat for your desired number of repetitions.



BENCH DROPS

- Stand on a bench, step or plyometric box of between 12 and 16 inches in height.

- With your feet dorsi-flexed (the front of your foot and toes pulled up towards your shin), step off the bench and land on your heels. Keep your feet dorsi-flexed throughout this exercise. Don't allow the front of your feet or toes to drop towards the ground. Land on both heels at the same time.

- Keep your knees "soft" or very slightly bent and absorb the impact with your thigh muscles.

- Repeat for your desired number of repetitions.



BOX DRILL

- This is a drill that is commonly used as conditioning for power sports such as football and soccer but is also an excellent lower leg strengthening drill for runners.
- Stand in a "ready" position with your knees soft and slightly flexed.
- Rapidly shuffle laterally to the right for about 20 meters then sprint quickly forward for 20 meters. Now rapidly shuffle laterally to the left for 20 meters before completing the "box" by backpedaling quickly for 20 meters to your starting point.
- Don't cross your legs during your lateral shuffles.
- Don't stop at any point during this exercise.
- Repeat for your desired number of repetitions.



CALF RAISE STRIDE

- Stand on the edge of a bench or step with the ball of your right foot on the edge of the bench and your right heel extending off and dropping below the level of the bench. Hold your left foot and leg loosely off the bench with a bent knee. Contract your abdominal muscles to stabilize your trunk and spine.
- Bend your right knee to about a 75 to 90 degree angle.
- Starting with your right leg bent, rise up on the toes of your right foot as far as possible and straighten your right knee. At the same time drive your left knee up as in a running stride.
- Now return to your starting position by dropping your right heel back below the level of the bench, dropping your right hip so your right knee is bent 75 to 90 degrees and dropping your left knee. All three of those motions should take place simultaneously.



CALF STRETCH

- There are two muscles in your calf that you should stretch. The largest and most visible muscle is called the gastrocnemius muscle. This is the large one you can see on the back of your lower leg. Underneath your gastrocnemius muscle is your soleus muscle. Your gastrocnemius muscle does most of the work when your knee is straight. When your knee is bent your soleus muscle contributes more work.

- To stretch your gastrocnemius muscle lie face down with your arms supporting your upper body in a push up position. Place your left foot over the back of your right ankle. Keep your right leg straight. With your toes flat on the ground push back so that your right heel is forced towards the ground. Hold that position for 20 to 30 seconds. Reverse leg positions and repeat.

- To stretch your soleus muscle perform the same exercise except bend your leg at the knee. This will bring your soleus muscle more into the stretch.



DOUBLE LEG LATERAL HOPS

- Stand in an upright position with your knees soft and very slightly bent in an athletic stance. Your feet should be about shoulder width apart.

- Quickly drop your hips and rapidly explode upward and to the right.

- Keep your feet dorsi-flexed (toes up) throughout this drill.

- Land on the balls of your dorsi-flexed feet under your center of gravity and very quickly bounce as far as possible to the left.

- Keep repeating this motion for about 30 seconds.

- Focus on bouncing off your dorsi-flexed feet rather than gathering yourself and jumping.



HEEL WALKING

- With your feet dorsi-flexed (the front of your foot and toes pulled up towards your shin), walk on your heels for about 20 to 30 meters.
- Repeat 2 to 4 times.
- Keep your feet dorsi-flexed throughout this exercise. Don't allow the front of your feet or toes to drop towards the ground.
- Keep your knees "soft" or very slightly bent during this exercise.



INTERMEDIATE PLANK

- Position yourself on the ground in a prone position with your body supported by your elbows and your toes.
- Keep your body very straight with your pelvis tucked in so that your hips are pressed forward. Hold for 30 seconds.
- From the basic plank position raise your right arm about 12 inches off the ground and hold for 30 seconds.
- Return your right arm to the basic position then raise your left arm and hold for 30 seconds.
- Return your left arm to the basic position and raise your right leg about 12 inches off the ground. Hold for 30 seconds.
- Return your right leg to the basic position and raise your left leg. Hold for 30 seconds.



LATERAL FOOT WALK

- Stand with your feet in a supinated position. Your feet are supinated when you roll your feet so that you are standing on the outside edge of your feet.
- Keeping your feet supinated, walk forward for 20 to 30 meters.
- Repeat 2 to 4 times.
- Keep your toes pointed straight ahead.



LATERAL HILL DRILL

- Some exercises are duplicated in other sections of this book. This is one of them. This exercise strengthens both your lower leg strength and your iliotibial band and is included in both sections.
- For this exercise you will need to find a short steep hill.
- Stand sideways to the hill in a "ready position" with relaxed but slightly bent knees.
- Push off laterally with your downhill leg and shuffle sideways up the hill. Don't cross your feet during this drill. Use a sideways shuffling motion.
- Keep moving up the hill for about 50 meters.
- Now shuffle back down the hill in the same position.
- Face the other direction using your other leg as the downhill leg and repeat.



MEDIAL FOOT WALK

- This exercise is similar to the lateral foot walk except you walk on the inside of your feet.
- Stand with your feet in a pronated position. Your feet are pronated when you roll your feet so that you are standing on the inside edge of your feet.
- Keeping your feet in a pronated position, walk forward for 20 to 30 meters.
- Repeat 2 to 4 times.



ONE LEG BENT KNEE CALF RAISE

- Stand on the edge of a bench or step with the ball of your right foot on the edge of the bench and your right heel extending off the bench. Hold your left foot and leg loosely off the bench with a bent knee. Contract your abdominal muscles to stabilize your trunk and spine.

- Bend your right knee to about a 75 to 90 degree angle.

- With your right leg bent, rise up on the toes of your right foot as far as possible. Keep your left foot and leg off the bench.

- Keeping your right knee bent at a 75 to 90 degree angle, drop your right heel down below the level of the bench as far as possible.

- Rise up on the toes of your right foot as far as possible again.

- Keep following that pattern of rising up on your toes and dropping your heel below the level of the bench for your desired number of repetitions.

- Keep your knees bent at a 75 to 90 degree angle throughout the exercise. Switch legs and repeat.

- This bent leg exercise emphasizes the use of your soleus muscle which is located under your larger gastrocnemius muscle.



ONE LEG CALF RAISE

- Stand on the edge of a bench or step with the ball of your right foot on the edge of the bench and your right heel extending off the bench. Hold your left foot and leg loosely off the bench with a bent knee. Contract your abdominal muscles to stabilize your trunk and spine.

- With your right leg fully extended, rise up on the toes of your right foot as far as possible. Keep your left foot and leg off the bench.

- Now drop your right heel down below the level of the bench as far as possible.

- Rise up on the toes of your right foot as far as possible again.

- Keep following that pattern of rising up on your toes and dropping your heel below the level of the bench for your desired number of repetitions.

- Don't lock your knees at any time during this exercise. Switch legs and repeat.

- This straight leg exercise emphasizes the use of your gastrocnemius muscle, the largest and most visible muscle in your calf.



ONE LEG HOPS IN PLACE

- Stand facing away from a bench, step or box that is about 12 to 16 inches high.
- Place your left foot behind you on the bench. Your right foot should be flat on the ground under your center of gravity with your right knee slightly flexed.
- Now begin to hop up and down on your right foot as quickly as possible. Keep your right foot dorsiflexed (toes up) and focus bouncing off the ball of your right foot.
- Concentrate on very quick and light hops. Don't try to hop for height. Instead, focus on hopping as quickly as possible.
- Keep hopping for about 30 seconds.
- Switch legs and repeat.



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REVERSE DOWNHILL RUNNING

This is a more advanced version of the reverse downhill walking exercise. Because of the additional coordination and strength requirements, don't try this one until you have mastered the reverse downhill walking.

- Locate a hill of moderate incline that is 50 to 100 meters in length.
- Jog backward down the hill in a slow and very controlled manner.
- Focus on keeping your feet and knees aligned and keep your feet straight with no inward or outward angling.
- Jog back up the hill and repeat 5 to 10 times.



REVERSE DOWNHILL WALKING

To complete this exercise you will need to find a hill of moderate incline that is at least 50 meters in length. During this exercise your calf muscles will contract eccentrically to control the downward motion of your heel. This eccentric calf drill is a great exercise for improving the flexibility of your calf muscle as well and providing additional strength.

- Find a hill of moderate incline that is at least 50 meters in length.
- Walk backwards down the hill in a controlled motion.
- Keep your feet straight. Don't allow the front of your feet to angle to the inside or outside.
- Jog back up the hill and repeat 5 to 10 times.



SHIN STRETCH

- This static stretching exercise will increase the flexibility in anterior (front) muscles of your lower leg.
- Begin in a sit-kneel position with your lower legs and feet directly under your thighs and your toes pointing directly behind your body.
- Now slowly lean back until you feel a slight pull on the front of your lower legs. Hold that position for about 30 seconds.
- Don't stretch to the point of pain and be sure to keep your lower legs aligned with your thigh.



SINGLE LEG LATERAL HOPS

- Stand on your right foot in an upright position with your right knee soft and very slightly bent. Hold your left foot up behind your body.

- Quickly drop your right hip and rapidly explode upward and to the right.

- Keep your feet dorsi-flexed (toes up) throughout this drill.

- Land on the ball of your dorsi-flexed right foot under your center of gravity and very quickly bounce as far as possible to the left.



- Keep repeating this motion for about 30 seconds.
- Focus on bouncing off your dorsi-flexed feet rather than gathering yourself and jumping.
- Repeat using your other leg

TOWEL PULL

- This exercise is another very simple one that is effective for lower leg conditioning and also helps prevent running injuries such as plantar fasciitis.

- Sit on a bench with your feet flat on the ground.

- Place the edge of a towel under the toes of your bare right foot.

- Grab the towel with your toes and pull the towel completely under your foot by repeatedly flexing or curling your toes.



- All motion should be at your toes.
- Repeat for your desired number of repetitions with each foot.

TWO LEG BENT KNEE CALF RAISE

- Stand on the edge of a bench or step with the ball of your feet on the edge of the bench and your heels extending off the bench. Contract your abdominal muscles to stabilize your trunk and spine.
- Bend your knees to about a 75 to 90 degree angle.
- With your knees bent, rise up on your toes as far as possible.
- Keeping your knees bent, drop your heels down below the level of the bench as far as possible.
- Rise up on your toes as far as possible again.
- Keep following that pattern of rising up on your toes and dropping your heel below the level of the bench for your desired number of repetitions.
- Keep your knees bent at a 75 to 90 degree angle throughout the exercise.
- This bent leg exercise emphasizes the use of your soleus muscle which is located under your larger gastrocnemius muscle.



TWO LEG CALF RAISE

- Stand on the edge of a bench or step with the ball of your feet on the edge of the bench and your heel extending off the bench. Contract your abdominal muscles to stabilize your trunk and spine.
- With your legs fully extended, rise up on your toes as far as possible.
- Now drop your heels down below the level of the bench as far as possible.
- Rise up on your toes as far as possible again.
- Keep following that pattern of rising up on your toes and dropping your heel below the level of the bench for your desired number of repetitions.
- Don't lock your knees at any time during this exercise.
- This straight leg exercise emphasizes the use of your gastrocnemius muscle, the largest and most visible muscle in your calf.



