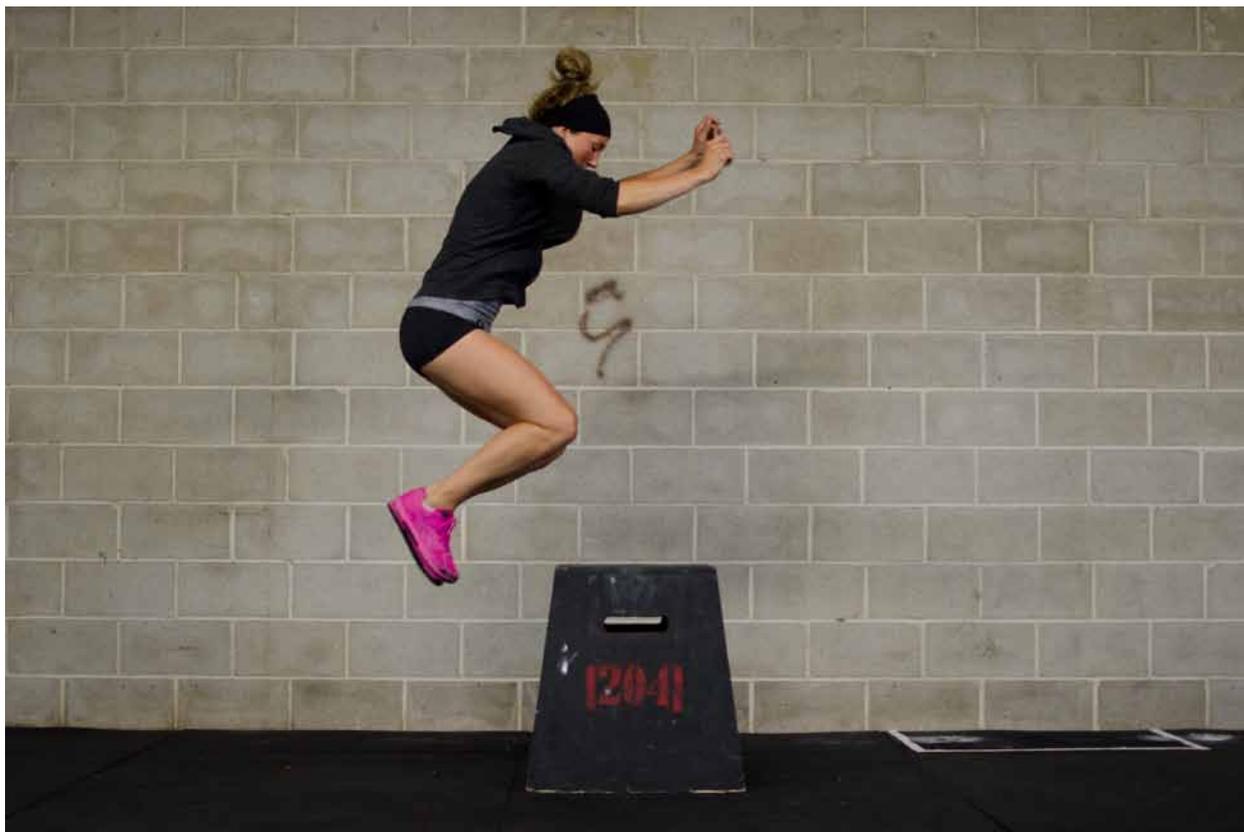

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Improve Your Jumping Ability

Bill Starr offers up an air-superiority program based around squats and calf raises.

By Bill Starr

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All images: Mike Warkentin/CrossFit Journal

Being able to jump high is a great advantage in so many sports. After watching the NCAA basketball tournament, I am always impressed at how the men soar in the air. They not only climb ridiculously high, but they also seem to have the ability to hit a second gear and shoot up another few inches when they need to.

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I also love watching beach and indoor volleyball. How some of those athletes get up way over the net seems impossible, yet they are able to do it time after time. Volleyball and basketball are the two sports that emphasize jumping ability the most—in team sports, that is. Individual sports such as high jumping and long jumping are all about soaring high and long.

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However, we only get to see those field events a few times a year. On the other hand, we get to appreciate basketball and volleyball quite often. Should you live in Southern California or in Hawaii, you can watch as much

beach volleyball as you like, especially in and around Santa Monica and Venice. I lived in both of those places and spent a lot of time on the beach playing volleyball. That's when I really began to appreciate those athletes capable of almost touching the sky.

Yet being able to jump high is also a great advantage in many other sports, although it's seldom talked about. How about the wide receiver in football who can out-jump his defender—a huge advantage. Same idea in soccer. The player who can climb up higher has the edge over his opponents when heading a ball. In baseball, the infielder or outfielder who can leap really high will be able to make catches of line drives and balls up against the wall much better than those who do not have that ability.

Tennis? You bet. That's one reason tall players excel in the sport. They're able to go up and strike the ball easier than shorter ones. And certainly lacrosse belongs on the list of sports where being able to have a strong vertical jump is a plus. Jumping is useful to figure skaters because it allows them time to make another movement when they're off the ice, and the same applies for gymnasts. In fact, it's an essential attribute for success in that sport.



Might as well jump! It's an asset in most sports.

In a great many sports, the benefit of being able to jump high is often quite subtle. Take a javelin thrower. At the end of his run-up, he propels himself upward and forward to give the javelin a final, strong thrust. A swimmer doesn't leap upward, although he does, in fact, leap horizontally when he comes off the blocks or makes a turn during the race, so it's the same muscle groups providing the power.

Finally, I need to mention the Olympic lifts. When I was competing, the best snatchers and clean and jerkers were also the athletes with the highest vertical leap. All those lifts rely on an explosive finish, and that is provided by the muscle groups that lift you off the platform. At the finish of the snatch, clean, and jerk, the lifter is actually jumping to add more power into the bar and to give him time to move under it.

And although few athletes and coaches recognize the fact, those lifts will help improve anyone's vertical leaping ability. Bill March, the great champion in the '60s, was an exception leaper. The strength he built from heavy lifting gave him enough upward thrust that he could dunk a basketball at a height of 5 foot 9. It was said that Paul Anderson could also perform that feat when he weighed 350 lb., although I never saw it myself and question some of Paul's accomplishments. I also know what I could do. At the same height as Paul and Bill, I could dunk a slightly deflated volleyball. My hands were too small to hold a basketball. Because of my weight training, I was able to go from just being able to get off the floor enough for a jump shot to where I could extend my hand up over the rim of the basket.

Wrestling doesn't require a strong vertical jump, nor do running, table tennis, golf and bowling. But just about every other sport does, and the best thing about the whole deal is that it only takes a couple of exercises to help improve leaping ability: basically, a full squat and calf raises. If an athlete knows how to do the Olympic lifts and the equipment to do them is available, these movements are very useful as well. March, for example, never bothered with calf raises, other than to hold that position in an isometric contraction in the power rack every so often. His jumping prowess came from doing the Olympic lifts and back squats.

Jumping: The Benefits

I never had any trouble convincing most coaches of the value of a stronger vertical leap, but there were always some who believed their athletes were getting sufficient



Bill Starr says squats and calf raises are the keys to improving your leaping ability.

leg work during practices and didn't need any specific exercises to aid them. A soccer coach at Johns Hopkins told me that he didn't think his team needed to squat with heavy weights or hit the calf machine twice a week as I had recommended in my strength program.

I explained that while it's true running does help make the legs and calves stronger, those groups can best be strengthened with specific exercises. Then the athletes will not only be able to jump higher, but they will also be able to run faster. Coaches are often skeptical but end up being believers if their athletes are willing to put in the time and effort in the weight room. I know it works because I've seen sterling examples of it throughout my coaching career.

Whenever I talk or write about this topic, a basketball player from the University of Hawaii always pops in my mind. Unfortunately, I have forgotten his name—a forgivable sin because it was 37 years ago. But I can still picture him, a 6-foot-3 guard who got little playing time in his first year, mostly because we happened to have a very talented team. They had gone to the National Invitation Tournament (NIT) that year, and to add to the young athlete's woes, Rick Pitino, an assistant coach, had gone out and recruited two highly regarded guards.

The young athlete approached me after the season had ended and asked if there was anything he could do when he went home in the summer to improve his chances of getting more playing time next year. I had already started the basketball team on the Big Three—flat bench, power clean and back squat—but hadn't really had the time with them to add in any other exercises. And I had just talked the basketball coaches into buying a calf-raise machine for the university weight room.



No calf-raise machine at the gym? Improve with a 2 x 4 and a barbell.

I told him to do the Big Three and really work hard on the squats and to always put them first at every workout, and I gave him a set and rep formula to use during the summer that always brings dividends. Then I showed how I wanted him to do calf raises, what sets and reps to do, and how often. For him, that was three times a week. Really, really strong calves are the key to improving the vertical jump. He was a very good athlete, as almost all basketball players are, and he mastered the form on all the exercises before he left the island for the summer.

When he came back for the fall semester, the coaches put the members of the team through a series of tests, one of the most important being the vertical leap. And the hundred-yard dash was tested as well. After the tests, he came in to see me, and he was grinning—for good reason. He had improved his vertical leap by four inches and cut two seconds off his hundred-yard dash. He also dunked the basketball for good measure, something he had never been able to do before, and it delighted his teammates and the coaches for he was a personable young man.

Because he could now jump considerably higher, he was able to rebound successfully against taller players and get his jump shot off much easier as well. And the overall strength he gained helped him do battle with larger and heavier opponents. Coach Pitino told me that the improvement in his leaping ability had not just made him a better player physically, but it had also made him more confident. Although he didn't gain a starting position, he did become the regular sixth man on a team that went to the NIT again.

A four-inch increase is excellent but not exceptional. It's typical for anyone who does the necessary exercises consistently and really leans into them. Both full squats and calf raises have to be attacked. Staying in the comfort zone simply doesn't get the job done. While I do understand that most of the great leapers in sports are naturally gifted in terms of having the right kind of attachments in their lower legs, I also know this skill can be greatly improved by any athlete who is willing to put in the time and effort. Those who are able to leap high naturally seldom do much in the way of trying to improve their ability to jump even higher. It's usually the marginal players—like the University of Hawaii guard—who understand the value of being able to jump higher and decide to lay down the sweat in the weight room.

Deep Squats!

The routine for improving the ability to jump higher is very simple. It consists of squats and two forms of calf raises. The squats can either be done as front squats or back squats, and both seated calf raises and standing calf raises will work. The difficult part of the deal is that the athlete must apply himself 100 percent at every session. Except for the light day, the legs and calves should be sore the day after you work them—not so sore that you have trouble walking, but rather sore enough for you to know they were definitely worked hard.

This is why I really like front squats: You absolutely have to go low.

Although the program is uncomplicated, there are several points to be aware of in order to achieve the desired benefits. The most important in regards to squatting is you must go very low. Not low as in a powerlifting squat, which means just breaking parallel, but rock-bottom low. The lower you go in a squat, the more muscles come into play, such as the quads, adductors, abductors, hamstrings, glutes and all those that make up the powerful hips.

This is why I really like front squats: You absolutely have to go low in that version of squatting. If you try to cut them off, you end up making the exercise much more difficult, and it also places a great deal of stress on your wrists and elbows as you try and keep the bar secured across your frontal deltoids. Front squats require a lot of flexibility in your shoulders and elbows, so if that is a big problem, don't worry about doing them. Back squats work just as well if you go low.

Many taller athletes that I train have difficulty going low when they first start squatting. But that changes if they keep trying to go a bit lower each time they squat, and the repetitions and heavier and heavier weights eventually allow them to go deep with every rep. It's usually just a matter of stretching out the attachments in the rear of the lower leg.



Squat as deep as you can for best results. As flexibility improves, so will your maximum depth.

For those who are struggling to go low enough, I have them do this: set the pins in a power rack at a position slightly lower than you normally go when you squat. Start out with a relatively light weight. Squeeze under the bar, get set, then stand up with it. Lower it all the way back down to the pins, reset, and do another rep. Make sure you come to a dead stop at the bottom. If you rebound the bar off the pins, it will not help your cause. When you're able to knock out all your desired reps at that pin position, lower them even more, And so on and so forth until you're hitting a deep position.

Once an athlete has learned correct form and had time to build a solid foundation of strength in the squat, I have him do the routine below.

Monday is the heavy day: 5 sets of 5 to limit, with a back-off set of 8 to 10 reps. Wednesday is the light day: 5 sets of 5 with about 20 percent less than what was used for the final set on Monday. Until the athlete gets really strong on this lift, I use this method to determine how much he should handle on his final set on the light day: whatever poundage was used for the third set on the heavy day will be his fifth set on the light day. No back-off set on the light day.

I don't believe in pushing an athlete to complete failure. If he can't recover from a workout, he's not going to make progress.

Friday is the medium day, and the set and rep formula is changed a bit, with the athlete doing 2 sets of 5 followed by 3 sets of 3. That final set of 3 will be at least 5 lb. more than what was used on the final work set on Monday. Then a back-off set of 8 to 10. While this may seem like I'm abusing the medium day by having the athlete handle more weight on it than he did on the heavy day, I'm not. The overall workload is less on Friday, and with two days of rest before the next heavy day, it's a perfect set-up day.

Early on, when everything seems to be clicking, most can use 10 lb. more on Friday than they did on Monday. But when the numbers start climbing higher and higher and start approaching the 400-lb. mark, a 5-lb. increase will be more reasonable. The back-off sets should be with roughly 50 lb. less than what was used for the final set that day. But this varies from one athlete to another. The back-off set shouldn't be a walk in the park, but it shouldn't be extremely hard, either. The idea is to handle a sufficient amount of weight so as to increase the workload, yet not so heavy that it totally fatigues the lifter. I don't believe in pushing an athlete to complete failure. If he can't recover from a workout, he's not going to make progress.

I've had some athletes who could use 50 lb. less than their top triple and knock out 10 easy reps, while others needed to lower their back-off sets down to 100 lb. less than they just did for 5 or 3 reps.

To finish explaining the program, at the next heavy day, the weight you will use for your final set of 5 will be the same amount that you used for your last set of 3 on Friday. Move the numbers up steadily in this fashion and you will soon be handling a great deal of iron. To make this more clear, I'll lay out a sample squat program for two weeks.

Week 1

Monday (heavy): 135 x 5, 225 x 5, 275 x 5, 295 x 5, 315 x 5, back-off 265 x 10

Wednesday (light): 135 x 5, 185 x 5, 225 x 5, 255 x 5, 275 x 5 (no back-off)

Friday (medium): 135 x 5, 225 x 5, 275 x 3, 305 x 3, 325 x 3, back-off 275 x 10

Week 2

Monday: 135 x 5, 225 x 5, 275 x 5, 300 x 5, 325 x 5, back-off 275 x 10

Wednesday: 135 x 5, 185 x 5, 225 x 5, 260 x 5, 275 x 5 (no back-off)

Friday: 135 x 5, 225 x 5, 285 x 3, 315 x 3, 335 x 3, back-off 285 x 10

As the triples improve, so do the numbers for the light and heavy days. It's an ideal formula to improve intensity and expand the overall workload in a synergetic fashion.

Calves: Make 'Em Burn

Now for the calves. In order to strengthen the calves completely, you need to do two forms of calf raises—standing and seated. Here's why: the calf consists of two muscle groups: gastrocnemius and soleus. The gastrocnemius is the one most people associate with the calf and is the larger and more prominent of the two. It has an inner and outer head and, when developed, highlights the back of the lower leg. The gastrocnemius originates above the knee at the condyles of the femur and extends downward to help form the Achilles tendon.

The soleus is smaller and lies directly behind the gastrocnemius. While not as well known as its close neighbor, the soleus is equally as important in terms of calf development and strength. It originates just below the knee at the posterior surfaces of the tibia and fibula, the two bones of the lower leg. It extends downward and becomes a part of the Achilles tendon as well.

The two muscles work in concert with one another, not independently. They form a functional unit called the "triceps surae." In order to maintain proportionate strength between the two groups and ensure optimal strength development, both have to be worked, and they have to be worked in a slightly different manner because of their places of origin. Because the gastrocnemius begins above the knee, it is only exercised effectively when calf raises are done with the knees locked. In contrast, the soleus is only worked when the knees are bent due to the fact that it originates below the knee.

This means you need to do both standing and seated calf raises if you want the best results for your efforts. There are several ways to do this. You can alternate them at the same workout or on different days. At the end of the week, you should have given each form of calf raises equal attention.



Cheating by bending the knees in a calf raise (top) is an error. Keep the legs straight to target the gastrocnemius and get the best results.

The program I use for calves I learned at the old Muscle Beach Gym in Santa Monica, Calif., by watching some top-flight bodybuilders train. They would do 6 sets of 30 and only rest long enough to stretch out their calves before jumping right back on the machine and doing their next set. I tried that and couldn't walk right for a week, so I modified it for my athletes to 1 lighter warm-up set followed by 3 work sets at the same weight, all for 30 reps.

The work sets have to be just that because the calves are weight-bearing muscles and they have to be brutalized to get them bigger and stronger. The amount of resistance used depends on the athlete, but the rule of thumb is the same for everyone. When you get to 20 reps, your calves should be screaming for mercy. Ignore them and knock out 10 more reps. That's how you break them out of their complacency and make them stronger.

Form is very important on these. Each up and down movement must be done smoothly, not herky-jerky. And you want to do a full range motion, finishing high on your toes and lowering your heels as far as you can on every rep. And no jamming or rebounding out of the bottom, as this can be harmful to your knees and ankles.

The biggest mistake most make on the standing calf raises is they start bending their knees when the reps get really hard.

The biggest mistake most make on the standing calf raises is they start bending their knees when the reps get really hard. When an athlete does that he's not making his gastrocnemius do most of the work. It's transferred to the other groups that make up the leg. I've watched idiots use all the plates in the stack and add more on top of the machine until they have 500 lb. to move. What they end up doing is what looks like a quarter squat. It may be helping their quads, but it isn't doing anything positive for their calves.

I've seen athletes cheat on the seated calf machine as well. They would pull on the handles when the going got tough instead of making the soleus do the work. Force the target muscles to do all of the work, even if it hurts. That kind of pain is a good thing in strength training.

Be sure to stretch out your calves after every set. Don't wait until you've gone through your entire calf workout to stretch them. If you really hit them hard, it's a good idea to stretch them again at the end of your session and again later on that night. This helps minimize soreness and cuts down on the risk of injuring your calves the next day.

If you plan on doing any running that day, do it before you work your calves, never after.

I also like to alter foot placement on the 3 work sets: toes straight ahead, turned inward, and turned outward. It's not much of a difference but that small adaptation does help in overall calf development.

Calves for the CrossFit Gym

What if there are no machines available?

I didn't come across either type of calf machine until I had been weight training for six years. I did standing calf raises by placing a bar on my back just as I would when squatting, placing my toes on a piece 2 x 4 and doing my reps. It takes time to learn the balance, but it can be done. Later on, when I had a power rack at my disposal, I would do them in that same manner and used the uprights to help me balance the weight.

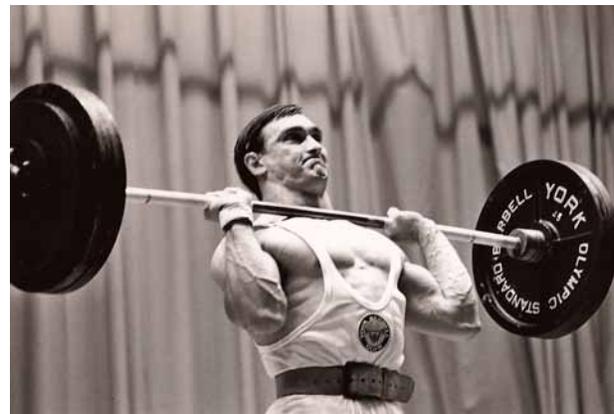
For seated calves, I would sit in a chair, place towels or a pillow across my thighs, then stack weight on that and proceed to do my reps. Because there's a definite limit of how much weight can be used on either of these, the reps have to be much higher. Just go until you know for certain that you have hit them hard, and you'll get results.

How often should calves be exercised directly? The answer depends on what the athlete is trying to accomplish. Those who rely heavily on their calves, as in basketball and volleyball, can benefit from working them three times a week in the off-season and a couple of times a week during the season. In most of the other sports, twice a week in the off-season and once a week during the season is enough to get and keep them strong.

Many of my athletes liked to do their calf raises on a separate day from when they did their other weight work so that they could put more energy into them. When you do calf raises as a part of your regular workout, make sure to do them at the end of the session. If you do them early in your routine, they will have an adverse effect on any other exercise that involves the calves. And there are a lot of them.

Improve the numbers on your squats and calves by 40 percent and you will be able to jump considerably higher.

That's not a guess. That's a guarantee.



Jody Forster

About the Author

*Bill Starr coached at the 1968 Olympics in Mexico City, the 1970 Olympic Weightlifting World Championship in Columbus, Ohio, and the 1975 World Powerlifting Championships in Birmingham, England. He was selected as head coach of the 1969 team that competed in the Tournament of Americas in Mayaguez, Puerto Rico, where the United States won the team title, making him the first active lifter to be head coach of an international Olympic weightlifting team. Starr is the author of the books **The Strongest Shall Survive: Strength Training for Football** and **Defying Gravity**, which can be found at [The Aasgaard Company Bookstore](#).*