Common Technique Errors in the Back Squat

Editor's Note: The following are responses to questions regarding exercise technique errors for the back squat. The names and addresses of participating authors are listed on page 27.

1. What is the most common error, and of the top five errors, how does that error rank (percent)?

Fairchild: The back squat may be one of the best exercises for strengthening hip and leg muscles and tendons and ligaments of the knee. This exercise can also be one of the most harmful to the knee capsule if done incorrectly.

There are many position points for optimal squat technique. These points require acute observation by a strength and conditioning professional when an individual is learning to squat or has lapsed into one of the more common errors discussed in this roundtable.

The most common error observed in the training facility is failure to reach parallel with the anterior surface of the thigh (Photo 1). This results in inferior overall development of leg musculature due to incomplete range of motion. Each muscle group must be worked through a full range of motion for maximum benefit. Verbal instruction, mirrors and video feedback will generally correct this problem in a short time. Failure to reach parallel is observed approximately 80 to 90 percent of the time in novice lifters, 30 to 40 percent of the time in intermediate lifters and 10 percent of the time in advanced lifters.

Hill: The most common error in squatting technique is improper head position (50 percent) (Photo 2a & b). The head and eyes should be straight or slightly down to help maintain a balanced position throughout the exercise (Photo 2c). If the athlete's head and eyes are up, the ability to maintain balance diminishes with the depth of the squat. This could result in loss of balance forward and lower back strain.

To correct this technique error, have the athlete set-up in a squat position with the head up. Close the eyes and squat: then have the athlete look forward or slightly down, close the eyes and squat. The athlete should be able to feel the difference with the head and eyes down.

Ritchie: One of the most common errors found in the performance of the back squat is incorrect foot stance. The feet should be placed approximately shoulder width, with the toes turned slightly outward. The athlete should feel and look comfortable in this position. Proper positioning of the bar depends on the type of squat to be performed. Positioning of the feet, whether they are too far apart, or too close, can cause problems as the lift is being performed. A correct stance

Photo 1. Failure of the thigh to reach parallel to the floor is one of the most common technique errors in the back squat.

Photo 2a. The head is too high.
may eliminate many errors associated with the back squat.

**Sochor:** Range of motion is the most common technique error in the back squat that I have observed. Athletes new to squat training often don’t realize the importance of executing strength training exercises through a full range of motion. Squat depth is very important. To be sport-specific, the thighs should be parallel to the floor (Photo 3). We have found that below parallel, such as required by powerlifters, will give better training benefits. There are few reasons to squat any deeper than powerlifters. To descend further puts undue strain on knees, hips, back and spinal column. Failure to descend deep enough causes no potential dangers to the athlete but does diminish efficiency of squat training.

Squat variations exercises are often performed at higher angles, but it is important that the deeper horizontal exercise be used to improve athletic performance. Hip, back and leg flexibility are essential in order to develop an athlete’s squatting depth. Forty percent of our beginning athletes have difficulty with squat depth. There is a correlation between poor range of motion and inflexibility. When flexibility improves, correct squat depth follows.

2. What is the second most common error, and of the top five errors, how does that error rank (percent)?

**Fairchild:** The second most common error in the back squat may involve excessive forward lean as the lifter begins to descend (Photo 4). This is often caused by lack of overall strength or may be accentuated by a weak lower back. Several factors contribute to this problem: a weak erector spine group, head and eye focus dropping from a neutral position, lack of strength in the hips and thighs, or excessive poundage beyond the lifter’s abilities.

To correct this error, lower back strength must be enhanced. Verbal instruction stressing proper descent with a “big chest” and “flat back” is helpful. Athletes may use mirrors to observe their technique. Slightly weighted front squats sometimes assist in correcting excessive forward lean, due to the extra demands placed on the body to hold the torso erect during the front squat.

All back strengthening exercises are recommended, especially back hyperextension with an isometric hold at the top of the lift. At least 50 percent novice lifters will have excessive forward lean in their squat.

**Hill:** The second most common error in squatting is an uneven bar grip (20%) (Photo 5). This could result in uneven displacement of the weight on the back and a twisting movement up from the bottom position, resulting in loss of balance.

To correct this technique error, demonstrate the proper grip and explain the importance of an even grip to keep the weight evenly distributed on the back.

**Ritchie:** The head position governs the position of the rest of the body. During the back squat I have often heard the coaching phrase “look at the roof when you squat.” This head position supposedly gives the athlete a better back position during the squat, however, I do not believe this to be the case. More often than not this places the back in too much of an extreme position. It is more desirable to hold the head comfortably in line with the spine and the eyes facing the mirror. This will keep the body in better alignment.

**Sochor:** Misalignment of the spine or back posture is a common technique error (30 percent). If shoulders are rounded (hyper kyphosis) there is potential for upper vertebra problems. A convex contour of the mid-back (T5-T7) area is also dangerous. Unnecessary pressure is applied to these vertebrae and injury is likely. A curved back is often found with the depth problem and can be helped with flexibility training. Isometrically contracting the spine and holding it erect during the complete squat movement must be stressed. It is helpful to thrust the shoulders back before the bar is placed on the back. Also, protrude the chest and stomach slightly forward to ensure a straight back. Use of a video recording will provide the athlete with feedback and the coach with an instructional aid in correcting the problem.

Light weight squats, squat snatches and front squats strengthen the back. These lifts and other back exercises will help improve flexibility in a weak back. Athletes that have poor back posture during the squat often have the depth problem. Although they may be related, each technique should
legs can tolerate, so he shifts his hips up and tries to lift the weights, stressing his lower back.

To correct the technique error, have the athlete adjust his max down and feel the weight over the whole foot, flex the abbs throughout the exercise and pull down on the bar when starting up from the bottom position.

Ritchie: During performance of the back squat the position of the knee should be governed by the hip position. The hips must be pushed back with the torso remaining as upright as possible in order to maintain the knee position over the toes (Photo 6a). If the knee moves forward over the toes, the shearing force is increased and may be a contributing factor to knee injuries (Photo 6b). Therefore, it is a good practice to maintain the knee position over the toes while performing the squatting movement. As the squatting movement is being performed, it is desirable to have the knee move in a straight plane with limited lateral movement to keep the knee as stable as possible. It is when the knee starts to move laterally that the possibility of injury develops. "There is very little predictive relationship between knee stability and prevention of knee injuries" (NSCA Position Statement: The Use of the Squat Exercise in Athletic Conditioning). Bouncing at the bottom of the squat to help initiate movement out of the bottom positions is also undesirable. It increases the likelihood of injury and increases the mechanical loads to the knee joint.

The knee position extending too far over the toe is also considered an error. In this position the heel raises from the ground and the hip is sitting too far over the heel. This raised heel position may be corrected by having the athlete sit back with the hips and allow the heel of the foot to be in contact with the ground throughout the whole squatting movement. Correction of this error is best achieved by video as the athlete with good kinesthetic awareness will quickly see and then feel the error and make the adjustments. Demonstrations are also an effective way of addressing the problem.

Another problem is the knee to toe relationship and the position of the back. If the back is kept in this strict upright position it will tend to force the knee out over the toe position. It
be analyzed separately and corrected. Another back error is lower back instability at the lowest position of the squat exercise. This problem isn’t always related to the other incorrect back techniques. It is often detected by dipping rapidly or loosening the rigid contraction of the back at the bottom of the squat. Seventy to 80 percent of athletes with this technique error can correct it with improvement of flexibility, back and abdominal strength. When no significant change is noted over a 30-day training period, however, suspect lower (L1-L5) or hip (S1) vertebrae problems. Do not be quick to diagnose the problem as overtraining, undertraining or mid-section weakness. Gather all information and workout data that helps you analyze the athlete’s symptoms and determine whether this problem needs professional health attention. Often, as many as 98 percent of our athletes with weak hips and lower back instability have been helped by chiropractic care. Seek professional assistance when the back and hip joints are suspect. It is frustrating for the athlete to improve squat technique and performance when training is hindered by a physical limitation, and the incorrect technique may create a severe medical problem if not corrected. Doing simple squat technique work with very light weight has alerted us to many athletes who needed chiropractic care and other treatment. Don’t hesitate to get professional health care advice from someone knowledgeable on squat training.

3. What is the third most common error, and of the top five errors, how does that error rank (percent)?

Fairchild: The third most common technique error in the back squat is the knees traveling forward. If done correctly the squat is a wonderful exercise for strengthening the knee capsule. Extreme forward motion by the knees through the descent may place undue pressure on a knee joint that is already undergoing tremendous pressure. Verbal reminders to keep the weight on the heel of the foot or emphasis on a slight extension of the buttock at the start of the squat are helpful reinforcers. Physical repetition of the first third of the squat with a “big chest,” hip extension and body weight on the heels sometimes gives the lifter a better breakdown of the mechanics being sought. Approximately 40 percent of novice lifters have this problem.

Hill: The third most common error in squatting (10 percent) is movement of the hips ahead of the bar from the lowest squatting position. This can result in bar movement forward of the balance position, causing loss of balance forward and lower back strain.

This often occurs when the athlete is attempting more weight than his
Achilles tendon area often cause the heels to rise as the lifter descends. Stretching exercises may also help. Thirty percent of novice lifters will have unsuitable heel lift.

Hill: The fourth most common error in the back squat (10 percent) is squating with a rounded back. This could result in the forces placed more on the lower back and less on the legs.

To Correct: Have the athlete squat with a wooden stick or just the bar until the technique is mastered, then start with light weight and progress as technique improves.

Ritchie: Throughout the back squat movement the back should be in a rigid negative arch position. The athlete should squeeze the shoulder blades together and elevate the trapezius muscles, then hold the bar as described in Question 1. Compression of the spine will occur as the bar is being placed on the upper back and shoulders. The athlete should try to maintain the back as upright as possible. Garhammer (1989) stresses the importance of flexibility in maintaining an upright torso position during the squatting motion to reduce spinal compression and shearing forces. (NSCA Position Statement: The Use of Squat Exercise in Athletic Conditioning). Any rounding of the back is a technique error and the athlete must drop the loading, correct the technique and then gradually increase the loading. The basic principle of training is to never sacrifice technique for loading. There are no desirable rotational movements involved in the squat. Any rotation movement should be corrected through repetition of correct technique. The squating movement should be performed in a controlled and smooth fashion.

Sochor: Another common error in the back squat is foot placement, which occurs 5 to 10 percent of the time in novice athletes. The heels should be about shoulder width with the toes rotated laterally 10 to 30 degrees. A narrower stance will push the athlete out of vertical alignment during descent by causing the hips to drift backward and the shoulders to drop too far in front of the feet. When athletes maintain this form and their back isn’t straight, alter foot placement to correct the defect. A wider stance may allow some athletes a better opportunity to achieve the depth and straight back needed for safe squats. However, female athletes should not use an extra wide stance. The structure of the female pelvis suggests an extra wide stance could create strain on muscles and organs of the abdomen.

3. What is the fifth most common error, and of the top five errors, how does that error rank (percent)?

Fairchild: The fifth most common error in the back squat involves foot placement. Many lifters will attempt to place their feet either too close or...
Photo 7. Raised heels during the descent hinders balance and increases pressure on the knees.

is a case of deciding what muscle group the athlete wants to develop and the physique of the athlete. The shin should remain as vertical as possible with a back position as upright as possible.

Schoor: I believe the third most common error when performing the back squat is bar placement on shoulders. Fifteen percent of athletes with incorrect technique will exhibit this characteristic. It is detected by rolled shoulders (hunched forward) prior to the descent of the squat. Placing the bar higher on the traps is helpful only if the squat can be performed with a straight back or slightly convexed in the anterior direction. Placement should be between T2 and T3 thoracic vertebrae. Bars can bruise or crack the spinal process if athletes slam the bar into their back to get a good bar seat. Instead, simply place the bar securely into the middle fibers of the trapezius. To help correct shoulders, slide hand grips in closer to the body.

placement too low on the back. This error is evident by the athlete leaning forward with shoulders and bar excessively out of line with hips, knees and feet prior to descent. The main danger is the bar rolling off the athlete's back, allowing a potential for injury to the spotters and the athlete. It is much safer to place and keep the bar approximately one inch below the top of the deltoids. Bar stability can be maintained by better shirt quality and chalking the shoulders.

4. What is the fourth most common error, and of the top five errors, how does that error rank (percent)?

Fairchild: The fourth most common error in the back squat is allowing the heels to come off the ground so the athlete is on his toes or balls of the feet through the descent phase (Photo 7). This creates a loss of balance, unstable positioning and unreasonable pressure on the knee capsule. To correct this problem it often helps to slightly widen the base of support, emphasizing toes out and weight on the heels. Remind the lifter to initiate the squat with a slight rearward extension of the buttocks and weight on the heels. Limited flexibility in the hamstring group and

This brings the shoulders back and pushes the chest out to improve upper body posture. Note: if discomfort occurs between the shoulder blades on either or both sides of the spine, the squatter's grip is too narrow, causing the scapula and rhomboids to be pinched. The other extreme is bar

Photo 8A. With the feet too close, the lifter may have difficulty keeping the feet flat on the floor and reaching parallel.

Photo 8B. With the feet too far apart, excessive forward lean and difficulty reaching parallel are potential problems.
too far apart (Photo 8A & 8b). With the feet excessively close, the lifter will have difficulty keeping the feet flat and attempts to reach parallel are sometimes painfully hampered. With the feet too far apart, forward lean is often exaggerated and again the lifter will have complications descending to parallel, often evidencing pain in the abductors or adductors. While not the same lift technically, it may help to have the lifter perform several front squats until he feels comfortable with the foot positioning. Mark the position of the toes on the floor with a piece of chalk, then have the lifter place the bar on the back, aligning the toes with the chalk marks and practice squatting. The foot positioning should be approximately the same. About 20 percent of novice lifters have incorrect foot position.

Hill: The fifth most common error in the back squat (10 percent) is allowing the heels to raise during the exercise. Loss of balance and possible low back injury could result from a) poor ankle flexibility; b) pushing the hips forward on the descent or c) emphasis of the weight forward on the foot instead of evenly over the whole foot.

Determine ankle flexibility by having the athlete lay flat on his back, straighten his leg, flex the foot down and hold, then take the leg back towards the athlete's head. If the athlete is unable to take the leg to 90 degrees, work on ankle flexibility and have the athlete squat only to the depth he can maintain a flat foot.

If the athlete is pushing the hips forward, have him squat without a bar emphasizing pushing the hips back and down. Once the athlete masters the technique without weight, start with light weight and progress as technique allows.

If the emphasis is on the weight forward, the athlete must keep the weight back over the whole foot.

Ritchie: The bar position is an important aspect of the back squat. If the bar is placed too high on the back of the neck, the athlete will round the neck and move the head back. This will also lead to rounding the back to protect the spine because the bar is placed too high on the neck, resting on the skin and bone of the neck rather than the muscle. The bar placement will depend on the type of squat being performed, the purpose of the lift and the muscle group worked. Olympic weightlifters prefer the high bar position as this works the leg a little more evenly and more emphasis is put on the quadriceps. During the performance of the low bar squat, the hamstrings and gluteus muscle group are more involved.

Schor: Improper breathing (5 percent) is a common error, especially among athletes squatting heavy weights. With heavier poundages during the athlete’s training, an inflated chest cavity helps to keep the spine rigid. Start to inhale on the descent. The lungs should feel filled before reaching the bottom. Exhale slowly only after the ascent of the squat is well on the way up. Breathing techniques require timing to obtain a comfortable feeling during the descent and rise. A slight variation in the timing of this pattern may help the athlete’s squat.

6. Do you have any concluding remarks on exercise technique errors for the back squat?

Fairchild: The sixth most common error in the back squat is placing the bar too high on the shoulders or neck (Photo 9a). The opposite extreme would be the bar placed too low on the back as is done by many powerlifters (Photo 9b). With the bar resting on the neck or base of the neck, rather than across the shoulders and posterior deltoid (Photo 9c), a definite balance problem is created. For many lifters immediate pain is evidence that the bar is in this improper position. Show the lifter the approximate area the bar should occupy, and emphasize an extended chest along with the idea of pinching an imaginary pencil that is sitting vertically on the lifters spine between the scapula. This “pinching” allows the scapular muscles to tighten which removes pressure from the spine. Improper positioning of the bar on the back occurs approximately ten percent of the time, most often in novice lifters.

With proper instruction and reminders to modify incorrect technique, an athlete should be able to squat recreationally or competitively for many years. Technique errors are difficult to assess individually. This roundtable will define some of the more common errors so that the athlete, coach and conditioning specialist are more aware of potential problems.

Ritchie: If the back squat technique is accurate, the thigh should at least reach parallel and preferably break parallel. There have been numerous arguments about the squat as an exercise. What is the correct depth? Is the squat a dangerous exercise? What is the potential harm to the knee? The NSCA has produced an excellent position paper on the squat. It is essential reading for anyone involved in the strength and conditioning area, and is excellent in-depth supplemental reading.

Schor: Some other common errors include:

1. Not pushing up with hands when rising during the squat. This is done to aid squat posture.

2. Not rotating elbows to the front while coming up. Rotating the elbows directly under the bar helps the arms lift and keeps the back straight and ascending at the same rate as the hips.

3. Descending too rapidly.
Breathing and rate of descent are techniques that require timing. Athletes must descend slowly to keep proper form, control and ample time to fill the lungs with air. To drop and try to bounce up through the bottom endangers athletes and spotters unnecessarily.

Technique problems can be improved over a period of time. It is important to start with both flexibility and technique before weight is involved. Technique must be continuously monitored and analyzed and feedback given to each athlete. Videos and personal observations are useful for this. The strength coach and athlete must patiently work together. The novice lifters will require more time and special attention. Lightweight with slow progression over a long period of time is required to safely improve the athlete's technique. This slow progression is also important for the 11 to 15 year old athlete's growing epiphyseal plates located in the ischial tuberosity. Be aware of hamstring origin. This is a vulnerable area because longitudinal forces on the hamstrings tend to separate these plates from the bone. Implementing better technique with patience, consistent effort and gradual progression will insure that all your athletes will become flawless squatters and better athletes.