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From the U.S. Soccer Communications Center  
Prevent Common Injuries in Soccer: Hamstring Strains

The top four time loss injuries in soccer are ligament injuries (to the ankle and knee) and muscle strains (to the hamstrings and groin). In many studies, a lateral ankle sprain is the top time loss injury, but in recent years, hamstring strains have been creeping up the list. In some recent reports, hamstring strains have been the number one injury.

In a previous post, the research process for injury prevention was presented. First, establish the incidence of injury. Second, determine how the injury happens. Third, devise a prevention protocol and finally, determine if the post intervention incidence is indeed lower. Let's follow this protocol as it has been applied to hamstring strains in a study (Arnason, 2007) conducted at the Oslo Sports Trauma Research Centre, a FIFA Medical Center of Excellence.

Step 1: Just what is the rate of hamstring injury in soccer?

A generation or two ago, hamstring strains were a rare injury in soccer. Only one teammate of mine in college (1970's) had a hamstring strain and that was over a full 4-year period. Today, a college team that has only one hamstring strain in a season would consider that a good year.

Remember, the overall match injury rate for professional males is between 25-30 injuries per 1000 match hours (this is mostly a match injury). The injury rate for international competition is two to three times higher. Current statistics show the frequency of hamstring strains in males to be up to 16% of all injuries (Croiser, 2008), or around three to four injuries per 1000 match hours (Arnason, 2007).

The medical literature has looked at risk factors; variables that suggest a player are prone to injury. The primary risk factor of any injury is a history of a prior injury – if you've had one strain, your chance of another strain is markedly greater than a teammate with no prior strain injury. A past hamstring strain raises the risk of another strain by a factor of six to eight times, so preventing the first injury would be really important. Other risk factors of hamstring injury include increasing age, strength imbalances, and flexibility and this is where prevention efforts are directed.

Step 2: How do injuries occur?

A hamstring strain is considered a sprinting injury although it can also happen during powerful kicking.

Strain injuries are predictable. They occur in muscles that have a complex design (some simple muscles look like the straight parallel grain of wood while other more complex muscles look more like a feather. Even more complex designs exist) and cross two joints. The three hamstrings begin on the pelvis and cross the hip, then the knee before finally inserting on the tibia (semimembranosus, semitendinosus) and fibula (biceps femoris). Of the three, the biceps femoris (makes up the lateral aspect of the back of the thigh) is the muscle that is injured most frequently.

Muscle strain injury happens when a muscle, while being stretched, is asked to perform a strong contraction. When the proper interaction of events occurs, the muscle can tear away from the tendon. Muscle doesn't tear within the muscle belly; it tears at, or near, where the

muscle joins with the tendon. A player sprints, and then when trying to increase speed reaches out further with the leg and when the foot hits the ground, the hamstrings contract and the muscle can tear. In some severe cases, the tendon can tear away from bone (called an avulsion injury).

Step 3: Devise prevention programs.

Prevention programs are designed to address proven risk factors. We can't do much about age and prior injury other than encourage those with a past history of a hamstring strain or the older player that they need to protect their hamstrings. But strength and flexibility are factors that can be modified.

**Strength:** It is somewhat intuitive that weak hamstrings would be the most susceptible to injury and a number of studies have been conducted to see if improving strength will reduce the number of strain injuries. One study followed the professional Icelandic and Norwegian leagues for four years (Arnason, 2008). The first two years were to establish the rate of hamstring injury and the next two studied the results of an intervention. The normal routine amongst the teams was to perform warm-up and do some stretching exercises. For the intervention period, the research team inserted a strengthening exercise they termed the Nordic Curl or Hamstring Curl. The kneeling player has his ankles held down by a partner. Keeping a straight trunk and hip, the player slowly lowers their body until they are unable to control the descent where they use their hands to protect the fall. The goal was to do 12 repetitions. As the player got stronger, they tried to control the descent as far as possible. Once 12 repetitions of the full range of motion were accomplished, the player was to be given a gentle push at the start to make it a little harder to control. While there are other strengthening methods possible, this particular curl exercise was studied because it requires only a partner and can be done on the field at training.

**Flexibility:** The most common intervention for muscle strains is static stretching. The thought is that if the muscle is lengthened, it will take more of a stretch to damage the muscle. The Arnason study had half the teams follow a traditional flexibility program that included static stretching and the other half added the Hamstring Curl to their warm-up.

Step 4: Re-assess injury rate to determine the program's effectiveness.

In the teams that used the Hamstring Curl exercises, the incidence of hamstring strains was reduced by 65%. The rate of re-injury was not influenced by the use of the curl exercises suggesting that the using the curls was effective at preventing the first injury. But when a re-injury did occur, the injury was less severe meaning a quicker return to play. No one was hurt doing the curl exercises and no one complained of delayed soreness. Flexibility training alone had no effect on the incidence or severity of hamstring strains.

Based on the current data on just who suffers this injury, adding the Hamstring Curls to a training program (usually during warm-up) would be wise, especially in highly competitive soccer such as elite age-group players, college, and professionals (particularly for older players). Hamstring injuries can be the most common injury during intense, high-speed competition so including this curl exercise will strengthen the hamstrings to become more resistant to injury. If an injury does occur, the data suggest that the injury will not be as severe. Adding this exercise is a small investment to pay for preventing a major muscle strain injury.

For more information:

View a video of the Hamstring Curl at [www.FIFA.com](http://www.FIFA.com), scroll down and click on 'player's health'. Click on the picture that links to The 11, and then click on Launch The 11. A list of exercises is displayed on the left. Choose No. 3 Hamstrings. A description will be displayed. Click on the link to see a video of the exercise.