

the **CrossFit** JOURNAL ARTICLES

The Slow Lifts

Part 2: The Squat

Mark Rippetoe

The squat is the key to strength and conditioning. It is the sine qua non of barbell exercises. I usually go so far as to tell new trainees that if they are not going to squat, they should not even bother to train. No other exercise changes so many things about the body in so short a time as the squat. To omit squats because some uninformed fool said they were “bad for your knees” indicates that you probably didn’t want to do them anyway, so it’s just as well.

The next time some quasi-professional health-industry type repeats this hoary old silliness, ask them how they know. If they say that the bulk of their professional practice is generated by athletes who regularly and correctly performed full barbell squats and consequently “blew out” their knees, call me and I will be there within thirty minutes with \$80 million in cash. My money is safe, of course. The truth is that the bulk of their professional practice—insofar as athletic/sports injuries are concerned (never mind the myriad injuries and conditions resulting from inactivity)—is composed of soccer, basketball, and football players with knee injuries, none of whom are ever counseled that their chosen activity will “hurt your knees.” That advice is always saved for athletes participating in a structured strength program that includes squats.

I have some experience in these matters. A local pediatrician actually told one of my trainees—a particularly good kid, big and tall, but with rather limited athletic ability (he had an 8-inch vertical jump at the time)—“I would really hate to see you jeopardize your career in athletics with a bunch of squats and weightlifting.” Over the past few years this particular doctor has cost lots of kids a chance at an athletic scholarship and me a bunch of

money, so I’m rather unhappy with him just now. And it’s all the result of a profound lack of curiosity about something he desperately needs to learn.

Squats produce bigger muscles, better nervous control over those bigger muscles, denser bones, tougher tendons and ligaments, and the cardiac and pulmonary capacity required to function under the circumstances of loaded squatting.

Squats make knees stronger. Squats make athletes better. Squats are good for kids, teenagers, adults, elderly people, and anybody else who can perform them correctly. Squats are the functional expression of human skeletal and muscular anatomy, and the human body is designed to do them. The squat is the

way that tens of millions of years of evolution has adapted the bipedal human body to lower itself to the ground. It is the position in which half the population of South Asia spends the afternoon. And when done weighted, it is the best exercise in existence for strength, power, coordination, joint integrity, bone density, confidence, discipline, intelligence, and charm.

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It is important to understand why squats produce these effects. The short answer is that squats are awfully bleeding hard, and hard stuff requires more effort and produces more results than easy stuff. This is obvious to anyone who has been alive for more than five or six years.

The long answer is that since organisms adapt specifically and exactly to the stresses they are exposed to, the stresses produced by the squat happen to be the very stresses the human body needs to receive to express the genotype we have inherited. Its movement pattern is the one the muscles and skeleton do anyway, the basis for bipedal locomotion and force production against the ground. When this movement is performed under progressively heavier loads, the body adapts by getting better at doing the very things it was designed to do. It adapts by increasing its ability to generate the force of muscular contraction, by coordinating those contractions more efficiently, by improving the quality of the structures that transmit the force from the ground to the load, and by getting better at doing these things exactly and specifically in accordance with the manner in which the stress is applied to the system.

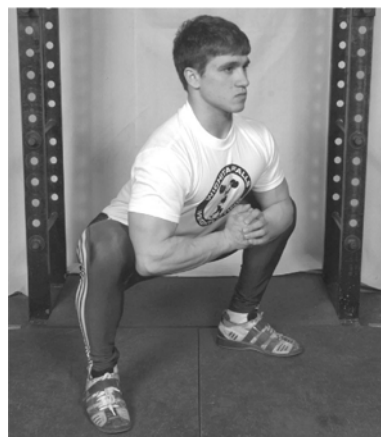
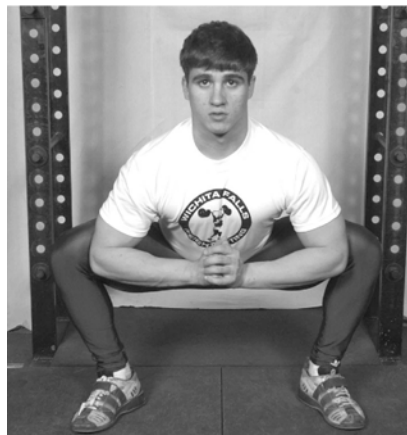
To enumerate, squats produce bigger muscles, better nervous control over those bigger muscles, denser bones, tougher tendons and ligaments, the cardiac and pulmonary capacity required to function under the circumstances of loaded squatting, and the psychological skills necessary to do them. Deadlifts come close, but don't quite stimulate the systemic response that deep squats produce, possibly because their range of motion is not as great, or possibly because their lack of stretch-reflex activation leaves out a key component of the stress. As of this writing these matters are poorly understood, and likely to stay that way so long as academia remains mired in the goo of dogma and conventional wisdom.

Learning to squat is not that complicated, although it can be made that way. I have developed a method over the years I have spent teaching squats to everybody who will hold still long enough, one that eliminates the usual trial-and-error approach taken by most personal trainers and strength coaches. It works well with individuals of different sizes and abilities, and with people of all ages. I have used it with deaf people with good results. It is detailed in my and Lon Kilgore's book *Starting Strength: A Simple and Practical Guide for Coaching Beginners*.

In a nutshell, it is easy to squat correctly if you know

before you squat with the bar exactly where you are going to be when you get to the bottom. This is accomplished by assuming the desired bottom position before the bar is taken out of the rack. This way, the motor skills involved in identifying the bottom position—its balance, its proper depth, and its foot, knee, hip, back, and chest positions—can be embedded before the factor of bar load is added.

The correct stance is taken, with the heels at about shoulder width and the toes pointing out at about 30 degrees. Some people, having been told (often by a football coach) that the toes need to point straight ahead, will need to point them out more than they want to.



Some people, having read the muscle magazines and seen pictures of large oily guys with no shirts and no body hair squatting with a narrow stance—"best for isolating the quads, my man"—will take a stance that is too narrow, and will need to be wider than they want to be. This stance is the best for allowing the hips to do their job of lowering and raising; it is not designed to isolate anything

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but rather to distribute the force evenly between the hips and knees so that everything contributes its anatomically predetermined share of the work to the job.

In this correct stance, squat down all the way to the bottom. The bottom is the extent of your full range of motion as limited by your flexibility but enabled by this correct stance. Once there, place each elbow against the inside of that knee, put the heels of your palms together, and jack your knees apart by pushing your elbows out against the insides of your knees, keeping your chest up as best you can. This puts the thighs in a position parallel with the feet, again about 30 degrees out from straight forward, with no twisting of the knee since the femur and the tibia are lined up. Your heels will be down, since that is where they have to be if your weight is distributed evenly on your feet. Your knees will be slightly in front of your toes, since that is where they will end up if your heels are down and your knees are out. Most people will be able to get below parallel in this position, since most of the reason people squat high is bad position of the leg and hip components. Squatting below parallel is perfectly natural if the correct position is used. If it weren't, it wouldn't be so easy to do.

Once this position is comfortable and stretched out a little, come up out of the bottom position and pay attention to what you do on the way up. Ninety percent of people who have had no previous instruction in the squat will lead up out of the bottom with their hips, essentially shoving their butt up in the air. This is correct. The squat is a hips-initiated movement, meaning that hip extension—glutes, hamstrings, and adductors acting to return the pelvis/low back and the femurs to a straight line—starts the squat up out of the hole.

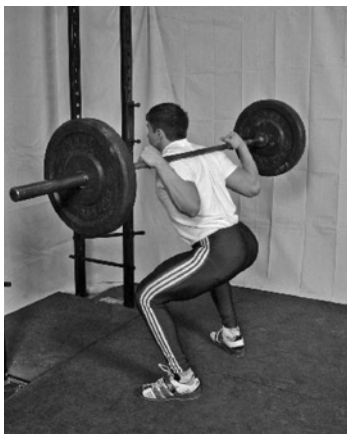
The trick is to keep the chest up while this happens.

Keeping the chest up and lifting the chest are two different things. “Keeping the chest up” involves maintaining the angle and position of the back while hip drive occurs, while “lifting the chest” involves changing that angle and position. Attempting to increase the angle of the back (by actually lifting the chest up) while coming out of the hole will pull you forward, off your heels onto your toes, and kill your hip drive, in addition to exposing your spine to changing leverages under load as its angle increases. The back will become vertical soon enough, after the hip extensors begin phasing out and the quadriceps become the prime movers. Making the back vertical too early, or trying to keep it too vertical in the bottom, interferes with the mission of the hips.

Here's a test that can be very illustrative of the concept of hip drive and its relationship to these angles. Take your correct bottom position and then have a training partner put a hand on your lower back, applying force straight down, perpendicular to the floor, as gravity would do. Drive up against this force while keeping your back angle constant, and see what this feels like. Now do the same thing while raising your chest up and increasing your back angle. I predict that you will not like it as well.

While we're at it, compare driving up against the hand while looking down at a point six to ten feet ahead on the floor, to driving up while looking up at the ceiling. I predict that you will like looking down much better. This is because looking up pulls up your chest and shifts your weight forward onto your toes, while looking down at that angle puts the cervical spine in an anatomically normal position. Looking down also allows the eyes to provide the brain with instantaneous information

regarding body position relative to a stationary point close enough to serve as a balance reference.



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So, here's the bottom line: your hips cannot drive up if your weight is balanced forward on your toes, and if your heels are not planted firmly, your weight is forward. This is because of the way the hamstrings work during the squat: they pull back against their insertion points on the tibia just below the knee, producing a stretch-reflex-enhanced contraction up out of the bottom. The tibia should be a solid anchor for this "bounce." The hamstrings use their proximal function in the squat—they pull on the ischial tuberosity of the pelvis to produce hip extension—the straightening out of the hip. No forward knee travel should occur after the hamstrings begin to tighten as the bottom of the squat is approached or as the upward drive occurs, since any forward knee movement (which can be thought of as backward movement of the distal end of the tibia relative to the knee) will diminish hamstring tension and make the stretch-reflex-enhanced hamstring contraction much less powerful. If the heels are not planted firmly, some of the force generated against the tibia gets absorbed as the heel gets pushed down, instead of pulling the pelvis into extension. In the squat, the tibia is the anchor for the hamstrings, and it can't anchor anything if its distal end at the heel is squishy.

All these things can be best studied and worked out before the bar is on the back. Most of the problems encountered in the squat can be fixed here, without load. Only after a good position is obtained at the bottom without weight should you squat with the bar. Fortunately, most people need only a couple of minutes in the position before they're ready to use the bar.

When you're ready, take the bar out of the rack (stepping back please, so that you walk forward when putting it up), take the same stance you prepared, look down a bit, think about keeping your knees out, take a big breath and hold it, and squat all the way down. I'd bet a lot of money—maybe not \$80 million, but a lot—that this first squat is balanced, strong, deep, and correct.

There is a lot here to consider, and this is just the beginning (which is why *Starting Strength* devotes 52 pages to the squat). It is the most important barbell exercise in our inventory of things to do in the gym. Learn to do it correctly, dammit. We need you strong.



Mark Rippetoe is the owner of [Wichita Falls Athletic Club](#) and [CrossFit Wichita Falls](#). He has 28 years experience in the fitness industry and 10 years experience as a competitive powerlifter. He has been certified as an NSCA Certified Strength and Conditioning Specialist since 1985 and is a USA Weightlifting Level III Coach and Senior Coach, as well as a USA Track and Field Level I Coach. He has published articles in the *Strength and Conditioning Journal*, is a regular contributor to the *CrossFit Journal*, and is the author of the books [Starting Strength: A Simple and Practical Guide for Coaching Beginners](#) and [Practical Programming for Strength Training](#).