

## Improving performance: Speed and Endurance Training Strategies

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Early gains can come fairly quickly during training performance. However, after several months or even years of training, you may find yourself stuck on a performance plateau. Below, we will discuss strategies to help you move beyond this plateau.

### Part 1: SPEED

Speed can be broken into three trainable components. Developing a training strategy which hits each component will help improve your speed.

1. **Acceleration.** Acceleration is the period-of-time between the start of effort to the moment you reach maximum speed. A sudden and confident increase may be the difference between a win and loss in short sprinting events and stop and go sports. Improvements in acceleration can be accomplished adding short sessions of explosive exercises such as plyometrics, powerlifts, starting block drills or 10-meter sprints two or three times per week.



2. **Top-speed.** Let's use running as an example. Top-speed in runners is determined by stride rate and stride length. For example, if you run 100 meters in 10 seconds with 50 strides, then divide those 50 strides by the 10 seconds it took you to run. That means five strides per second. (Five strides per second is a common in elite sprinters, while three strides per second is common in elite marathoners). The stride length depends on an individual's leg length, but the stride rate is very trainable. Many runners attempt to improve speed by lengthening their stride and fail to realize the most important determinant of maximum speed is the stride rate (strides/sec). Top speed in cycling, can be trained by placing focus on increasing the revolutions per minute (rpm).
3. **Speed-endurance.** Many athletes separate endurance training from speed training. In doing so, they may focus on the duration of a workout rather than the content of the workout. This mistake can lead to "garbage miles" or time spent training that doesn't lead to performance gains. Speed-endurance is an often neglected but trainable skill: practice maintaining top speed. Runners and cyclists use sprint-intervals, which is a repetitive cycle of max effort sprinting followed by a short recovery. A good way to do this is using a heart monitor. Run to maximum effort, then slow to a jog until your heart rate slows to less than 100 beats per minute. After that, run to max effort again for a set distance. It is important to note that speed endurance training is sport-specific. This is to say, if you want to run faster, you need to practice running faster.

In summary, speed and endurance are a foundation to every training plan, but there are proven methods to improve performance that may be overlooked or underrated.

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# Exercise program for Knee Arthritis

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Although exercise improves life-expectancy, it has a reputation of worsening knee arthritis because of increased wear and tear<sup>1</sup>. However, exercise can decrease pain, improve function and delay the need for surgery in those with knee osteoarthritis<sup>3</sup>.

## Exercise program for knee arthritis

Exercise results in stronger muscle groups allowing for better stabilization and support at the knee joint. Deciding on an exercise program depends on the severity of your symptoms, your past medical history and your previous exercise experience. If you are new to exercise, currently have pain, or had knee surgery, see your doctor before deciding which exercise is right for you. Physical therapy can provide guidance and monitor progress while developing a regular home exercise program

## Tips to protect the knee joint:

1. Start slowly and ramp up gradually. Trying gentle movements of your joint is the best way to warm up<sup>5</sup>. Recommendations include range of motion exercises for 5-10 minutes prior to aerobic or strengthening activities
2. Heat: Applying heat is recommended prior to beginning an exercise regimen. The heat relieves joint pain and improves stiffness<sup>5</sup>. Apply heat for 20 minutes, and make sure it is not painfully hot



3. Ice: Cryotherapy is recommended after activity to help reduce joint pain and swelling. Try applying it for 15 minutes. Commercial cold packs can be even colder than ice so be careful. Placing a cloth between the skin and the cold object to prevent a burn can be helpful.

## Types of exercises

**Range-of-motion exercise:** The goal of range-of-motion (ROM) or stretching is to gain a normal amount of knee movement prior to your activity. Studies have shown that routine stretching improves stiffness over time<sup>7</sup>. Stretching should be done daily between three to 10 repetitions. Although we are focused on the knee, we recommend attention from the toe up to the core muscles or “working up the kinetic chain”.

Range-of-Motion exercises include: toe curls, ankle dorsiflexion and plantar flexion, ankle circles, ball kicks, glute kicks, leg raises, standing jacks, cross-body leg raises.

**Low impact exercise:** Low impact exercise reduces load on your joint as you move<sup>5</sup>. Examples include:

1. Stationary or recumbent bicycles
2. Elliptical or arc trainers
3. Water exercise, especially in water of 82 to 88 degrees Fahrenheit. Examples include:
  - Water Aerobics
  - Water Walking
  - Swimming

**Strength exercise:** Building strong hip abductors, quadriceps and hamstring muscles will support and protect the knee joint. Recommendations include: quad clenches, short and long quad arcs, straight leg raise, knee marching/hip flexion, kick backs, heel raises and sit to stand.

## Other activities

If scheduled gym-type routines are not for you, social sports or even small repetitive movements can help. This includes raking leaves, walking the dog or fun activities like bocce ball, pickle ball or shuffleboard. Body awareness exercises such as yoga, Pilates and Tai Chi, improve your balance, can prevent falls and promote relaxation.

[Resources](#)



# Snapping Hip Syndrome

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The term ‘snapping hip’ has been used to describe a variety of biomechanical conditions that cause both a snapping sensation and sometimes pain. There are two types of snapping hip syndromes — internal and external.

Internal snapping hip syndrome is caused by snapping of the hip flexor tendon (iliopsoas) over a bony prominence of the anterior pelvis known as the iliopectineal eminence.<sup>1</sup> It can also describe the iliopsoas tendon snapping over the lesser trochanter or the femoral head itself.<sup>2</sup> It most likely occurs when extending the hip after a period of hip flexion, generally beyond 90 degrees. The snapping sensation is typically appreciated in the anterior hip and thigh. History and physical examination alone are highly suggestive of this condition. Definitive diagnosis is done under musculoskeletal ultrasound, with direct visualization of the mechanical movement of the iliopsoas tendon with hip movement.

External snapping hip syndrome is characterized by the snapping of the gluteus maximus or more commonly the iliotibial band (ITB) over the greater trochanter of the femur. This condition is typically seen in athletes with tight lateral hip musculature. This mechanical sensation occurs during repetitive flexion and extension of the hip. It is sometimes described as “popping the hip out of the socket” but it is not a true dislocation or subluxation of the hip joint at all. Affected individuals are tender to palpation at the greater trochanter secondary to the underlying biomechanics of this condition. For this reason, it is often misdiagnosed as greater trochanteric pain syndrome. This diagnosis can also be made largely based on history and the location of the mechanical snapping alone. Active flexion of the hip joint to greater than 90 degrees followed by passive motion extension and abduction typically elicit symptoms during physical exam. Direct examination with ultrasound is often helpful in direct visualization of the affected tendon over the greater trochanter.

Imaging may include plain film radiographs including standard AP and frog-leg lateral views to rule out other hip conditions. Additional views such as a Dunn view may be helpful



in the diagnosis and evaluation of hip problems including the specific views for the evaluation of femoral acetabular impingement (FAI) and the presence of a possible bony abnormality of the femoral neck or acetabulum that could lead to either FAI or internal snapping hip syndrome. MRI can prove useful in the evaluation of other hip and pelvis conditions including athletic pubalgia. It might help in identifying acute and chronic tendon inflammation, labral pathology, or associated bursa irritation and be ordered to rule out these associated conditions. However, it is not generally required to make the diagnosis of internal or external snapping hip syndrome.

Treatments for internal and external snapping hip syndrome are varied and include stretching, rest, activity modification, medications, physical therapy, injections, and surgical treatment options. The majority of patients should be treated conservatively with non-operative treatment options as many will have sporadic, situationally dependent symptoms that due to not limit their functional abilities. A brief period of rest and avoidance of exacerbating factors, activities, and positions may be all that is required. For most persistent symptoms, non-steroidal anti-inflammatory medication may be useful on a short-term, limited basis for pain relief and

treatment of underlying inflammatory conditions. Physical therapy centers on stretching of the underlying tendon is involved. Treatment regimens with physical therapy may also involve core strengthening and other treatment adjuncts such as foam rolling of involved muscle groups or regions. Injections are not typically necessary but may be performed to relieve secondary bursal inflammation or tendon irritation by experienced physicians. These injections are typically done with corticosteroids and done under direct visualization with ultrasound. Other injection options such as dextrose prolotherapy are currently being explored and may have utility in specific populations. Surgical treatment is rarely required but generally involves either lengthening or release of the affected tendon or treatment of associated conditions such as a labrum repair or debridement.

In summary, snapping hip syndrome is a term used to describe a variety of hip conditions that involve a mechanical snapping sensation and may be accompanied by hip pain. A general understanding of hip anatomy and possible involved structures allows for a more precise characterization and diagnosis. This allows quicker diagnosis and better patient treatment. These treatments are generally noninvasive and may only require activity modification and appropriate counseling.



# Managing Calf Tears

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Calf muscle strains and tears occur during high-intensity, high-impact exercise. Injuries usually occur in sports involving sudden acceleration or changes in position.

The calf is composed of 3 muscles – the gastrocnemius, soleus, and plantaris – and injuries can differ depending on which muscle is damaged.

## Gastrocnemius Strain

Gastrocnemius strains are the most common; occasionally referred to as “tennis leg.” The injury typically occurs when the calf muscle and knee are extended suddenly and forcefully. A “pop” may be heard, followed by swelling, and an inability to bear weight. You may see bruising, swelling and have tenderness over the muscle.

## Plantaris Strain

Injury of the plantaris usually occurs with similar movements such as push off and jumping in basketball and pivoting in tennis. Pain is commonly



Grade	Symptoms	Signs	Return to Activity
I	Sharp pain at time of activity Usually able to continue activity with no to minimal discomfort Tightness or aching upon rest	Pain with calf raise	10 -14 days
II	Sharp pain at time of activity Unable to continue activity Significant pain with walking Swelling and bruising at the calf	Pain with calf raise Muscle weakness	14-21 days
III	Severe and intense pain at time of injury Unable to continue activity Severe bruising and swelling	Complete inability to contract calf	4-6 months of rehabilitation and surgical recovery

over the outside of the lower leg or behind the knee. Pain is less severe than gastrocnemius or soleus strains; and typically resolves in less than a week. Pain is located closer to the heel compared to other calf injuries.

## Soleus Strain

Soleus strains are more commonly chronic injuries and typically occur during low velocity movements that demand prolonged muscle tension, like a ballet dancer extending on their tip-toes, or trying to grab something from the top shelf. Distance runners who tend to run primarily on uphill or uneven surfaces or uphill can develop soleus strains causing deep calf pain with activity.

Grade I and II strains rarely require surgery. The recommendation of rest, ice, compression, and elevation (RICE), is the mainstay of treatment. Healing times can vary and depend on the severity of the strain, initial conditioning of the injured individual and personal response to treatment. If there is a complete grade III tear, surgical evaluation may be recommended.

If pain is severe, a walking boot is recommended. Heel lifts are also helpful as they decrease the stretch and pressure on the calf muscles. Compression sleeves worn over the calf can help with continued swelling often aiding in return to activity.

Ice can be helpful with swelling, inflammation and pain. Icing the most painful area four times per day for 20 minutes at a time until swelling subsides. Heat should not be applied to the area during the first 7-10 days, as this may increase swelling and bleeding within the muscle. Nonsteroidal anti-inflammatory medications or acetaminophen can be used as needed for severe pain, but as always, please consult your doctor prior to taking any medications.

Physical therapy may be recommended in order to strengthen the calf. The aim of the physical therapy often will be to shorten the recovery time and strengthen the surrounding muscles and joints (such as the knee and ankle) in order to provide more support to the calf and prevent re-injury.

Surgery may be required in patients who complain of ongoing extension pain (4–6 months) with evidence of contracture and inability to stand on their tiptoes.

Returning to exercise and activity often will be done with the guidance of your doctor and physical therapist. They may recommend an interval running program and home stretches/exercises for complete rehabilitation.

## References

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