

Running injuries - what are the most important factors

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Why do runners get injured?

Runners are injured when they exceed their tissue capacity and tolerance.

Strength and conditioning

When running the ground reaction force is 2.5-3 x body weight (BW) with a peak soleus muscle load of 6-7 x BW. A runner needs to be strong enough to manage the load experienced when running. Strength and conditioning helps to improve load tolerance when running, specifically high load, low repetition training. Strength and conditioning also has positive influence on performance by improving running economy and reducing injury risk. Runners should be encouraged to perform 1-2 strength and conditioning sessions per week, replacing run sessions if necessary.

Load Management

Clinically load management of runners can be challenging. Training structure and progression of loading is important to allow adequate adaptations to occur. Runners should be encouraged to plan training/races for the next 3-6 months, and include periodised blocks of running and strength training. During a strength training block the running volume should be reduced. In practice load should change gradually to allow the body time to adapt to the increased load. Historically the 10% rule has been used however the percentage increase will depend on a variety of factors.

Should I run when injured?

The risk vs. reward when stopping a runner from running needs to be considered. If continuing to run will have long-term impact on the injury the runner should stop running for a short period of time. However if they have an important race coming up then stopping running may significantly impact performance. The length of time out of running should be kept as short as possible. A runner may cross train whilst they are not running.

Running should be stopped with bony stress injuries such as MTSS and highly reactive tendinopathies. Before returning to running the runner should be pain free on impact testing (jog on spot, jump in place, hop on spot). A study kept runners running with 4/10 pain and it took up to 100 days to get to 20 minutes running.

24 hour pattern

Use the 24 hour pattern to monitor the runners reaction to load. If pain does not settle within 24 hours, running volume should be reduced. Be aware of the runners may adopt a compensatory running style to avoid loading painful areas, which may lead to altered loading and injury in other areas.

Common Myths

One size fits all approach which is often portrayed in the media does not work. There is no one best cadence or foot strike pattern for everyone. These myths should be challenged in clinical practice.

Foot strike Pattern

Changing the foot strike pattern will move load which can have either a positive or negative impact on the runner. Changes to foot strike pattern should be small and gradual, avoiding a big change from rearfoot to forefoot. Be aware when changing the strike pattern in runners who over stride as this may lead to further loading / injuries.

Pathologies where changing strike pattern may be appropriate:

- Anterior compartment syndrome – a temporary change away from a heel strike pattern may reduce symptoms. The runner may return to a heel strike when the pain settles
- Chronic degenerative knees – Runners who have previously been told that they shouldn't run anymore. Changing them to a forefoot strike pattern will reduce loading through the knee. Wilson et al. (2014) showed that a forefoot strike reduces PFJ loading by 10-13% however a shorter stride length reduced PFJ loading by 15-20%.
- Achilles Tendinopathy – pathology may have developed due to a sudden change to forefoot strike. Encouraging a more posterior foot strike may help to relieve symptoms.

Subjective assessment

Ask the runner what distance they can run without symptoms. Advise the runner to start with this distance ensuring adequate rest between runs. If required a longer run can be replaced with a high intensity bike ride or swim. The running distance can then be increased in line with the irritability of symptoms.

Use information gained from the subjective assessment to adapt the running assessment. As part of your objective assessment and identifying pain during or after an activity eg after a long run, you may ask patient to go for a run and then assess.

If a runner experiences pain during high speed runs then observe runner at a range of speeds to see if anything changes. A runner that does not normally run on treadmill should be assessed off the treadmill if possible.

Running assessment

Areas to consider during assessment:

- Over stride – is the foot landing more than a foot length in front of the centre of mass.
- Knee flexion on impact – allows for good shock absorption
- Strike pattern
- Pelvic position – improved muscle contraction in posterior pelvic tilt
- Dorsiflexion at mid stance – if runner does not absorb load well then will have increased dorsiflexion / knee flexion at mid stance leading to increased load on Achilles and PFJ.
- Overall pattern of running
- Listen to the landing – heavy landing may indicate issues with neuromotor function.

During the assessment compliment the runner on what they are doing well as this helps to build resilience in runners. Avoid focusing on negative aspects of the runners gait, as this can have a impact on their confidence. Communicate to the runner that they need some fine-tuning to make running more comfortable.

Running retraining

Before starting running retraining the runner needs to have the muscle capacity to tolerate the change. If the runner does not have the load capacity required to tolerate running retraining then start with rehabilitation to increase muscle capacity and then progress onto running retraining.

If the runner has an acute injury with limited history then there may be no need to change the running style. Longstanding injury that has led to maladaptive running patterns should be addressed. Start by making changes in the sagittal plane as changes in this plane will influence the frontal/ transverse plane.

Over Striding

The easiest way to reduce load is to reduce over striding. This can be achieved by running with a metronome to increasing cadence. Increase the cadence by 5% for a short period of time and assess for any changes. Moore (2016) has shown that the optimal step rate for runners is around 3-8% higher than what they self-select.

However increasing cadence does not always lead to a reduction in load as the runner may not have the required capacity to reduce the contact time. Also consider if the runner has the hip muscle capacity to land closer to centre of mass and the Quadriceps capacity to absorb the load of landing with flexed knee. If the runner already has a high step rate of 175-180 then increasing this further will have a limited impact on reducing load.

Should changes in running style be permanent?

Running retraining should start in a simple manner and expanded over a period of time. Changes to running technique do not need to be permanent. A temporary change in style may give a reprieve to let symptoms settle and keep runner running. A small change in running technique may uncouple the pain from the movement pattern.

Identify areas that can be changed to reduce load eg increase posterior pelvic tilt for proximal hamstring tendinopathy, decrease hip adduction/internal rotation for PFJ pain or dorsiflexion for Achilles tendinopathy. Be aware that structural factors cannot be changed (e.g. Femoral Anteversion) as this will lead to compensation elsewhere in the kinetic chain. Static alignment variables (Anteversion, Q angle) have limited impact on running pattern.

Ask the runner if change feels comfortable. If runner reports change feels uncomfortable/ hard work then may have a negative impact on efficiency. Advise then to go away and work at it for 20-30 second bursts during a run and see how it affects the symptoms. There is a link between the feel of running and metabolic cost, if it feels easier then likely to be more efficient.

Plyometrics

Runners may benefit from exposure to small volumes of high load activity such as plyometrics to improve the ability to produce propulsion and absorb load. This may involve jumping, hopping and bounding.

Psychological factors

Psychological factors are another form of load to consider. Psychological factors such as lack of sleep or stress at work can delay healing by up to 60%. Beliefs such as 'running wears out your joints' may negatively contribute to a runners recovery and need to be challenged.

How do elite runners run?

Elite runners have short contact time, high hip/knee drive, high cadence and a stiff running pattern.

Advice for new runners

People new to running should be advised to start slowly and listen to their body. They may experience improvements quickly initially and then the rate of improvement slows. If the runner has a history of playing other sports then they may tolerate an increase in load quicker.

If a runner begins to experience persistent pain with every run that is increasing then they should be advised to get this assessed. A novice runner presenting with a history of previous injuries would benefit from a targeted strength and conditioning program to address any deficits.

Footwear

Runners should select shoes based on what is comfortable and avoid big changes in type of footwear. Runners should be advised that the shoes they wear are less important than the way they run and how they manage load. Lightweight shoes may improve performance in an experienced runner and should be adapted to slowly.

Papers mentioned in this episode

[Is there an economical running technique? A review of modifiable biomechanical factors affecting running economy](#)

[Influence of step length and landing pattern on patellofemoral joint kinetics during running](#)

[The training-injury prevention paradox: should athletes be training smarter and harder?](#)

[Optimizing strength training for running and cycling endurance performance: A review](#)

[A negative life event impairs psychosocial stress, recovery and running economy of runner.](#)

[Running shoes and running injuries: mythbusting and a proposal for two new paradigms: preferred movement path and comfort filter](#)

[The effectiveness of exercise interventions to prevent sports injuries: a systematic review and meta-analysis of randomized controlled trials](#)

[Chronic psychological stress impairs recovery of muscular function and somatic sensations over a 96-hour period](#)

[Frontal plane kinematics of the hip during running: Are they related to hip anatomy and strength?](#)

[High eccentric hip abduction strength reduces the risk of developing patellofemoral pain among novice runners initiating a self structured running program: a 1 year observational study](#)

Links mentioned in this episode:

[Couch to 5km](#)

Greg Lehman:

[Greg Lehman Website](#)

[Twitter](#)

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Tom Goom:

[The Running Physio Website](#)

[Twitter](#)

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[You Tube](#)

[Running Repairs Course, UK](#)

[Running Repairs Course, Australia](#)

Dr Christian Barton:

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