

Starting Strength

Active Hip 2.0: The Directors' Cut

by

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The term “active shoulder” has been used to describe what happens when the muscles of the shoulder girdle are used to support weight overhead in a way that protects the joint from impingement and places the load in balance over the scapulas. It involves the active contraction of the trapezius muscles, in recognition of the fact that the scapulas articulate with and therefore support the arms in the overhead lockout position, and that the traps thus ultimately hold up the weight of the bar if it is in balance directly over the glenoid fossa, the “socket” of the ball-and-socket joint of the shoulder. The active concentric contraction of the traps at the top of the scapula combined with the tension at the bottom of the scapula from the serratus anterior combine to tilt the top of the bone in the medial direction, away from the humerus in its position of lockout overhead, thus preventing any possible impingement of the soft tissue between the acromion process and the humerus. In effect, the triceps and deltoids bring the arm bones into alignment and hold them that way, but the traps hold the load up overhead by holding up the scapulas, the bones over which the bar is balanced and supported.

This active concentric contraction is in contrast to the isometric contraction used during the pull from the floor: when the bar hangs from the shoulders under the scapulas, the weight of the bar is suspended from the traps at their attachment to the scapulas, the transfer of force from the spine having been accomplished along the traps' more than 18” of attachment to the spine between T12 and the base of the skull in an average-size man. In this function, the traps don't shorten – they just maintain the normal anatomical position of the scapulas as they receive the force from the spine. The lats then keep the arms at the slight angle required to hold the load vertically under the scapulas. The lats are also in isometric contraction during the pull, for the same reason: their job is to hold the position of the load while the extending knees and hips produce the force that moves the weight, and the rigid spine transfers this force from the hips and legs across the scapulas and down to the load hanging from the arms. If we are doing a snatch or clean, the bar accelerates as it passes the mid-thigh and the force against the scapular mechanism that suspends the bar increases to the point that an active concentric contraction becomes necessary to stabilize the scapulas as they receive rapidly increasing amounts of force from the hip and knee extensors. This “shrug” may or may not be perceptible to the observer, but it is present as an involuntary protective mechanism of force transfer any time acceleration through the top of the pull occurs.

The concept of the “active shoulder” is very useful in teaching the press and its variations, the snatch, the overhead squat, and the jerk. Wouldn't it just be funnier than hell if there was an equivalent concept available for cleaning up the problems associated with the squat? Well, there is, and just for the sake of making a nice little pattern, let's call it “active hip.”

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When we squat, the standard range of motion criterion for the exercise is “below parallel”, defined as the hip joint – identified at the apex of the hip angle, the “corner” in your shorts over the hip – as it drops below the knee, identified as the top of the patella. Most people that have trouble with the squat are having trouble getting good depth while keeping their low back from rounding. Pretty much anybody can get deep if they allow the lumbar spine to relax into flexion. But we have found that almost every single human being on this planet can squat below parallel with pretty good lumbar extension if their stance is correct and if they simply shove their knees out to the sides as they squat. This is because a type of impingement occurs at the bottom of the squat that is relieved by shoving out the knees, allowing for a below-parallel squat with this simple skeletal position adjustment. At the same time a drastic improvement occurs in the way the hips work.

Stef, who is much smarter than I am, occasionally walks up to me and says things that cannot be ignored. Not that I would ever want to, and not because she says them in a clear, strong voice, but because they make such perfect sense that you have to say to yourself, “Why is it that *she* said this before I did? Am I that *dull*? This is so damned obvious that I must now begin to question my ability to reason and observe. Maybe I’m drinking too much, or not sleeping enough, or ...” So when she walked up to me one day and made the observation that, “You know that the femur impinges on the hip pointer at the bottom of the squat if the knees aren’t out of the way in the same way that the acromion process of the scapula impinges on the humerus in the press if the traps aren’t shrugged, don’t you?”, like I was a moron. I had to agree.

Most people think that the main problem with squat depth is hamstring extensibility, more commonly referred to as “flexibility” – the ability of the hamstrings to lengthen as the depth of the squat increases. This is not really necessary, and loose, elastic hamstrings are not the key to a deep squat. Optimal skeletal mechanics is.

If you stand with your heels at shoulder-width apart and point your toes out at about 30 degrees, squat down, and keep your thighs parallel to your feet, then as your hip angle closes and your thighs approach your torso, your femurs will track to a position that is *outside* of the ASIS – the anterior superior iliac spine – the hip pointer that you feel right below your waistline. But if you point your toes straight forward and let your knees follow your toes, or even if you point your toes out but still let your knees cave in toward the middle when you squat, then as you squat down your femur will approach the ASIS as you approach the bottom. So as your thighs crowd your belly, they tend to trap any soft-tissue structures that may be in the area between the thigh and the hip pointer. If you have a big gut or big thighs, or a lot of clothes on, this will keep you from obtaining a below-parallel squat.

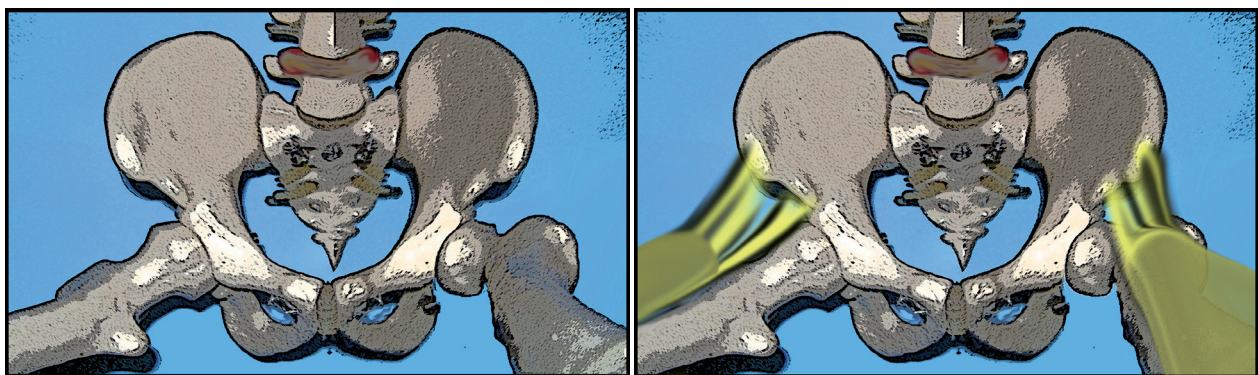


Figure 1.
The anatomical details of “hip impingement”.

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Squat depth is a function of hip angle, the angle formed between the generalized plane of the torso and the femur. If you try to continue to drop down to get better depth with no adjustment in the position of your femurs, it will happen at the expense of a rounded lower back, since the hip angle cannot become more acute if the femur is impinged. If the pelvis – which is supposed to be locked into the lordotic curve with the lumbar vertebrae, held rigid by the erector spinae muscles – can’t tilt forward to maintain this position because it rams into an obstruction formed by the impinged femur, the only way to keep going deeper is to round the low back into lumbar flexion. The obstruction occurs before the bones actually touch, of course, since the hip flexor origins lie in between. Everybody, big belly or not, will experience this phenomenon to one degree or another, and everybody that cannot get below parallel with an arched low back has this problem. If you’re having depth problems, shoving the knees out fixes it so often that it is waste of time to do anything else first.

Most people won’t do the job of keeping their knees out unless they’re coached to do so, often and loudly. The knees want to track more medially than this because of the tension on the inside of the femurs produced by the adductors – the groin muscles. These five muscles (the adductor magnus, adductor brevis, adductor longus, pectineus, and gracilis) attach at various points along the medial and posterior aspect of the femur, and on the ischium and pubis of the pelvis. Tension is produced between these two bones as you squat down and keep your knees out; this is an eccentric action for these muscles, since they lengthen as the femur maintains its position parallel to the feet. As you come up out of the squat, the distance between the inside of the femur and the medial pelvis shortens as the hip angle opens up; the concentric action of the adductor muscles thus produces hip extension.

Visualize this by imagining a point at the end of the inside of your thigh down by your knee, and another point on your “seat bone,” under your butt and behind your crotch. These points represent the attachments of the biggest adductor, the *magnus*-one. Since your back is locked in extension by your spinal erector muscles, and the back of your pelvis is locked in position along the line of your back by these same muscles, as you squat down and make your back more horizontal your seat bones rotate back and away from your knees. And if your knees stay in position, pointed in the same direction as your feet – out at about 30 degrees – the distance between the point on the inside of your thigh and your seat bone increases. And if this distance increases as you go down and decreases as you come up, the contraction of the muscles that got longer on the way down makes the coming-up part happen. This is how the adductor muscles function in a correctly performed squat, and why they are considered hip extensors, along with the glutes and hamstrings as part of the posterior chain.

Since the adductors tend to pull the knees in, what keeps them out when you use your hips correctly? If *ad*-duction of the thigh means pulling the distal end of the femur toward the midline of the body, it seems like *ab*-duction would be the movement used to keep them out, and that the abductors would be the muscles that did this. But the abductors consist of the tensor fascia latae (TFL), a small muscle that connects the hip at the anterior iliac crest to the lower leg, as well as the gluteus medius, and the gluteus minimus. Together they create hip abduction if you raise your leg out to the side away from your body. Since nobody actually does this except in biomechanics class to demonstrate the definition, this is probably not what is going on when we squat.

External rotation occurs when you make your right femur rotate clockwise and your left femur rotate counterclockwise, as when you stand up and rotate your toes away from each other balanced on your heels. The action of rotating the femurs out is what actually occurs when you drive your knees out on the way down to the bottom of the squat. Prove this to yourself by sitting in a chair and making

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the same muscle action on your femur as you would pointing out your toes while standing up. There are at least nine muscles that perform this function: the gluteus medius, minimus, and maximus, the adductor minimus, the quadratus femoris, the inferior gemellus, the obturator internus, the superior gemellus, and the piriformis. External rotation is critical to stabilizing gait mechanics through the stride.

Using these muscles to set the knees in a position parallel to the feet makes all kinds of sense when you consider that they are in an effective position to do it and the TFL is not (the minimus and medius are external rotators anyway). (And while we’re using parentheses, Nautilus had an extremely silly machine that exercised abduction and adduction of the hips – in isolation, of course, from the rest of the hip function. A cleverly designed device, but utterly irrelevant to human movement.) So shoving the knees out at the top of the squat and keeping them there so that the adductors can do their job is accomplished by hip external rotation, and forms an important part of the active hip concept.

When you intentionally shove your knees to the outside as you come down into the bottom of the squat, you not only get the femurs away from the ASIS and the gut, you allow the adductors to stretch tighter and position them to more effectively contract as they reach the limit of their extensibility. A tight, stretched muscle contracts harder than a looser, shorter muscle, because the stretch tells the neuromuscular system that a contraction is about to follow and a more efficient firing of more contractile units always happens when preceded by a stretch. This *stretch reflex* is an integral part of all explosive muscle contraction, and better athletes are very good at making it happen. When we squat, the external rotators of the hip position the femur so that the adductors can participate with the hamstrings in the bounce, so that the whole hip musculature contributes to squatting efficiency – *if* you shove your knees out.

The bounce you feel when you stretch out the hamstrings and adductors at the bottom of the squat is *not* due to knee ligament tightness or rebound. The correctly performed squat is an ACL/PCL-neutral event. You bounce off of the stretched and tightened components of the posterior chain and the now-correctly loaded quadriceps, and it is absolutely safe for the knee. It is an important part of the squat, both when loaded with a heavy weight and when unloaded as an “air” squat, when a rapid turnaround is important for timed exercises. When you use an *active hip* – actively pushing the knees out into a position parallel to the pointed-out toes with your pelvis locked into your arched lumbar spine, you make your squat depth more easily obtainable and your hip drive out of the bottom faster and more powerful.

The limit of the adductors’ and hamstrings’ extensibility will almost always be below parallel, as defined earlier. A few people lack sufficient extensibility in the posterior chain muscles, and some people have tight joint capsule ligaments, but not nearly as many people need stretching out as merely need the correct stance, the correct knee position outside the ASIS, and a loud reminder to keep their knees out. The weighted squat has few superiors in the realm of things that go *stretch* anyway, and what little actually needs to be stretched can most often be done within a few sets of weighted squats that incorporate an active hip.

It has recently come to my attention that a relatively high percentage of people, many more than I had previously thought, have no idea what the hell their low back is doing at any given time. My good collegiate weightlifter and one of my older members both recently became the recipients of my head popping out of my ass one day recently, when it occurred to me that maybe they needed a refresher on arching the low back. As it turns out, neither of them had ever consciously contracted

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their lumbar erectors, and didn’t actually know how to do it. This awareness of the position of the body or its parts in space is called *kinesthetic sense*. They had been relying on ligament tension and general trunk tightness, fine for very light weights but really a handicap at work-set loads. If the lumbar spine and the pelvis do not stay perfectly rigid in what could be called “pelvic lock,” force transfer is not as efficient up the spine, posterior chain rebound is soft, and back safety may ultimately suffer. A developed kinesthetic sense of spinal position is necessary for efficient force transfer, and effective athletic performance in general.

As it turns out, if you can’t make a voluntary concentric contraction of the lumbar erectors – the movement commonly understood as “arching” the lower back – then you have no voluntary way to keep it in extension when this position gets hard to maintain. Remember that the hamstrings attach to the bottom of the pelvis at the ischial tuberosity, and that the erectors attach to the sacrum. The pivot in the middle is the hip joint. So the back muscles and the hamstrings are fighting for control of the lower back, especially when the hip angle gets closed with the knee in extension like at the start position of the deadlift. This position tightens the hamstrings, and this tension on the bottom of the pelvis works directly against the efforts of the lumbar muscles to hold the top of the pelvis locked with the low back in extension.

This is important because lumbar extension places the ischial tuberosity at a better angle to stretch out the hamstrings at the bottom, with a longer distance between the top and bottom tendon attachments, and thus provide a longer potential contraction that can contribute to hip extension. In effect, there is a war between the erectors and the hamstrings over control of the pelvis, and the erectors *have to win* if the back is to stay rigid and the hamstrings are to be stretched effectively. If you do not know how to get your erector muscles to contract to arch your lower back with no tension from the hamstrings interfering, this means that you do not know how to assume this position voluntarily. You do not have the kinesthetic sense to know when it is there and when it isn’t, and you can’t put it in this position at the bottom of a deadlift or keep it there at the bottom of a squat when hamstring tension is at its highest.

There are several tricks I can use to make a lifter assume this position and hold it, all of which depend on the ability to know when the back is arched, when it’s not, and how to squeeze the lumbar muscles into a hard voluntary concentric contraction so that the ability to hold it in isometric contraction during a squat or pull can be developed. The “superman” position on the floor works because a set of 10 reps causes a burn in these muscles, and when the kid stands up he can feel the muscles quite well and then he can duplicate the contraction that caused the burn. Many young men are unfamiliar with an arched low back, while I have never encountered a female that didn’t already know this position well. (This probably has something to do with normal female posture, but that smells like sociology to me.) My weightlifter subsequently did four PRs at a meet two weeks later; my other member was merely happy. We now include learning this simple movement very early in our seminars, where we usually find that about 15% of the people in attendance don’t have voluntary control of their lumbar muscles.

So the concept of the *active hip* is best understood as the use of an actively locked lumbar extension and actively shoved-out knees, which results in a below-parallel squat that incorporates a stretch reflex using all the muscles of the posterior chain in the most optimal way possible. The active hip gets the thighs out of the way of the pelvis so good depth can be more easily obtained. At the same time it makes the squat stronger because of the now-active use of the external rotators holding the

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femurs out so that both external rotators and adductors can contribute to hip extension. This produces a more effective use of more muscles over a wider range of motion.

The active-hip concept is also applicable in movements that don't elicit a stretch reflex. If a hip extension is involved in the movement, as it most certainly is with all pulls from the floor, the lower back obviously needs to be in pelvic lock and hard extension, but what is less obvious is the adductor/external rotator component. If the knees-out position can tighten up the adductors, they can function more effectively as hip extensors, and since hip extension is involved in any pull, a knees-out position can improve their participation in the pull. Since the range of motion of the hips in a pull from the floor is relatively smaller than that of the squat, their direct contribution is lower than in a squat, but any external rotation engages the adductors in a supportive/hip tightening role. This allows more precise control of movement at the hip (an effect that's easy to feel in the dip-and-drive of the jerk) and more effective transfer of force by the hip extensors that directly contribute to moving the load. Olympic weightlifters often employ this knees-out starting position to fix problems off the floor and allow for a better back angle.

A more knees-out position also effectively shortens the distance between the bar and the hips when the knees are shoved out of the way a little. This modification of the effective length of the thigh makes a more vertical bar path easier to obtain off the floor. This may be very important for lifters with longer femurs trying to get into a better start position. But even for lifters with normal proportions, a little external rotation of the femur alters the balance of muscle action around at the hip in a positive way, helping with a more effective hip extension off the floor.

So next time you squat, remember the concept of the active hip: just get your knees out of the way and lock your lower back into extension. It's as useful to your squatting as shrugging your traps is to your pressing.

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