



## Achilles Tendinopathy

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The Achilles tendon is the thickest and strongest tendon in the human body and is the combined tendon of the two calf muscles. It can contribute to 6-18% of injuries in recreational runners. During running forces equalling ten times body weight can be put through the tendon.

The term tendinitis is often attributed to tendon injuries, but the term 'itis' suggests inflammation and it is now believed that problems with tendons do not involve inflammation. More appropriate terms tendinopathy or tendinosis are being used to refer to tendon injuries.

The Achilles tendon is a common tendon of the two calf muscles; the Gastrocnemius and the Soleus. Injuries to Achilles commonly occur in the mid portion of the tendon 2-3 cm above where it inserts into the heel.

Runners with overuse tendinopathy may notice a gradual onset of symptoms such as pain and morning stiffness in the tendon. This can reduce with walking about or with the application of heat such as a shower. The pain may reduce during training but then recur several hours later. There may be redness or warmth over the area, and you may hear crepitus (crackling sound) when feeling the tendon. Tight shoes which press on the tendon may cause pain.

Acute tendinopathy may be felt as a sudden pain which can be disabling, making walking on the foot sore. If there is a marked decrease in ability to weight bear on the foot associated with a sudden severe pain and a sound such as a pop or 'shot' you may have ruptured the tendon. This can be confirmed by physical examination and MRI.

Less commonly, pain can be reported at the insertion of the tendon into the heel. Where this is the case careful examination is required to rule out other causes of the heel pain including inflammation of bursa (a fluid filled sac between the tendon and the bone), or if a bony prominence at the back of the heel found in some people is also involved.

### What causes it?

Injury to the tendon occurs when the load applied to the tendon over a period of time or in a single episode exceeds the ability of the tendon to withstand the load.

It's worth taking a look at what the calf does when running or walking. The calf functions to point the toes towards the floor and create the movement that lifts the heels off the floor as you step. Stand on your tiptoes and take a look at your calf – the muscle has contracted and looks defined. The calf muscles raise you on to your toes by contracting which pulls on the Achilles tendon connected to the heel, which then lifts the heel. Unlike muscles, tendons are not very flexible structures and can only stretch approximately 6% of their length, so if there is excessive strain being put through a tendon, they can tear leading to pain and injury.

Certain factors can lead to Achilles problems:

- Changes in training such as increase in mileage, increases in intensity or a reduction in rest days between training. The calf muscles do not have time to recover, or can get strained from the training so put excessive stress through the tendon



- Changes in running surface e.g. hard to soft, flat to hills etc. Running on hills requires a greater effort from the calfs as they have to work harder to lift the heel and propel the body up as well as forward. Also running on hills stretches the calfs more as it increases the amount of dorsi-flexion (action of foot moving closer to the shin) of the foot due to the increase in incline and this repetitive strain can injure the tendon. Moving from a soft surface to hard increases the amount of shock going through the body which is absorbed by the calfs and other muscles. Going from an even surface to uneven also challenges the foot and your biomechanics at the ankle. The calfs may need to work harder to control the foot, so tighten or strain more easily.
- Changes in footwear for example changing to a lower heel spike, wearing shoes with a heel tab that compresses on the tendon, or wearing poor or inadequate footwear for your activity can cause Achilles problems. Changing to a lower shoe stretches the calf slightly so it has to work in a range that it not may be used to leading to more strain being put through the tendon. Wearing high heels can shorten the calf, so going from high heels to low runners can cause stress to the calf and tendons.
- Tight calf muscles reduce muscle flexibility and put more strain through the tendon. Tendons are structurally different to muscles which are elastic, and can only stretch approximately 6%. If they are being continually stretched beyond their 6% range it can lead to micro tears and pain. Also if your calf is weak it cannot withstand training, which can lead to more stress going through the tendon.
- Restricted joint motion at the ankle can cause problems by changing the normal range of movement of the calf.
- The kinetic chain is the chain of joints and muscles that are involved in helping you walk or run. Problems elsewhere in this chain may lead to pain the Achilles. The Gastrocnemius crosses two joints – the knee and the ankle – so problems at the knee and upper leg e.g. tight hamstrings, can affect the functioning and tone of the Gastrocnemius and hence lead to Achilles problems. The hamstrings attach to the pelvis so imbalances at the pelvis may affect the hamstring, which can pass down to the calfs etc. A full examination of the kinetic chain should be carried out to determine if there is an imbalance elsewhere contributing to or causing the Achilles problems.
- Increased pronation i.e. rolling in of your ankle mid way through a step has been found to be a causative factor in Achilles problems. Increased pronation alters the alignment of the Achilles tendon and puts increase load on the calf muscles to correct the foot alignment as you toe off

### How to prevent or resolve it

In order to avoid Achilles problems or to help an existing Achilles problem consider the following below:

- Stretch your calf muscles regualry.
- If you have a tendency towards tight calfs, get a regular massage to keep them flexible or use a foam roller to work them out.
- Strengthen weakened calf muscles.
- Assess your training schedule and ensure that that it is sensible in terms of training frequency, mileage progression, intensity and rest.



- Much of the recent research into Achilles tendinopathy rehab has found that eccentric exercises are successful in treating chronic Achilles tendon problems. An eccentric contraction is when the muscle contracts as it lengthens. Confused? Think of the biceps and triceps. The biceps flexes the arm like in a bicep curl, the triceps straightens the arm. If you perform a bicep curl you perform a concentric contraction i.e. the two ends of the muscle get closer together. Now, imagine you've performed a bicep curl with something heavy, e.g. a dumbbell, and as you lower the arm to the ground again, is it performed in a controlled steady manner or does your arm fly down by your side? Most probably it occurred in a controlled manner – what gave this control? The biceps did – as you straightened the arm and the biceps lengthened, it did so in a controlled manner, by contracting and slowly lengthening. This is an eccentric contraction. An eccentric contraction of the calf is performed when slowly lowering your heel over the edge of a step – the calf is contracting to control the movement while it is lengthening. Research proposes that you perform eccentric exercises on an injured Achilles, working through repetitions and sets which gradually increase. Unusually they also recommend that you work through pain felt when doing this.
- See your Physical therapist to assess your calf flexibility, your gait, and joint mobility. They can use soft tissue work to increase the flexibility of the calf, breakdown scar tissue in the tendon, mobilise your ankle, and monitor a rehabilitation program.
- Check your footwear (training, work, and social), could it be a cause? If you've moved to a lower training shoe and wish to continue to use it going forward, return to the shoe you are used to, then slowly over a period of time introduce the new shoe to your training to allow the body to adapt to it. If you have shoes that fit tightly on the heel consider buying a new pair with a looser fit. Or some people cut out a small section on the top of the back of the shoe that is in contact with the heel to gain relief.
- Orthotics: a foot assessment will determine whether you would benefit from orthotics to control pronation (rolling in of the foot) which can cause and aggravate Achilles problems.
- Some people find that putting a heel lift into their shoes can help give some relief from Achilles pain as it shortens the calf muscles which put less strain through the tendon. This is a short term solution until the pain levels have decreased.

## Exercises

IMPORTANT: Before undertaking any new exercises you should contact a Doctor or Physical Therapist to make sure that they are appropriate for you do. Without doing so, carrying any exercises out described in this article is at your own risk.

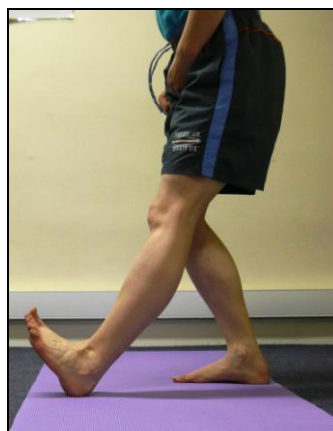
The calf contains two main muscles – the Gastrocnemius and the Soleus. When stretching or strengthening we often think of the calf as one unit, but to be more effective we should exercise each calf muscle separately. For all the exercises below the body should be warmed up as stretching or strengthening on a cool body could cause injury. Do some light jogging, walking, cycling, housework, or have a hot shower etc to warm up.

## Stretching

There are many ways of stretching the calf but I am going to describe a stretch that can be used at home or when training.

***Stretching the Gastrocnemius (left leg)***

1. Stand with both feet together then take a step forward with the left foot
2. Keeping the leg straight point the toes of the left foot towards the sky
3. The right leg may bend at the knee, this is fine.
4. A stretch should be felt in the left calf, if not, or to progress the stretch further, lean forward a little until a stretch is felt
5. Hold the stretch for 30 seconds and repeat 3 times on each leg. If stretching prior to exercising stretching for 10 second repetitions is sufficient.



***Stretching the Soleus (left leg)***

This stretch is practically the same as the above, but in this stretch the left knee is bent slightly. This helps to isolate the stretch to the Soleus muscle.

1. Stand with both feet together then take a step forward with the left foot
2. With a 45° bend in the knee point the toes of the left foot towards the sky
3. The right leg may bend at the knee, this is fine.
4. A stretch should be felt in the left calf, if not, or to progress the stretch further, lean forward a little until a stretch is felt
5. Hold the stretch for 30 seconds and repeat 3 times on each leg. If stretching prior to exercising stretching for 10 second repetitions is sufficient.



### Calf Strengthening

Calf raises off a step is a method of strengthening a calf particularly when performed on one leg. Like with the stretches performing them with the knee straight, then with the knee bent helps to target both muscles in the calf. You start these exercises strengthening both legs together at the same time before progressing on to one leg at a time. These exercises use a step, but a curb, or edge can also be used. For safety it is best to use the bottom step of a stairs and to have a handrail or wall that you can use for balance and support if you cannot balance properly when doing the exercises.

### ***Strengthening the Gastrocnemius (right leg)***

1. Stand on a step with the heel(s) protruding over the edge of a step
2. **Keeping the leg(s) straight** raise up on to the toes
3. Lower back to the starting position with the heel(s) protruding over and level to the step
4. Build up to doing 3 sets of 10 repetitions 3 times a week. If you start to find this easy you can add a backpack (on both shoulders) with some items in it to add weight and make the exercise more difficult.



Gastrocnemius Strengthening – Start position. Heel level with step

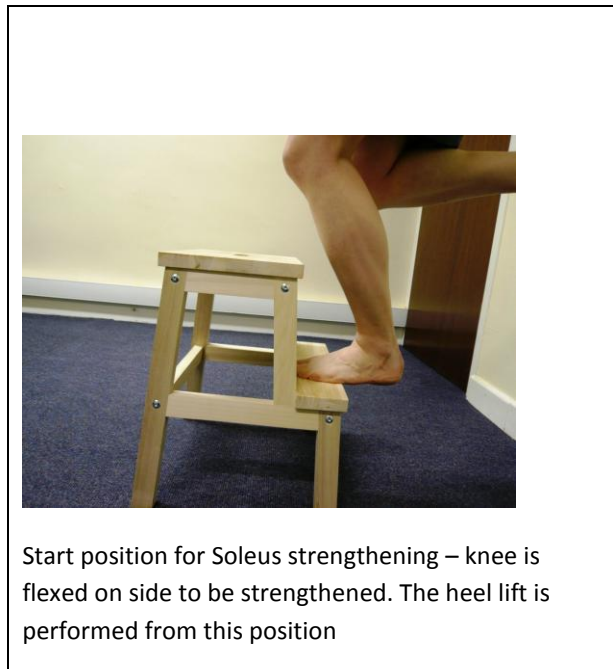


Gastrocnemius Strengthening – End position. Heel is raised above the step

### ***Strengthening the Soleus (right leg)***

This exercise is very similar to the one above, but bending the knee helps to isolate this exercise to the soleus muscle.

1. Stand on a step with the heel(s) protruding over the edge of a step
2. **Keeping a 45° bend in the knee(s)** raise up on to the toes
3. Lower back to the starting position with the heel(s) protruding over and level to the step
4. Build up to doing 3 sets of 10 repetitions 3 times a week. If you start to find this easy you can add a backpack (on both shoulders) with some items in it to add weight and make the exercise more difficult.



### ***Strengthening the Achilles***

Recent research into Achilles tendinopathy rehabilitation suggested that good results were obtained by eccentric exercises. This exercise protocol is termed the Alfredson's painful heel-drop protocol.

It is called the painful heel drop as pain will be experienced when doing this exercise and the exercises should be continued through this discomfort. For this reason I am not going to explain the exercise where, I strongly recommend that you attend a physical therapist to follow a rehabilitation programme to ensure that you are doing it correctly and that it is a valid programme for your condition. While the Alfredsons protocol has been found to be successful for Achilles pain experienced in the mid tendon, it was found to be only 30% successful for pain at the insertion of the Achilles into the heel. Your Physical Therapist will be able to guide you on rehabilitation for this.



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