

# Dynamic Health Services



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## **Don't Let a Hamstring Strain Happen to You!**

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### Anatomy

The hamstrings are situated on the back aspect of the thigh and are commonly injured in athletes, often becoming a troublesome chronic condition. The hamstring muscle group consists of three muscles- the semimembranosus, semitendinosus, and the bicep femoris (long and short heads) which run from the hip or upper thigh and across the back of the knee to the lower leg. They all originate on the ischial tuberosity (the bone you sit on) with the semitendinosus and semimembranosus muscles running down the inner aspect of the thigh and the biceps femoris running down the outer aspect. The bicep femoris also has a short head that originates on the outer aspect of the thigh bone. They assist in extending the hip, bending the knee, and providing stability for the knee.

### Function

The muscles act to decelerate the hip and knee during late swing phase, extend the hip during stance phase, and bend the knee when the foot is not weight bearing. When walking and running, the hamstrings function to coordinate the motions of the knee and hip along with the quadriceps muscle. As the speed of the movement increases, greater demands are placed on the muscles. It is during early take-off and late swing phase of running that most hamstring injuries occur.

### Mechanism and Factors of Injury

Of the three, the biceps femoris muscle is injured the most, usually during the early take off phase. The semimembranosus and semitendinosus muscles may also be injured, with most strains occurring during the swing phase of the gait cycle. The mechanism of injury is usually from the increased force generated during the eccentric or lengthening action of the muscle as opposed to a shortening contraction. In the running cycle, the hamstring becomes vulnerable to injury when the muscle decelerates the extending knee during forward swing and also at take off, secondary to the sudden change in function of the muscle from stabilizing the knee in flexion to having to assist in extension of the knee. The two most common factors in hamstring injury are lack of adequate flexibility and strength imbalances in the hamstrings, either right versus left or quadriceps to hamstring strength. A hamstring to quadriceps ratio of less than .6 or a strength imbalance of 10% or more between the right and left hamstring have

been proposed to be a factor in injury. Other factors contributing to injury include hamstring weakness, faulty biomechanics and muscle fatigue. Any individual having less than the normal hamstring flexibility of 70-80 degrees of hip flexion with the knee fully extended is at a greater risk for injury. Muscle fatigue has also been identified as a factor in hamstring injuries, possibly from depleted glycogen supplies.

### Signs and Symptoms of Injury

With an acute strain, the athlete is immediately aware of the injury and may feel as if something has “popped” in the back of the thigh. In more severe cases, a more intense tearing sensation may be felt with pain from the top of the thigh to the back of the knee. There is usually generalized pain with tenderness localized to the area of the actual tear. Swelling may occur as well as the inability to fully bend the knee against resistance and limited passive straightening of the knee. A slower onset of strain is commonly seen in long distance runners with progressive tightness and discomfort in the upper third of the muscle. Localized tenderness may or may not be present. Hamstring flexibility is limited, weakness is usually apparent, and running gait is altered and often asymmetrical.

### Treatment and Recovery

During the immediate (first 3-5 days) stages of treatment the usual protocol of rest, ice, compression, and elevation, along with anti-inflammatory medication is prescribed with the main goal of controlling hemorrhage, swelling and pain. Heat, electrical stimulation, and ultrasound modalities may also be used to facilitate a return to competition. Heat is effective at increasing tissue temperature prior to stretching and exercise while electrical stimulation can be used to control swelling and pain. Ultrasound is used as a form of deep heat during the subacute and remodeling phases to decrease spasm and prevent shortening of the tissues. Following the acute stages of injury, deep tissue massage and progressive stretching is also indicated as well as a strengthening program to correct for any muscle imbalances.

### Prevention

Since the most common factors cited for hamstring injury are lack of flexibility and strength imbalances, these areas should be emphasized in any prevention program. Prior to competition, a general warm-up (jogging, cycling) to increase tissue temperature followed by dynamic vs. passive stretching involving sport specific movements is recommended. Examples would be the forward lunge, high knee marching/jogging, and straight leg kick.

See Iron Hamstrings link for a simple hamstring prehabilitation routine!

### Summary

Hamstring strains are a common problem that affect athletes of all sports and abilities. An appropriate rehabilitation program should address all predisposing factors that may have caused the hamstring injury, such as lack of flexibility, muscle imbalances, biomechanical problems, and errors in training or nutrition. Proper rehabilitation is a complex issue and sport specific exercise is highly beneficial in returning an athlete to competition.