

Preventing Hamstring Injuries: By Mitch Hauschildt

Hamstring injuries have long been feared by athletes and coaches alike. The sight of an athlete dropping to the ground as if hit by a sniper bullet is disturbing to anyone who witnesses it. Months of speed training and conditioning can be quickly negated with one hard sprint. To make things worse, many athletes have a tendency to develop what has been termed “chronic” hamstring injuries, ending seasons prematurely and in some cases shortening careers. In this article, we will challenge traditional thought processes with regards to hamstring injuries and demonstrate that they are one of, if not the most preventable sports injury.

In order for us to prevent the hamstring injuries, we must first understand how they work during athletic movements. Biomechanics literature supports the notion that the hamstrings’ primary responsibility is to decelerate the lower leg to control toe placement while sprinting.

In order to do this, the hamstrings must contract eccentrically (as they lengthen) to slow the lower leg to a controllable speed and absorb energy. By nature, the eccentric contraction is very difficult for any muscle, especially at high speeds. This is why most hamstring injuries occur just prior to or right at toe placement at the end of the recovery phase of the running cycle.

The anatomy of the hamstrings are such that they span both the hip and knee joints, making it possible to perform several movements. As demonstrated in Figure 1 (adapted from Roger Cole), the hamstrings originate at the ischial tuberosity on the back side of the pelvis and insert on the lower leg. As the muscle shortens, it will perform hip extension, knee flexion, or both. With that being said, *the hamstrings are not intended to perform hip extension during sprinting*. Even though the hamstrings can **assist** with hip extension, **the glutes are much better suited for this movement**. *If the glutes are weak or not firing properly during activity, the hamstrings have to perform the bulk of hip extension and become overtaxed.*

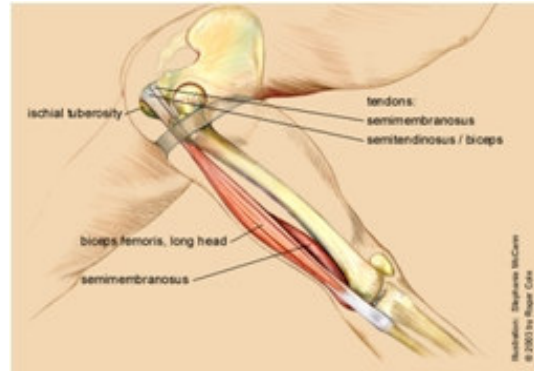


Figure 1

When we look at hamstring injuries, there are several key causes

1. Strength: There are actually 2 strength issues when looking at the hamstrings. First, while very rare, there are instances where an athlete can become so quad strong and dominate, that they overpower the hamstrings. This will only occur for athletes who are performing a large number of squats, lunges, step ups, leg extensions, etc. for the quads, and very few reps of hamstring work. The second strength issue is much more of a problem for most coaches. As we discussed above, the hamstrings contract eccentrically during sprinting, yet we have been taught that hamstring strengthening is best achieved through concentric means (leg curls). We have become very good at replicated sporting activities with our agility and speed training, but still seem to fall short when it comes to appropriately strengthening the hamstring group.

2. Flexibility: Conventional wisdom has stated that in order to prevent hamstring injuries, we need to stretch the hamstrings. Looking back at the anatomy of the hamstrings (figure 2; adapted from Roger Cole), we can understand if the pelvis becomes rotated forward (anteriorly) the ischial tuberosity will rise and thus put the hamstrings on stretch. Oftentimes, this happens when the hip flexors on the front of the pelvis become tight and shortened, rotating the pelvis anteriorly. When an athlete combines a prestretched position with a very difficult eccentric contraction, it is easy to understand how hip flexor flexibility deficits play a much larger role on the hamstrings than hamstring tightness.



3. Core Stability: The inner muscles of the core (specifically the transverse abdominus and multifidus) are responsible for stabilizing the pelvis. If the core is unstable, the pelvis will be allowed to enter the same forward tilt mentioned above and put the athlete at risk for injury.

4. Neuromuscular Response: At times, an athlete may run into a situation where their hamstrings “forget” how to fire in the proper sequence needed for efficient movements. This is especially true for athletes who perform hill training as a means of power development. When they run uphill, the glutes, quads, and calves fire at a very high rate to propel the body forward. When this happens, the concept of reciprocal inhibition comes into affect. Reciprocal inhibition states that when one muscle contracts, the opposite muscle relaxes. The greater the contraction, the greater the relaxation. This can be good for speed training, because teaching over active hamstrings to shut down, can minimize braking forces during sprinting. However, too much of a good thing can cause problems. Teaching the hamstrings to shut down over and over, can cause the muscle group to forget how to fire properly when they are sprinting on flat ground.

5. Biomechanics: The mechanics of the entire lower extremity also need to be considered. Looking at the mechanics of the pelvis and hips are important for those athletes with recurrent injuries and/or injuries that always occur on one side of the body. If an athlete presents with a rotation or upslip of one side of the pelvis, they will have a functional leg length discrepancy. Many athletes also present with an anatomical leg length discrepancy where they are naturally built with one leg longer than the other. This is a very detailed evaluation process that is best left to medical personnel and is beyond the scope of this article, but we need to acknowledge that this factor exists.

Now that we understand the risk factors for hamstring injuries, we need to figure out how to appropriately address them. It may seem somewhat daunting to tackle all of them with a few modifications to what our athletes are currently doing, will pay valuable dividends when the season arrives. *As we look at each of the factors, here is how to easily and quickly make significant improvements in hamstring injury rates:*

1. Strength: First off, for every quad rep completed, perform a hamstring exercise. *This will ensure that your athletes will not become quad dominate.*

Second, **get your athletes off of the leg curl machines where they strengthen the hamstrings concentrically, and strengthen them eccentrically** through Romanian Dead Lifts (RDLs; Figure 3) or Good Mornings. These exercises work the hamstrings as they get longer and replicate the demands of the hamstrings during sprinting.



2. Core Stability: You must assess your athlete's core strength vs. core stability. Just because your athletes can perform a lot of crunches on a stable surface, does not mean that they can stabilize their core. Teach athletes to stabilize their inner abdominal muscles through remedial draw-in progressions and evolve to stability holds and then dynamic stabilizing movements either with medicine ball or physioball exercises. There is a lot of information available on this topic. Whatever your approach, make sure the core is addressed on a daily basis and you challenge your athletes to perform stability exercises at a high level.

3. Flexibility: Focus the bulk of your athlete's flexibility work on their hip flexors. Initiating every flexibility session with a good hip flexor stretch (i.e. In Line Lunge; Figure 4) will not only help you emphasize the importance of the hip flexors to your athletes, but will reset the pelvis in a more neutral position prior to performing other stretches.



4. Neuromuscular Response: The simple fix for neuromuscular firing issues is to integrate ground based sprint training along with hill running. Also, basic sprint technique drills that have been traditionally used for track athletes (i.e. A Skips, B Skips, High Knees, Butt Kicks, etc.) can pay valuable dividends for preventing injury. Performing drills 2-3 times per week for 10-15 minutes will keep the muscles of the lower extremity constantly firing in the sequence that they were intended to.

5. Biomechanics: As stated above, this evaluation process is highly technical and should be left to qualified medical personal. The important thing to take from this is to know your athletes. If they have recurrent injuries that they can't seem to shake, or if you see that they have a history of right or left sided injuries, they need to be evaluated from the feet to the hips and everywhere in between to find the weak link.

As always, all of this should be incorporated into a comprehensive program including a proper dynamic mobility warm up, power development, stability training, strength training, speed and agility training, and conditioning to work properly. With that in mind, making some simple changes to the already quality program that you are performing will quickly eradicate hamstring injuries from your team. Your players and their fans will thank you.