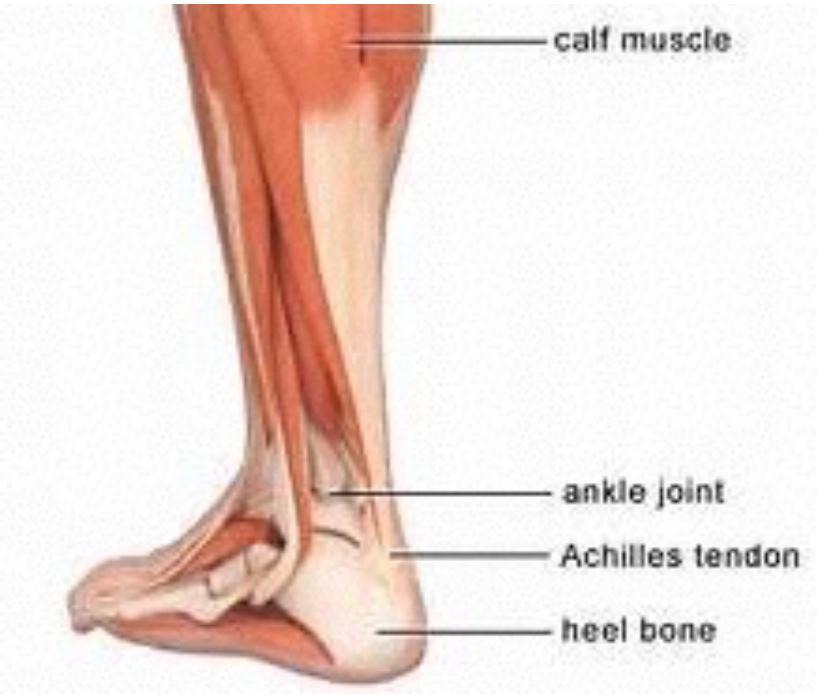
Achilles tendon injury

Achilles tendinopathy is highly prevalent in athletes who participate in running-based sports but can also occur in racket sports and in sedentary people. Research suggests there is equal chance of either male or females athletes suffering an Achilles tendon injury. Typically there is localised tenderness in the mid portion of the Achilles 2-6CM from its insertion into the heel bone.

The Achilles tendon is the largest human tendon and attaches proximally to the calf muscles (gastrocnemius and soleus) and distally to the superior tuberosity of the calcaneus (heel bone) It has a broad and flat aponeurosis at its proximal muscle attachment and becomes rounder in the midsection due to spiralling of its fibres before broadening out again at the distal attachment at the calcaneus. It is suggested the mid-portion spiralling adds to its strength, but it may also concentrate load, which may be a significant factor as this region is the most common location of tendinopathy within the Achilles.



The primary role of tendons is to transmit tensile forces produced by muscles to the skeleton in order to produce and control joint movement. If the force generated is too great then injury to the tendon prevails.

The exact pathological processes resulting in tendinopathy are yet to be clearly defined. Early models of chronic tendon inflammation have been superseded by theories suggesting a predominantly degenerative process. Cook and Purdam (2009) proposed a

continuum of three potentially overlapping entities – reactive tendinopathy, tendon disrepair and degenerative tendinopathy.

The science and symptoms
Reactive tendinopathy often seen in the 15-25 years old age group is described as being characterised by a temporary localised thickening of the tendon, thereby reducing stress and augmenting stiffness, in response to acute overload/increase in training or trauma. Pain can be reported as very acute.

Tendon disrepair typically seen in the 20-35 year age groups described as being similar to reactive tendinopathy, but with greater collagen production and separation, with associated destruction of the tendon matrix. Abnormal neo-vascularisation (blood vessels found in the tendon area on ultrasound scan) may also be observed. Often pain is prevalent on first loading but then eases with warm up.

Degenerative tendinopathy (Achilles and patella) often seen in the over 30s age group is proposed to occur when areas of the tendon are characterised by largely irreversible matrix breakdown with relative absence of tenocytes and collagen and extensive neo-vascular infiltration. Pain is often associated with stiffness

The source of tendon pain at any stage of this continuum is not clear and has variously been attributed to mechanical, biochemical and neo-vascular factors. Tendons in the degenerative stage have demonstrated an absence of inflammatory markers, leading to inflammation being dismissed as a pain-provoking factor. Inflammatory mediators may play a role in reactive tendinopathy or disrepair, and this idea is supported by modern *in vitro* work indicating inflammatory mediation via large magnitude tendon stretching and anti-inflammatory effects of small amplitude stretching.

Using the Cook and Purdam tendinopathy continuum model helps the clinician decide when and what exercise/load to introduce rather than the previously blind application of eccentric loading exercises to tendinopathies, which has often been ineffective.

Achilles Tendon internal risk factors for injury
Abnormal dorsi flexion ROM either decreased with the knee extended (linked to increased tension on the AT) or increased ROM (reason unclear).
Abnormal subtalar (inwards /outwards movement of the foot) ROM either increased or decreased.
Decreased ankle Plantar Flexion strength. Those patients with Achilles tendinopathy exhibit a decreased ability to generate a plantar flexion torque. It is normal to have a 6-11% difference between the strength of limbs. Research suggests deficits can be found in both the gastrocnemius and soles muscles when comparing runners with an Achilles tendon injury compared to healthy runners.
Pronation: Injured runners have been identified to have increased Calcaneal inversion at initial contact, display greater pronation and take less time to achieve full pronation.

External risk factors
Increase volume of running
Sudden change in running terrain
Change in footware

Treatment of Achilles:

Based on the best current clinical evidence the main approach is a combination of tendon load management and exercise taking into account the stage your tendon injury, your age and sport/occupation. There is minimal to no evidence for the use of massage, foam rolling or electrotherapy.

In the reactive stage if there is an inflammatory presentation anti inflammatory medicines may help.

Interesting Research has suggested the Achilles tendon structure is designed to remain the same throughout your life. Unfortunately the structure does change when injury occurs and can take many months to clinically demonstrate healing. During the cold war 1955-1963 numerous nuclear tests took place which led to an increase in the amount of radioactive carbon-14 in the atmosphere (bomb pulse era). Changes in atmosphere radioactive carbon-14 can be reflected in the human body because we eat plants and animals fed with plants that have absorbed radioactive carbon-14.
Studies of Achilles tendons from people who lived during the bomb pulse era demonstrate retained high levels of C-14 which researches concluded shows very little renewal in the AT structure had taken place. This would suggest a poorer healing process and why symptoms may persist for long periods.

A rehabilitation programme may consist of several stages e.g. isometric (usually mid range), functional isometrics (isometrics through range) , functional loading (disrepair tendon -heavy slow resistance, a degenerative tendon- eccentric load) and sport specific activity including plyometrics.
The most common exercise programmes are based on:
Alfredson et al (2000, 2003, 2005) research which recommended three sets of 15 heel raises. Painfully loaded, tendon-specific eccentric exercises were performed slowly, twice a day, every day, i.e. 180 repetitions per day, for twelve weeks. A high volume of therapeutic exercise has been shown to reduce abnormal neo-vascularisation associated with tendon pain.

Silbernagel 2007 researched a combined progressive loading concentric/eccentric programme in which improvements seen were concluded to be due to the high level of intensity of training, with daily exercises and a gradual increase of the load creating positive effects on both the muscle and tendon.

Heel drop eccentric exercise. Forms part of an Alfredson eccentric loading programme.

A heavy slow resistance programme (used in less irritable or degenerative tendon symptoms and in high-load demands such as in athletes), improved neuromuscular performance (e.g. torque, work, endurance) and was consistently associated with improved clinical outcomes. (Tenocyte activity is thought to be highly strain-dependent, with heavy loading required for maximal collagen systhesis, heavy loading can also increase muscle strength and tendon stiffness, which, combined with greater collagen density, may act to reduce tendon stress for any given sporting load).

Using a press machine performing a calf press which may form part of your heavy slow resistance programme

There is limited equal evidence for all types of exercise which creates a challenge for the Physiotherapist when deciding on the best programme for the individual.
Important key factors in improvement are both the intensity and type of loading. The underlying effects of exercise are not fully known, but mechanical loading on tendons appears to be important in both the healing process and in improving strength of the tendons.

With all exercise programmes current research suggests a certain degree of pain can be tolerated but the level of acceptable pain during rehabilitation should be guided by the

clinician and education of the patient. Pain monitoring may allow continuation of activity such as running during treatment.

Lower limb alignment/ control and foot biomechanics also need to be considered.

An expert assessment by a skilled **HEALTH ROOMS** Physiotherapist will ensure you follow the correct rehabilitation programme to allow you to return to running as soon as possible.
With Achilles tendon injury the correct diagnosis is imperative to allow delivery of the most appropriate treatment regime and enhance your return to sport or full function in the shortest possible time.

The Health Rooms Physiotherapy staff are very experienced in the assessment and treatment of lower limb injuries and in particular injuries related to running.
We have been involved in writing best practise guidelines on lower limb injuries for the British Military. We currently deliver teaching at Lillieshall blah blah blah to GPs with an interest in Sports Medicine.
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P. Malliaras et al. Achilles and Patellar Tendinopathy Loading Programmes
A Systematic Review Comparing Clinical Outcomes and Identifying Potential
Mechanisms for Effectiveness 2013