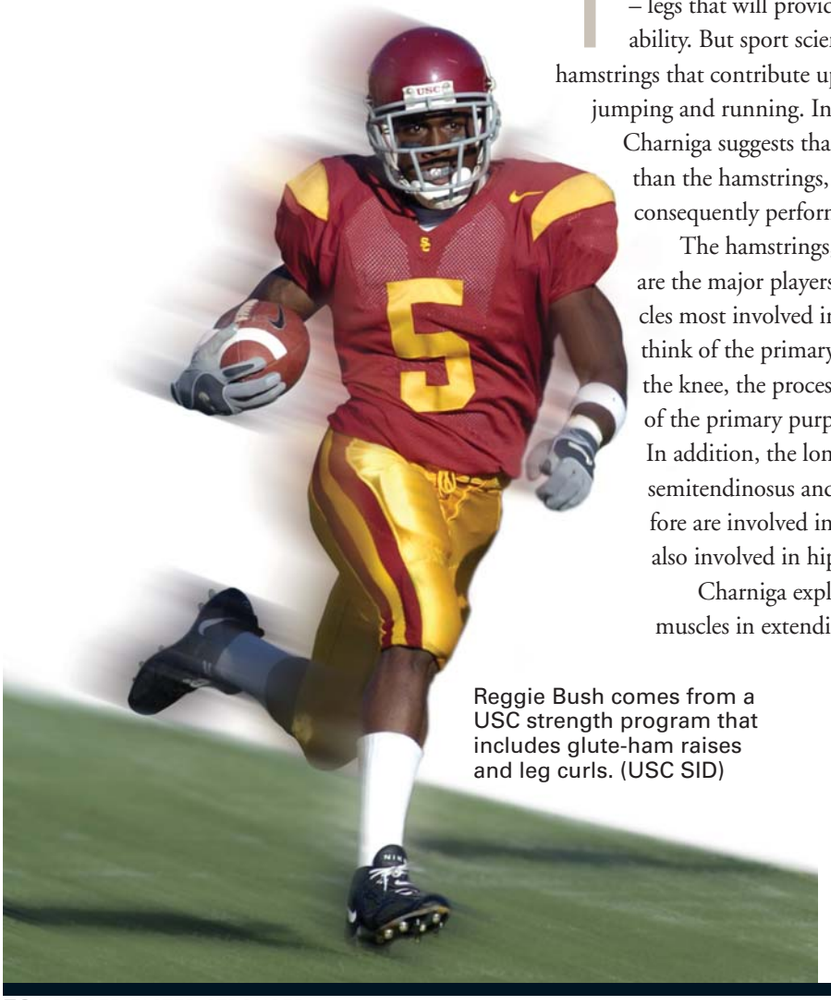
More Secrets of Speed and Jumping Power

While muscular quads are impressive, there's more to athletic power than meets the eye

When asked the difference between bodybuilders and weightlifters, former Olympic weightlifting gold medalist Norbert Schemansky once said to the effect that "bodybuilders try to look good, weightlifters try to do good." Apparently Norb wasn't too fond of bodybuilders. But the analogy of bodybuilders versus weightlifters also applies handily to the difference between the quadriceps and the muscles on the backside of the body.



Reggie Bush comes from a USC strength program that includes glute-ham raises and leg curls. (USC SID)

To the average person, large, muscular quads represent powerful legs – legs that will provide an athlete with great speed and jumping ability. But sport science research suggests that it's the glutes and hamstrings that contribute up to 80 percent of the power output for jumping and running. In fact, Soviet literature translated by Bud Charniga suggests that if the quadriceps are proportionally stronger than the hamstrings, the effect could be a reduction in speed and consequently performance in the sport of weightlifting.

The hamstrings, glutes and erector spinae (Figures 1 and 2) are the major players in the "posterior chain," which are the muscles most involved in lifting, jumping and running. While you think of the primary purpose of the hamstring as being to flex the knee, the process is quite complex, as knee flexing is also one of the primary purposes of the short head of the biceps femoris. In addition, the long head of the biceps femoris, along with the semitendinosus and semimembranosus, cross the hip and therefore are involved in extending the hip. The gluteal muscles are also involved in hip extension.

Charniga explained to me that the influence of the gluteal muscles in extending the hip is obvious when you compare the development of these muscles in humans versus apes. Apes spend little time in the upright position, preferring to walk on all fours, and therefore have less development of the gluteal muscles relative to humans. Now contrast this with humans, specifically weightlifters and figure skaters, whose sports require explosive extension of the trunk. You'll find these athletes often have excep-

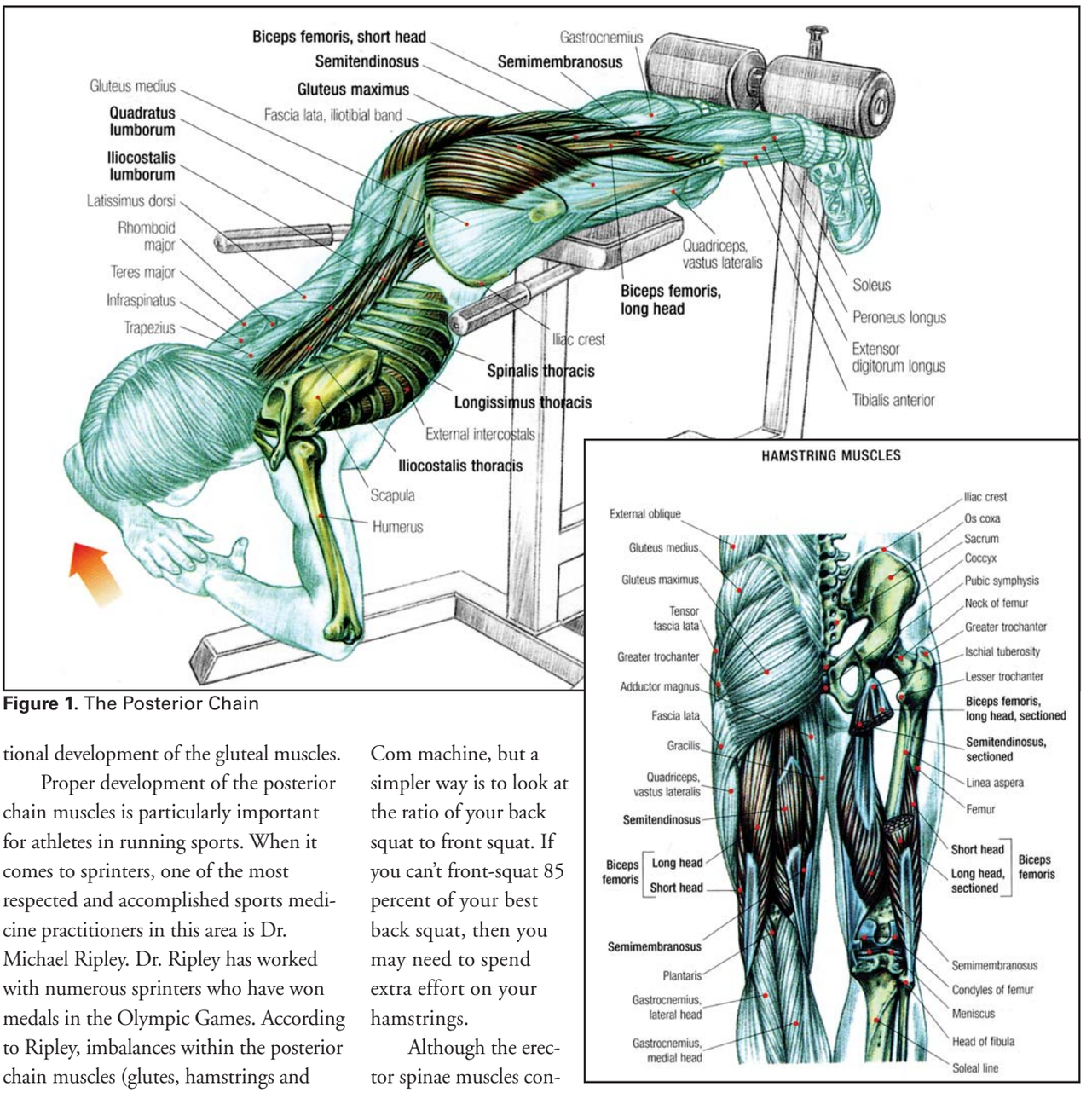


Figure 1. The Posterior Chain

tional development of the gluteal muscles.

Proper development of the posterior chain muscles is particularly important for athletes in running sports. When it comes to sprinters, one of the most respected and accomplished sports medicine practitioners in this area is Dr. Michael Ripley. Dr. Ripley has worked with numerous sprinters who have won medals in the Olympic Games. According to Ripley, imbalances within the posterior chain muscles (glutes, hamstrings and erector spinae) can lead to injuries and performance problems. Much of his practice is spent teaching athletes special exercises to resolve these muscle imbalances, especially in the hamstrings.

Generally, the hamstrings should be able to produce two thirds of the force of the quadriceps. How does an athlete determine the proper ratio of hamstring to quadriceps? One way is with expensive laboratory testing devices such as a Kin-Com machine, but a simpler way is to look at the ratio of your back squat to front squat. If you can't front-squat 85 percent of your best back squat, then you may need to spend extra effort on your hamstrings.

Although the erector spinae muscles contribute little to powerful hip extension, they are important for enabling athletes to overload the gluteal and hamstring muscles. According to Ripley, if the lower back is not held rigid and is allowed to sag during the pull for a power clean, for example, the force of the legs is dissipated and the athlete will not be able to lift as much weight. Such improper technique can also place excessive stress on the ligaments of the lower back and may cause injury.

Strengthening the Posterior Chain

What I'd like to do for the remainder of this article is introduce several unique auxiliary exercises for the glutes, hamstrings and erector spinae. The first series of exercises requires the use of a leg curl machine, preferably one with a V-shaped bench, as it's easier on the lower back, and the remaining ones require a glute-ham developer and a Hex bar.

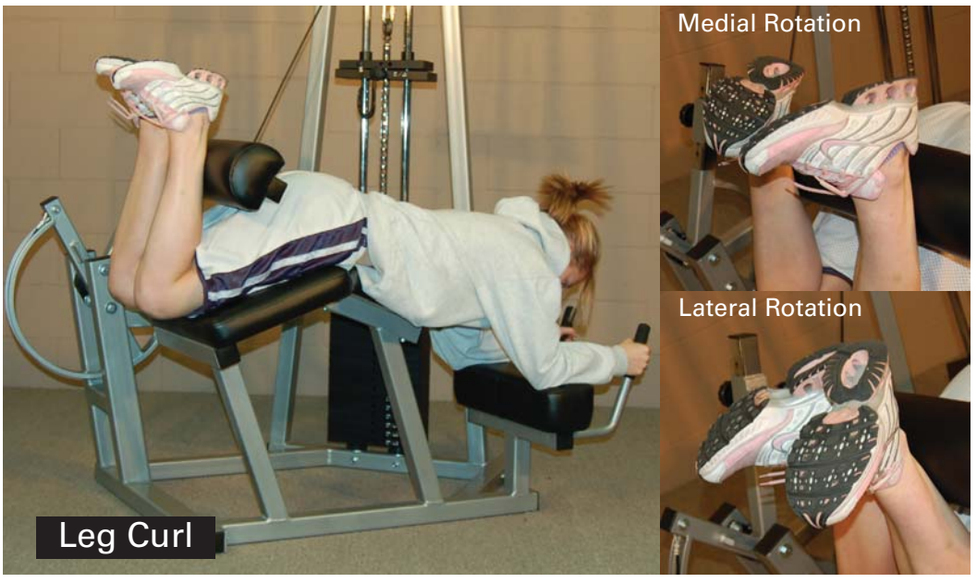


Figure 2. Leg Curl Variations

Medial and Lateral Leg Curls.

Taking our anatomy review a step further, the hamstrings are also involved in the outward (lateral) and inward (medial) rotation of the knee. Specifically, the biceps femoris helps turn the knee outward, whereas the semitendinosis and semimembranosus help turn the knee inward. To maintain knee stability and proper alignment of the feet during running, athletes should occasionally perform leg curls with their toes pointed outward and inward (Figure 2).

According to strength coach Charles Poliquin, there is an easy way to determine which of these auxiliary leg curl exercises is best for you. After several warm-up sets, perform a regular leg curl (feet in neutral position) with a weight that allows you to perform only six repetitions. "As you reach muscular failure, your feet will rotate in one direction if there is a muscle imbalance," says Poliquin. "If your feet turn towards the midline of the body (medial rotation), your semitendinosus and your semimembranosus are too strong for your biceps femoris. If they turn away from the midline of the body (lateral rotation), your biceps femoris is too strong for your semitendinosus and semimembranosus."

Back Extension with Hex Bar.

This is a great exercise I adapted from a book by Frans Bosch and Ronald Klomp, *Running: Biomechanics and Exercise Physiology Applied in Practice.* It's great for specifically strengthening the erector spinae muscles, which Ripley says are often relatively weak compared to other muscles of the lower extremities. Often it is difficult to overload these muscles with back extensions because it's hard to hold weights across the chest or behind the neck.

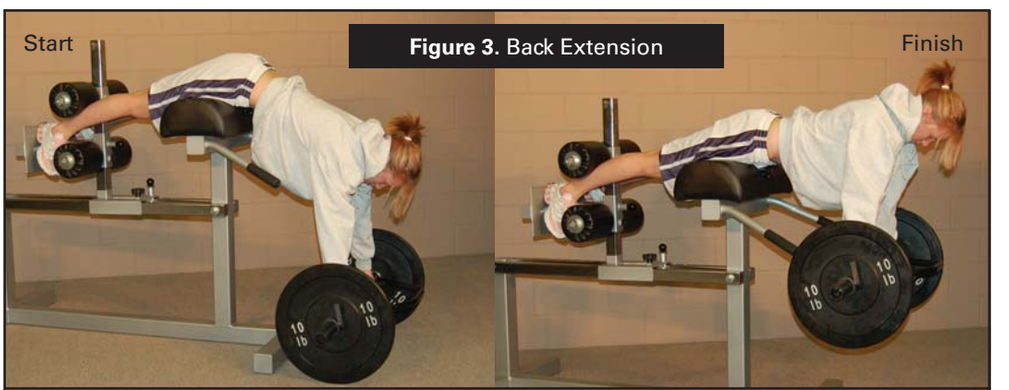


Figure 3. Back Extension

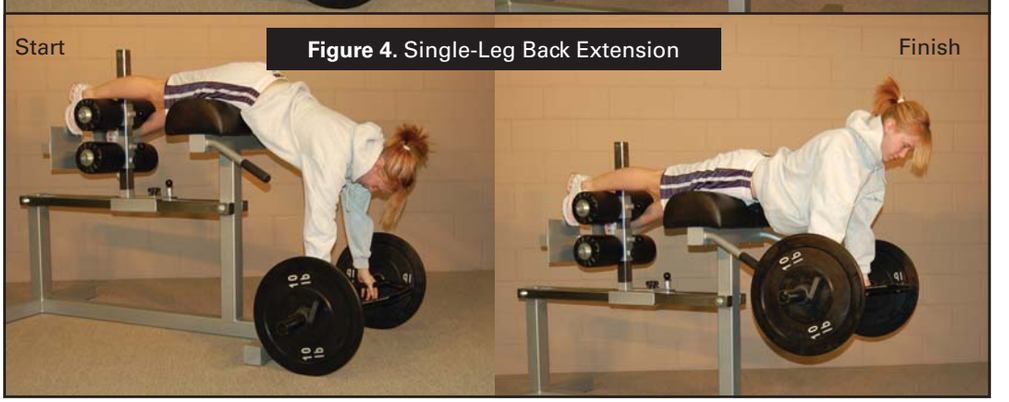


Figure 4. Single-Leg Back Extension

With this variation, you place a Hex bar with Olympic plates on the floor in front of the glute-ham developer, with the axis of the bar directly over your shoulders. Grasp the bar with straight arms, and then straighten your torso until it is parallel to the floor (Figure 3). The height of the Olympic plates limits the range of motion of the exercise, and the parallel handles on the Hex bar make it easier to hold heavy weights. Both these factors make it easier to use heavy weights in this exercise.

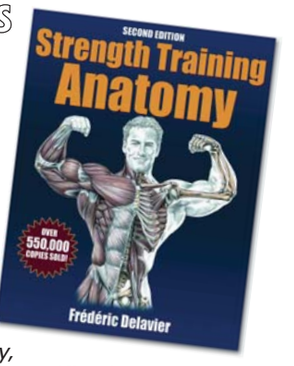
Single-Leg Back Extension with Hex Bar. The limiting factor in the previous exercise is the erector spinae. Because only one leg is anchored in this exercise, there is more stress on the hamstrings.

To get into the starting position for this exercise, place a Hex bar with Olympic plates on the floor in front of the glute-ham developer, with the axis of the bar directly over your shoulders. But instead of anchoring both ankles under the roller pads, place one leg on top of the pad. Grasp the bar with straight arms, and then straighten your torso until it is parallel to the floor (Figure 4). Having only one leg anchored eliminates the use of that leg and reduces the amount of weight the erector spinae muscles need to lift.

Because the hamstrings are primarily fast-twitch fibers, they respond better to lower reps (and therefore heavier weights) than other muscle groups. Whereas many bodybuilders will perform back extensions and leg curls for sets of 12-15 reps, for improving athletic performance you would have better results with 5-8 repetitions.

If you decide to try these auxiliary exercises in the BFS program, please remember they are just that: auxiliary exercises. Do your core exercises, then perhaps one of these auxiliaries for a few sets at the end of your workout – don't add all of them, and you'll probably be better off not performing them in-season to avoid overtraining.

Although we live in a culture that admires the impressive physiques of bodybuilders, achieving your best in the athletic arena requires a different set of training protocols. It's often not so much training harder that counts as it is training smarter. BFS



Illustrations for this article where taken from *Strength Training Anatomy,* available from Human Kinetics, www.humankinetics.com