

HAMSTRING INJURIES: WHY ATHLETES ARE REPORTING HIGH INCIDENCES OF INJURY AND RE-INJURY WHILE RUNNING



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INTRODUCTION

Hamstring injuries are the most prevalent types of injuries for team sports. They account for up to 26% of injuries in Australian football, American football, rugby and track and field. Additionally, the biceps femoris muscle is the most commonly injured muscle, as up to 68% of these hamstring injuries occur while athletes are sprinting. With this in mind, we have organized a guide to the hamstring muscles – what it is, how it can get injured, and what the healing process looks like.

WHAT IS THE FUNCTION OF THE HAMSTRING?



Located in the posterior of the thigh, the hamstrings are composed of three muscles called the biceps femoris, semimembranosus and semitendinosus. The three originate at the ischial tuberosity, also known as the sit bone. The biceps femoris spans behind the knee to attach posteriorly and laterally (at the head of the fibula) while the semimembranosus and semitendinosus travel posteriorly and medially (to the tibial condyle and pes anserinus) to create the upper portion of the diamond shape behind the knee (aka popliteus fossa).

These muscles cross two joints (the hip and the knee) and therefore are responsible for the extension of the hip and flexion of the knee. These muscles are often at the root of most hamstring sports injuries, as there can be more motor control dysfunction for muscles that cross two joints.

WHAT IS A NORMAL RANGE OF MOTION FOR A HAMSTRING DURING A PASSIVE STRAIGHT LEG RAISE?

During an isolated straight leg raise, an athlete's 'normal' range of motion can vastly vary, but on average our athletes range from 70-90 degrees of hip flexion. Athletes experiencing an injury may not be able to control their range of motion, resulting in a loss of stability and overall joint function.

Here, it's important to note the differences between flexibility and mobility, as they are not the same thing although they are often used interchangeably.

Flexibility is the ability of a muscle to lengthen while mobility is the ability of a joint to move actively through a range of motion. It is possible to be inflexible but to have great mobility, which is why it's crucial to not mix up these two concepts.

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WHEN IS A HAMSTRING SUSCEPTIBLE TO INJURY?

There are many risk factors for hamstring injuries, including age, history of a previous injury, strength imbalance, fatigue, and low eccentric strength. And, athletes who may have great flexibility but limited mobility are also susceptible to these kinds of injuries.

HOW DO I KNOW IF I HAVE A PULLED HAMSTRING?

There are three types of hamstring injuries, starting with mild first-degree strains and concluding with severe third-degree strains:

FIRST-DEGREE STRAIN OR CONTUSION

A mild or first-degree hamstring injury occurs when there are a few tears in the muscle fibers. Athletes will typically experience minor swelling and discomfort, minimal to no loss of strength and minimal to no restrictions to their movement. Athletes should restrain from activity to ensure the tear has time to fully heal. In general, these strains resolve within three weeks.

SECOND-DEGREE STRAIN OR CONTUSION

The second type of hamstring injury is a more moderate strain that results in a greater tear in an athlete's muscle fibers. There is more swelling and pain present as well as a significant loss of strength and movement.

THIRD-DEGREE SEVERE STRAIN OR AVULSION

A third-degree hamstring injury is the most severe, resulting in a complete tear across the muscle fibers. There is a complete loss of motor function, severe pain, and serious muscle weakness. In most cases, athletes cannot put weight on the affected leg and crutches are needed.

For third-degree hamstring strains, surgery is sometimes considered the most appropriate course of action, especially for athletes who have no motor function at all. For these kinds of hamstring injuries, seeking a medical professional for diagnosis and proper treatment is necessary.

WHAT MUSCLES WORK WITH THE HAMSTRINGS?

The body functions as a whole, so when one muscle group is overloaded, other muscles come along to help. The following muscles work with the hamstrings in order to support one another and provide stability to the posterior chain:

- Gastrocnemius
- Soleus
- Gluteus maximus
- Piriformis
- Quadratus lumborum
- Lumbar extensors
- Neck extensors

The semimembranosus, semitendinosus and biceps femoris muscles support the hip and knee. They also have a relationship with the posterior fibers of the adductor magnus (sometimes called the 4th hamstring). Together, these fibers work to make hip extension easier, although it can sometimes lead to dysfunction. This can be due to overworking one muscle group more than the other.



Zach Moreno

KLynergy Massage & Wellness

HIP FLEXOR VS. HAMSTRING

"Muscles that cross multiple joints have more responsibilities and the hamstrings (knee and hip) are one of them. Too much sitting, for example, can cause us to lose hip extension, our ability to get our thigh bone (femur) behind our torso without spine compensation. When we lose that ability, the mind-body must choose an alternate pathway.

Most compensatory patterns include an outward rotation of the foot rather than pushing straight through the foot. This is because we are having trouble accessing the hip extension at all. Structures become overburdened, including your outside hamstring, which creates a higher chance for re-injury as you constantly require that tissue to make up for lack of function in other tissues."

Zach Moreno, LMT.

WHAT MUSCLES FIGHT AGAINST THE HAMSTRINGS?

Antagonist muscles are the ones doing the exact opposite as the muscles that are being used during movement. It is the muscle that is at rest. For the hamstrings, the antagonist muscles are the hip flexors (also known as the iliopsoas) and the knee extensors (also known as the quadriceps).

WHY DO OTHER PAINS ARISE?

When an injury occurs, the body recruits other muscles and nerve pathways to compensate in order to stabilize the muscles and allow athletes to perform to the best of their ability. These compensatory patterns are often subtly different to athletes so they are unable to detect a change initially. Until, that is, other injuries or wear and tear begin to show in the form of inflammation or referral pains.

Some of the more common compensatory patterns athletes experience due to a hamstring injury include:

- Hip pain
- Knee pain
- Loss of push-off on the big toe
- Loss of strength in the gluteus maximus
- Neck or low back pain
- SI pain
- Shoulder pain
- Sciatica





HAMSTRING REINJURY

During the late swing phase of running, the biceps femoris and other hamstring muscles function eccentrically to resist the opposing actions of hip flexion and deceleration knee extension. The hamstrings are most vulnerable to injury during this late swing phase just before the foot is in contact with the ground. This lengthening injury prominently occurs during running.

On a cellular level, a muscle strain (tear) takes roughly 6-8 weeks to heal, that is without re-injury. Here is the catch that most athletes fall victim to, though: most athletes are not able – or willing – to rest sufficiently in order to allow for isolated healing. Or worse, they continue to train and compete using injured muscles. So when a repeated injury occurs, time and again it is because an athlete has been building up scar tissue. A certain amount of rest is crucial to allow cells to lay their groundwork repair.

HAMSTRING TREATMENT PHASES

The following stages are based on a treatment protocol for athletes from Canton et al. it is important to note that the phases differ from athlete to athlete, based on the severity of their injuries. Returning to the game prematurely will put you at an increased risk of reinjury.

PHASE I – ACUTE (LASTS 1-7 DAYS)

During this phase, athletes should follow the RICE treatment protocol: rest (isolate the movement in order to assess), ice (decrease excessive vasodilation), compression (minimize excessive swelling) and elevation (gravity exacerbates swelling). Doing so will control hemorrhaging and minimize inflammation and pain. It is important to note that inflammation is a sign that cells are coming to the site of the injury to repair the area. So, while some inflammation is beneficial for repair and remodeling, it still should be controlled.

PHASE II – SUBACUTE (1 TO 3 WEEKS)

Inflammation and pain begin to subside and some muscle activation should occur at this time. Delaying this could result in significant loss of strength and atrophied muscles. During this phase, it's good to introduce concentric exercises and isometric contractions. The goal is to achieve full range of motion without pain. Athletes should proceed gingerly, not aggressively, with movement exercises to avoid reinjury.

"Between an athlete who is used to continuous training and recovery, or a weekend warrior (plays for a league, not professional), or someone who just runs a single marathon, the recovery time depends on the person because of how active they are. There's a huge correlation with how you train, how long you've been training, what you've been doing for recovery beforehand, and how hard you can push your body.

At a bare minimum, you give them 3 days before active isolated stretching (AIS) to make sure there is no microtear. If there is any inflammation, you don't want to exacerbate that. The athlete who is more used to the recovery can do [AIS] immediately because of their years of training," says Mary Etheridge, LMT.



Mary Etheridge
A Better You Tampa

HAMSTRING TREATMENT PHASES

PHASE III – REMODELING (1-6 WEEKS)

During this phase, most of an athlete's scar tissue will restrict the range of motion. However, it's also when athletes are most at risk of reinjury because they start to experience less pain and introduce higher intensity workouts that their body is not ready for. Stretching, massage, NKT, acupuncture and other soft tissue therapies are a great supplement to help with recovery. Additionally, eccentric exercises can be introduced into training.

PHASE IV – FUNCTIONAL (2 WEEKS TO 6 MOS)

Athletes can return to their sports and training without risk of reinjury. They can progress from low-speed jogging to running and finally to sprinting, as long as they remain pain-free.

PHASE V – RETURN TO COMPETITION

Athletes are fully healed and can return to full-strength workouts and being on the field. During this phase, it's important to continue mobility training to maintain strength and reduce the risk of reinjury.



"Anytime peripheral tissue is injured, assessing load tolerance is crucial for determining where to start treatment. Determining any underlying neural impetus that may be influencing recovery or return to performance is equally as important. The hamstring is a vital part of the kinematic chain and requires proper recovery in both of these areas to facilitate the best outcome." Ryan Flick, DPT.



HOW LONG DOES IT TAKE TO RECOVER FROM A HAMSTRING INJURY?

Athletes can be tricked into thinking their hamstring injury has healed because of the eccentric capacity (the ability to disperse through lengthening contractions) of the hamstring. This is often where coaches and players prematurely deem an injury 'recovered' and ready for play.

However, since the hamstring has not been fully challenged or stressed yet because high-intensity workouts have not been reintroduced, it's inaccurate to consider the injury to be fully healed. That's why it's crucial for athletes to work their way through each stage of the treatment protocol.

In fact, a study conducted of soccer players with hamstring injuries showed that their recorded strength was at 70% at two weeks, 85% at three weeks and 90% at six weeks when they were tested using isometric exercises. The average time the athletes felt stronger than the initial injury was 16 weeks.

HOW CAN ATHLETES BE PROACTIVE?

Athletes should always be proactive when it comes to general muscle maintenance and injuries, as controlling hemorrhaging and minimizing excessive inflammation and pain is key. The most immediate way to address the onset of injury is through the RICE method: rest, ice, compression, and elevation.

Additionally, the following therapies can assist an athlete's recovery:

- Massage
- Increases circulation
- Reduces edema through flushing
- Breaks down adhesive scar tissue
- Returns pliability of the muscle
- Renews or improves mobility
- Decreases susceptibility of re-injury
- NeuroKinetic Therapy
- Re-establishes the brain-body connection
- Addresses referred pain patterns
- Reprograms compensatory patterns
- Integrated Kinetic Neurology
- Reinforces body balance
- Restores proprioceptive control and agility
- Decreases painImproves functional movement screens
- Improves the brain-body connection



Experts in order of mention:

Zach Moreno - KLynergy Massage & Wellness

Mary Etheridge - A Better You Tampa

Ryan Flick - Integrated Kinetic Neurology

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