Stop Hamstring Pulls *Now!*

10 tips to prevent this frustrating injury

BY **KIM GOSS, MS**

At the Olympic Trials in track and field, an athlete must finish in the top three in their event to earn a spot on the Olympic Team – finishing fourth is essentially equivalent to placing last. At this level, these elite athletes have proven their superiority, but no matter how prepared they are, an injury to their hamstrings can instantly destroy their chance to compete. In the 200-meter finals of the 2000 Olympic Trials, this is exactly what happened to two athletes who had been expected to battle for Olympic gold.

One of these athletes was Michael Johnson, the current world record holder and defending Olympic champion in the event. The other was Maurice Greene, then-holder of the world record in the 100 meters. In the finals of the 200 meters the unthinkable happened when Johnson pulled his left hamstring in the curve and Greene did the same just coming out of the curve. The only consolation was that Johnson had already qualified in the 400 and Greene in the 100, and at the Games both earned Olympic gold.

Could these hamstring injuries have been prevented? We'll never know, and consider that athletes at this level usually have access to sound sports medicine care. But we do know that hamstring injuries are often difficult to heal – some never heal completely – and often inhibit athletes from going all out in training and competition. Case in point: A 2010 study published in the *Journal of Orthopaedic and Sports Physical Therapy* found that although most athletes can return to sports within three to four weeks after a hamstring injury, about a third of them will reinjure their hamstrings within a year.

On the positive side, we also know there are risk factors associated with hamstring injuries. Here are 10 of those risk factors, along with advice on dealing with them:

1. Improper running mechanics. A popular joke in athletics is that to be a good track coach the only thing you have to do is stand in the middle of the track and shout, "Run faster, turn left, run faster, turn left…! Of course it's not that simple. Being able to design appropriate workouts is important, and equally important is being able to teach athletes how to run. To get you started on learning good sprint mechanics, learn the BFS 6 Absolutes and read the section on running in the book *Bigger Faster Stronger*. A great print resource on running mechanics is *Running: Biomechanics and Exercise Physiology in Practice* by Frans Bosch and Ronald Klomp (Churchill Livingston, 2005). It's 424 pages of heavy reading, but it also comes with an excellent DVD that shows how to put the information into practice.

2. Inadequate warm-up and cooldown. Improperly designed workouts can cause hamstring injuries. Sprinters need a proper warm-up to prepare the muscles and nervous system for sprinting. Dynamic stretching is especially effective before sprinting for this purpose. Also, it's important to cool down after a sprinting session, such as by slow walking, and then to stretch. After sprinting, muscles still carry a high level of tension, and a series of static stretches for the quads, hamstrings and glutes is especially important. To learn more about dynamic and static stretching, consult the *BFS Flexibility Manual*.

3. Not developing all functions of the hamstrings. The hamstrings have several functions, the two primary ones being to flex the knee and extend the hip; the glute-ham exercise is effective for developing both. For knee flexion, leg curls are the auxiliary exercise of choice; for hip flexion, excellent exercises are reverse hypers and the standing hip extension exercises on machines designed for this purpose.

However, also consider that the medial hamstrings (semitendinosus and semimembranosus) rotate the foot inward and that the lateral hamstrings (biceps femoris) rotate the foot outward. A coach needs to understand that if an athlete turns their feet excessively outward or inward during running,

The deadlift is a great exercise for the hamstrings. One of the best deadlifters of all time was Vince Anello. Anello had great leverages for the lift and was the first man to deadlift 800 pounds while weighing less than 200 pounds.

Photo Bruce Klemens

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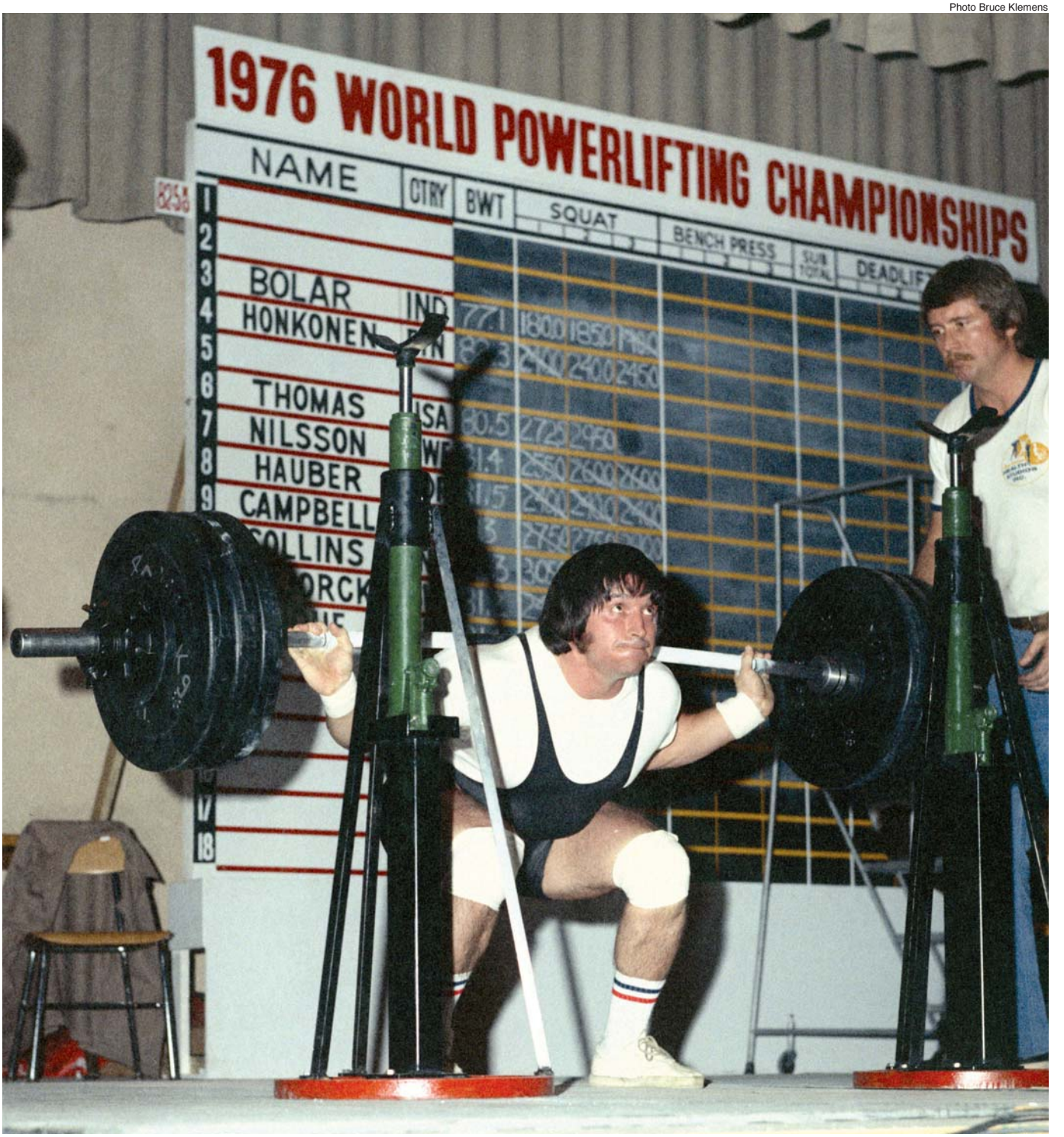

Although he didn't take up weight training until the age of 28, Great Britain's Ron Collins went on to win six world championships (1973-77, 79). Powerlifters often carry the bar low on their shoulders and lean forward, which increases the work of the glutes and lower back.

this could indicate a weakness in either the medial or lateral hamstrings. For example, running with the feet turned excessively outward may indicate a weakness in the medial hamstrings. Good auxiliary exercises to correct this are leg curls with the toes turned inward.

4. Poor squat form. Squats are an effective way to develop the hamstrings, but they must be performed properly. According to Canadian strength coach and Posturologist Paul Gagné, a powerlifting squat tends to place more work on the glutes and lower back; in this type of squat the barbell is held low on the shoulders and the athlete leans well forward. In contrast, Gagné says,

holding the bar high on the shoulders and squatting all the way down, as an Olympic weightlifter would do, places more stress on the quads and works the hamstrings through a greater range of motion. Gagné says that squat depth also influences hamstring involvement, such that an athlete who does not squat low enough should supplement their training with additional hamstring exercises, such as leg curls.

Leg curls work the knee flexion function of the hamstrings, while standing hip extensions work the hip extension function of the hamstrings. Both are great auxiliary exercises.

5. Poor program design. Don't rely just on squats to develop the hamstrings. For example, deadlifts work the same muscles as squats do, with the exception of the biceps femoris. One difference is that the range of motion for the quads is reduced in the deadlift. BFS prefers the hex bar deadlift, as it involves the quads more and places less compressive forces on the spine, but the hex bar deadlift will still give the hamstrings a good workout.

6. Improper hamstring-to-quad ratio. The standard recommendation by physical therapists is that an athlete should have a hamstrings-to-quadriceps ratio of 66 percent, which means the hamstrings can produce 66 percent of the force of the quadriceps. However, the current thinking is that this gap is much narrower for such athletes as sprinters and running backs. One simple test to determine if an athlete's hamstring strength is proportionate to their quadriceps is to compare their front squat to their back squat. An optimal ratio is 85 percent front squat to back squat, such that if an athlete back squats 200 pounds, they should be able to front squat 170.

7. Lack of eccentric strength. An eccentric contraction occurs when a muscle lengthens while producing tension, such as when lowering the barbell to the chest during a bench press. According to Bryan Heiderscheit, PhD, when an athlete's speed and stride length increases as they sprint, the eccentric load on the hamstrings also increases. Heiderscheit, an associate professor in the University of Wisconsin's Department of Orthopedics and Rehabilitation, has done extensive studies on hamstring injuries. Heiderscheit's research has found that the point at which a hamstring injury is likely to occur, and where the highest stress occurs, is just before the lead foot touches the ground. From a practical perspective, this means that athletes should frequently prolong the lowering portion of exercises involving the hamstrings. For example, during the lower phase of a leg curl or after the front foot lands during a lunge, an athlete could prolong the lowering phase to 5-8 seconds.

8. Inappropriate repetition protocols. The biceps femoris, which is the most injured hamstring muscle, consists primarily of fast-twitch fibers. These fibers respond better to lower reps and heavier weights. Using reps in the 10-12 range for leg curls may be tiring, but a better repetition protocol would be 4-6.

9. Excessive scar tissue. Scar tissue in the hamstrings is associated with excess muscle tightness that can result in hamstring injury. Dealing with the scar tissue with soft-tissue techniques such as Active Release Techniques Treatment® can help restore normal muscle function in the hamstrings. Of course, athletes also should perform a regular stretching program to help reduce excessive muscle tightness.

10. Excessive use of NSAIDS. Nonsteroidal anti-inflammatory drugs (NSAIDs) are often used after hamstring injuries. However, improper use of NSAIDs can interfere with the healing of the tissues. Use NSAIDS only according to the advice of an appropriate health care practitioner, and consider using natural methods such as ice to deal with inflammation, as well as omega 3 fish oil and probiotics.

There are many other possible causes of hamstring injuries, but following these recommendations will go a long way in helping athletes stay strong, fast and injury free! BFS