Eccentric Training to Reduce Hamstring Injuries in Sprinters

Jason Brumitt, MSPT, SCS, ATC, CSCS,*D

One of the worst things a sprinter can hear from an athletic trainer or a physical therapist is the words "you pulled a hammy". A "pulled hammy" is a strain injury to the hamstring muscle group. This injury can be extremely painful and have a slow recovery. The purpose of this article is to provide you with training suggestions in order to help reduce your risk of this injury.

Risk Factors for Hamstring Injuries

The hamstrings consist of three muscles: the Semitendinosus, the Semimembranous, and the Biceps Femoris. Hamstring injuries can occur during sprinting especially when decelerating. Many risk factors have been proposed including a previous history of a hamstring injury, hamstring weakness, and hamstring tightness (1, 2, 4). You may be able to reduce your risk of injury by performing some specific stretching and strengthening exercises (table 1).

Stretching

There are many ways to perform the static hamstring stretch. Figure 1 demonstrates a classic static hamstring stretch. When performing a static stretch for the hamstrings you should attempt to maintain a straight back throughout the movement. For optimal flexibility gains stretching should be performed on a daily basis.

Recent evidence suggests that an eccentric form of hamstring stretching may have a superior immediate effect on flexibility as compared with traditional static stretching (5). To perform the eccentric hamstring stretch, wrap a 3-foot strap or thick resistance band around the heel (figure 2). From this starting position, pull on the bands to bring the hip into full flexion. As you pull the leg into hip flexion, contract your hamstring muscles as if you were attempting to resist the hip flexion motion (5). You should perform each eccentric repetition for five seconds.

Static stretching appears to have limited to no effect on injury prevention and may even decrease an athlete's strength (6). Eccentric stretching exercises on the other hand may serve a protective role when incorporated into a pregame dynamic warm-up (5). You should consider performing static stretching at the end of your workout or event.

Tables 1 and 2. Hamstring Stretching and Strengthening Program

Hamstring Stretching: Perform Daily		
Static Stretching	3 sets x 30 second holds	Perform at the end of a workout or after an event. May be performed as part of a pre-event or pre-game workout.
Eccentric Stretching	6 sets x 5 second	

Strengthening Program: Perform 2 Times Per Week	
Leg Curl Machine	3 sets x 10 repetitions
Lunges	3 sets x 15 repetitions
Assisted Russian Hamstring Curl	1 – 2 sets x 15 – 25 repetitions
Good Morning Exercise	2 sets x 10 – 15 repetitions

Figure 1. Static Hamstring Stretch

Strengthening

The key to avoiding a hamstring injury may rest in your ability to increase the strength of the hamstrings. The following exercises (Table 2) should be considered and performed as part of a comprehensive training program.

Leg Curl Machine

Performing the traditional leg curl exercise can help athletes increase their overall concentric hamstring strength. Unfortunately, if one only performs this exercise, it probably will not serve a protective role.

Lunge *(figure 3)*

It has been speculated that core weakness can contribute to a hamstring strain (3). The walking lunge is a valuable exercise for sprinters in that it strengthens the core and the lower extremities in a functional position.

Assisted Russian Hamstring Curl *(figures 4 & 5)*

To perform this challenging exercise, hook your heels under a bench (or similar object). Assume the starting position with your knees bent to 90º and your back straight (figure 4). Perform the exercise by leaning forward, lowering your body as low as possible toward the floor. Once you are on the floor, contract your hamstrings to return your body to the upright starting position (figure 5). This exercise is usually extremely difficult at first, with many athletes lacking the strength to lower themselves all the way to the floor. If you are unable to lower yourself throughout the entire range of motion to the floor, use a bench or a stability ball to provide an alternate end point.

This exercise may also be performed with the assistance from a partner or your strength coach. Wrap a thick resistance band around your waist or torso. Choose a band that is pliable enough to allow you to lower yourself under control toward the floor, but strong enough to not break when loaded by your body weight. Return to the starting position by contracting your hamstrings. Pulling on the band, the coach or partner is able to assist your return to the starting position

Good Morning Exercise *(figure 6)*

Choose a training bar or a light weight-lifting bar (15lbs to 25lbs) and place it across your shoulders. The exercise is performed by bending at your waist while keeping your head up and your back and legs straight. Lower yourself toward a position where your torso is parallel to the floor. It is important to maintain proper form, especially avoiding rounding your low back.

Additional Training Tips

The exercises suggested here will provide you with an initial program to increase your hamstring flexibility and strength. These exercises should be performed as a part of your comprehensive training program.

References

1. Brockett CL, Morgan DL, Proske U. (2004). Predicting hamstring strain injury in elite athletes. Medicine & Science in Sports & Exercise, 36(3): 379 – 387.

2. Foreman TK, Addy T, Baker S, Burns J, Hill N, Madden T. (2006). Prospective studies into the causation of hamstring injuries in sport: a systematic review. Physical Therapy in Sport, 7(2): 101 – 109.

3. Fredericson M, Moore T. (2005). Muscular balance, core stability, and injury prevention for middle- and long-distance runners. Physical Medicine and Rehabilitation Clinics of North America, 16(3): 669 – 689.

4. Jonhagen S, Nemeth G, Eriksson E. (1994). Hamstring injuries in sprinters: The role of concentric and eccentric hamstring muscle strength and flexibility. *The American Journal of Sports Medicine*, 22(2): 262 – 266.

5. Nelson RT. (2006). A comparison of the immediate effects of eccentric training vs. static stretch on hamstring flexibility in high school and college athletes. *North American Journal of Sports Physical Therapy*, 1(2): 56 – 61.

6. Thacker SB, Gilchrist J, Stroup DF, Kimsey CD. (2004). The impact of stretching on sports injury risk: A systematic review of the literatures. Medicine & Science in Sports & Exercise, 36(3): 371 – 378.

About the Author

Jason Brumitt is a board-certified sports physical therapist residing and practicing in the Portland, OR area. He serves as adjunct faculty for Pacific University's school of physical therapy. He is currently pursuing his Doctor of Science degree at Rocky Mountain University of Health Professions. To contact the author email him at jbrumitt72@hotmail.com.

▲

Figure 2. Eccentric Hamstring Stretch

Figure 3. Lunge

Figure 4. Russian Hamstring Curl Start Position

Figure 5. Russian Hamstring Curl Raising

Figure 6. Good Morning Exercise