

BFS POSITION PAPER

Squat Variations

The front squat is a great squat variation and is a key exercise for Olympic lifters. Shown here with great form is Lusia Angilau, a volleyball player from Hunter High School in Salt Lake City, Utah. Lucia has cleaned 150 pounds and vertical jumped 27.1 inches.

The BFS perspective on these valuable lower body exercises

The back squat forms the core of leg training in the BFS program and is performed once a week, year-round, off-season and in-season. But throughout the year we also encourage the performance of what we call a “squat variation” exercise to supplement, not replace, the back squat. By adding such variety, coaches can customize the workouts to make them more sport specific, help prevent injury and keep motivation high.

We have already discussed the box squat in a separate position paper, so we will focus here on the pros and cons of

the front squat and several multi-joint leg exercises such as the leg press.

FRONT SQUAT

Many strength coaches consider the front squat superior to the back squat as a leg exercise for athletes. In the front squat the quads work harder because the barbell is positioned on the front of the shoulders. In a survey of top European coaches the consensus was that the three best weight training exercises for sports are the power snatch, the incline press and the front squat. However, consider that often coaches who are surveyed are

working with athletes who have a base of training with the back squat.

One drawback to the front squat is it's difficult to perform higher repetitions because holding the weight on the shoulders compresses the chest and makes it harder to breathe. Performing more than five repetitions, or even three repetitions for some individuals, often leads to a breakdown in form and even blacking out.

The best way to hold a barbell in a front squat is to use the same grip as you would in a power clean, which is with your hands supinated (palms down)



Front squat assistant devices such as the two shown here often place the body in unnatural postures.

and elbows held high. Unfortunately, holding the bar in this manner can cause pain in the wrists and elbows if you have relatively long forearms or tightness in the wrists or – the primary problem – tightness in the upper back or shoulders. The *BFS Flexibility Manual* offers several exercises that will help improve the range of motion in these exercises. Often, however, just relaxing your grip as you hold the barbell and simply performing the exercise regularly will quickly resolve any flexibility problems associated with this exercise.

Another front squat technique is to cross your arms in front of you. This method works, but balance can be especially difficult to manage – often you have to focus so much on balancing that it can be hard to use significant weights. The issue with harnesses that support the weight in front of the body, such as the E-Z Squat and the Front Squat Harness, is that they often force the back into a rounded posture, placing unnatural stresses on the back and making it even more difficult to breathe.

The best alternative we've found to the traditional front squat involves the use of lifting straps, preferably a pair that has about a foot of length after being tied to the bar – note that the “quick release” straps Olympic lifters use usually don't work well for this technique. To perform this variation, place your shoulders under the bar and grasp the straps with a neutral grip (i.e., palms facing each other). How high up to grab the straps depends upon the athlete's flexibility (the less space between the bar and your

hands, the better). From this position, simply lift the weight off the squat racks and begin front squat-

ting. The only drawback is it can be difficult to replace the bar onto the racks, so you should always have a spotter assist you. Eventually, by using straps you should be able to smoothly transition into regular front squats.

How much can you lift in the front squat? Generally, the ratio of back squat to front squat should be about 70-80 percent if you are going to equal depth in both exercises.

LEG PRESS

The leg press is performed on a horizontal or angled machine designed for this exercise. It emphasizes the quadriceps, especially the outer quadriceps muscle called the vastus lateralis. It also works the hamstrings and glutes, although not at the same intensity as the squat.

With the leg press, because the back is stabilized on the backrest there is minimal stress on the lower back. In fact, EMG studies show that the leg

press reduces stress on the lower back by approximately 80 percent. This offers several advantages.

First, athletes with lower back injuries or medical conditions that make squatting painful or even impossible (such as with certain cases of scoliosis) can often perform the leg press without any discomfort. Second, the position assumed when performing the leg press is similar to that used in the start position for sprinting and in sports such as speed skating and ice hockey. The sprint position is definitely worth spending time on because a lot of work takes place in sports where the trunk is inclined. Therefore, the leg press can be considered a sport-specific exercise for many athletic activities.

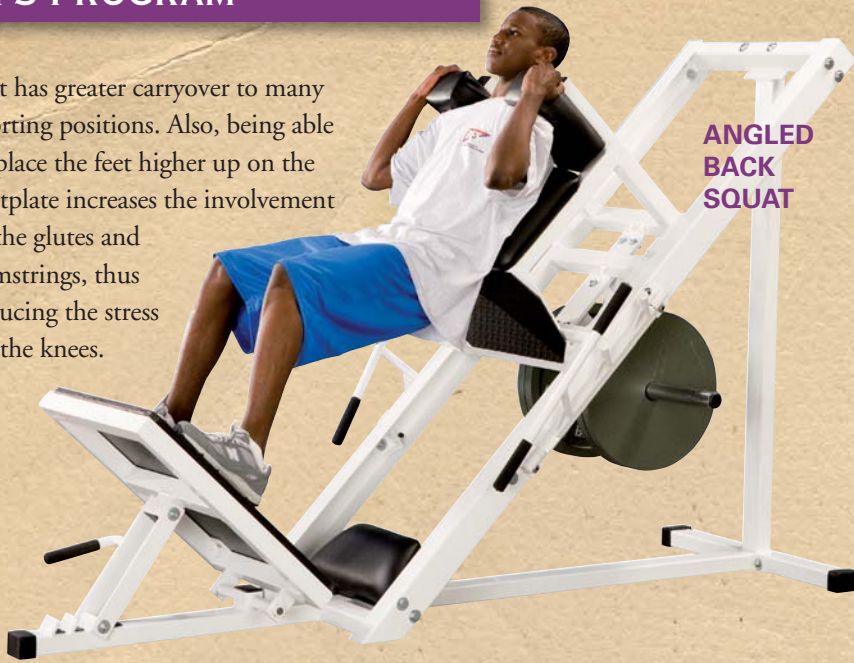
Injuries are rare when performing the leg press, but the major point is to “lock in” the lower back and not allow the weight to be lowered to a point at which the lower back is rounded at the bottom. Also, by starting at the top, the user can determine exactly how low to go and also can avoid injury from jerking the weight on the first rep to get the movement started.

When shopping for a leg press, it's best to select one that has a large footplate so you can place your feet in an “athletic” stance, a wider foot stance



LEG PRESS

that has greater carryover to many sporting positions. Also, being able to place the feet higher up on the footplate increases the involvement of the glutes and hamstrings, thus reducing the stress on the knees.



ANGLED BACK SQUAT

The angled back squat is performed on a specially designed machine – many such machines are designed to allow you to perform both of these exercises on the same unit, such as the BFS 3-Way Hip Sled. With this exercise the weight is supported on the shoulders. Some machines are designed so that the exercise is performed with the athlete holding the weight at hip level (and are called hack squats), but this design often limits the amount of weight that can be used because greater grip strength is required.

The exercise closely resembles the motion of a back squat, so for most athletes the strength gained from this exercise will have a greater carryover to the back squats. Also, the range of motion of this exercise is greater than that in the leg press. One EMG study on this exercise showed that compared with the squat, this movement had similar effects on the vastus lateralis, and even more strongly worked the glutes and biceps femoris (the lower hamstring muscle that is involved in knee flexion). This exercise also produced less involvement of the lower back muscles (erector spinae) compared with the squat, but more involvement than with the leg press. As such,

when an athlete who has suffered from a back injury is cleared to perform back squats, a logical progression might be to start with a training cycle using the leg press, followed by the angled back squat, and finally the back squat.

Although we strongly encourage all athletes to squat, some athletes are uncomfortable supporting heavy weights on their shoulders. Athletes with shoulder injuries or back problems are in this group. Also, young athletes who don't have the emotional maturity to be trusted to squat properly with spotters should not perform the squat and could be better off using the angled back squat.

As with the leg press, injuries are rare in this exercise, and the major precaution is to keep the lower back "locked in" throughout the exercise. A weight training belt will help in this regard, as it provides the user with feedback on improper

form (e.g., when they are excessively rounding their spine).

HIP THRUST

The hip thrust is similar to the angled back squat and is performed on a special machine designed for this exercise. Because the athlete is facing the machine, it makes the exercise more biomechanically specific to many sports. This exercise is very popular among football players, especially linemen and running backs. It's also a great exercise for sprinters to improve their start. The same safety precaution applies as with the angled back squat: The lower back should be kept "locked in" throughout the exercise, and use of a weight belt is recommended.

After acquiring the basic equipment needed for a balanced strength training program (such as barbells, bumper plates, power racks, lifting platforms and benches), a wise investment would be in a multipurpose machine that allows the athlete to perform the leg press, angled back squat and the hip thrust. Except in the case of an injury that prevents an athlete from back squatting, these exercises should be used to complement the back squat, not replace it. **BFS**



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