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**Overhead Squat Help**  
**The Deep Squat Test**  
**Motor and Perceptual Schema**  
**Learning from Images**

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## Chapter One: Overhead Squat Form

Most people squat “fan style” They simply try to fold themselves up, one joint on another like a Chinese fan. Problem is the body doesn’t fold into a nice neat compact package like a fan does.

The trick to learning how to overhead squat is realizing what your torso is and how it relates to your legs. For all intents and purposes your torso should be viewed as your “core”. The core I’m talking about is your “center”. Yoga people really get this. Ask a Yoga instructor where their core is. They won’t start talking about their abdominals! They’ll point to their belly a little ways above the navel and say “it’s here in the center”. The center is the “center of gravity”.



Suppose that one structure is sitting on top of another structure. It is the center of gravity (or center of mass which we can consider the same) that is important for the top object. All the stuff to the left, right, back or front of the center of gravity doesn’t matter if you want it to be balanced and stable.



Consider the image to the left. So, do you still think your “body” rests on top of your legs? Where is your body really? Study the hip area closely. See how the legs articulate with the pelvis. Does it really appear as if the body rest on top of the legs? No! It’s slung between them.

Your body then is your core or center of gravity. All the meat, bone and gristle that surround it are the hardware that keeps it stable. So don’t think of your torso, or body as all that stuff of muscle, bone, and organs. Think of it as a center point at which the entire weight of the body is concentrated. This point is actually slightly forward (anterior) to the first or second sacral segment. But for our purposes we can just think of it as being in the “center”.

When you try to squat as if you are folding up your hips and knees you are going against the design of your body. You are trying to squat as if your body is on top of your legs rather than between them. The majority of strength and bodybuilding trainees squat this way. The group that tends to get it right is Olympic lifters. They squat down between their legs. This simple realization can make that "deep squat" a lot less mythical! Watch Dan John teaching the Overhead Squat:

<http://www.gustrength.com/videos:danjohn>

*Skeleton image by [Raul654](#) via <http://commons.wikimedia.org/wiki/File:Skeleton.jpg>*

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## **Chapter Two: Tweaking the Overhead Squat: Dislocates, Reaching Back, Grip Width and Mobility Drills**

Can't do an overhead squat? Or you can but it's messy? Or you can't do it with anything other than a broomstick?

Let me guess. You do the hip mobility drills. You even work on your ankles. You stretch your shoulders (ouch).

You know the corrective exercise thing is a little funny. For a while now people have been raging against the 'body part mentality' of bodybuilding. Yet when it comes to failure to perform a lift suddenly it becomes about a list of deficiencies that need "correcting". Each one a separate segment of the body. The way I define mobility is how the body moves in a dynamic sense. Therefore the more you integrate the body the more mobile you become. Yes, many of the mobility exercises we do are about whole body movement but they are not specific, necessarily.

You can't squat because you lack ankle mobility. So do ankle mobility drills. You can't squat because your hamstrings are too tight (NOT likely) so you stretch your hammies. Etc. and so on.

I am sorry to inform you that Spidersmans and Warrior Lunges will not produce a good overhead squat for you. Those are great things to do for general mobility but the overhead squat is a specific exercise and the best way to deal with it is specifically. How's that for logic?

So let's get on with it.

The basic bar position for the overhead squat is barbell held overhead and lined up in the imaginary "pocket" between the scapula and the back of the ears. Some people teach this as being between the shoulders and ears as well. It doesn't make a lot of difference. The bar will be somewhere in that area and with practice you will develop the proper position.

Two of the variables then are the grip width and related shoulder mobility and thoracic mobility. I want to talk about some of the well meaning but mistaken advice on these issues.

## **Grip Width for the Overhead Squat**

The grip width for an overhead squat will always be wider than shoulder width and probably a good bit wider. The widest grip option is what is known as the "snatch grip" and it got its name for the common wide grip used in the performance of the Olympic Snatch Lift.

The Snatch Lift did not derive its name from the grip. A wide grip is simply used by many lifters because it lessens the distance the bar must travel, helps with mobility under the bar, and imparts more lateral control to the bar (bar is more controlled "side to side"). The grip is usually found by approximating the distance between the elbows when both arms are abducted to 90 degrees.

Not many overhead squatters will choose a wide grip because of distance or control issues. They will choose it because thoracic and shoulder mobility will not allow them to use a narrower grip during the descent of the squat.

Although you may be able to place the bar in position with a slightly wider than shoulder width grip during the standing/starting position of the squat the shoulders will be pulled forward as you descend and many will not be able to compensate. A wider grip lessens the pull. Even so most lifters have to actively "reach back" as they descend.

Many trainees use a grip that is much too wide due to lack of mobility. The narrower your grip the more weight you will be able to support overhead in the long run. Some trainees may choose a grip that is "too narrow" but this means it is too narrow for them to perform the lift with rather than too narrow to be "correct". There is no physical reason that a narrow grip cannot be used if mobility allows it although a too narrow grip cuts down on the control of the bar somewhat.

## **Overcompensating with the Reach Back**

It's not just shoulder flexibility it's both thoracic and shoulder mobility. The idea of shoulder flexibility for the overhead squat does not take into account what happens during the actual dynamics of the squat. As you descend in the overhead squat you must keep the bar lined up in the imaginary pocket between your ears and scapula. Not OVER your scapula which is a frequent mis-teaching. Keeping the bar over your scapula means that it doesn't matter what your torso does and you can simply continually push the bar back while the torso declines forward. The bar will be over the scapula while your eyes are starting

to face the floor! Although there will be some torso decline, initiated at the hips, the amount of torso decline some trainees display is ridiculous.

You would not compensate for a back or front squat by moving the bar to a different position yet people routinely move the bar to a different relative position as they descend into the overhead squat. The bar should never migrate from the pocket. The body should compensate in order to keep the bar over the center of the feet.

Trainees who overhead squat by reaching too far back with the bar will never be able to support very heavy loads. They also have less control over the bar and may be in an unsafe position if ever it comes time to dump the bar. The proper way to dump the bar during an overhead squat is to push the bar behind you, let go, and move out of the way quickly. Having the torso over-inclined with the shoulders flexed to their end range of motion is not a position that allows one to safely dump the bar.

One way to illustrate to yourself that it is not just a shoulder mobility problem is to try an overhead lunge. Many trainees will have no problem keeping the bar back during a deep overhead lunge even with a "narrow" grip of shoulder width or a bit wider but would never be able to do the same for a squat.

### **Overhead Squat Facing Wall**

Test yourself by overhead squatting while facing the wall. You should start with your toes about 6 or so inches from the wall. You should be able to squat not only without the bar or dowel contacting the wall but without planting your face against it too. If the initial distance is okay for you then move your toes a little closer to the wall. The goal is to be able to squat with your toes touching the wall. Once you can do this with a deep squat you have not only achieved the mobility but you have learned to distribute your weight properly.

If you cannot do this then you do not have a good overhead squat yet. There are mobility exercises below that may help you and meanwhile you can keep using the wall as a gauge. If you need to elevate your heels then do so but make it a goal also to get rid of the heel elevation. A couple of small plates will work to elevate your heels but a piece of lumbar will work better and be more stable.

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Try thoracic extensions on the foam roller get started loosening up the thoracic spine area:

<http://www.gustrength.com/videos:mobilitypg5>

## **Drop the Dislocates**

Personally I hate so-called 'dislocates'. This is the practice of bringing the bar up over your head and then back behind your head in a circle. I can't think of any positive to having your arms behind your head with a bar or anything else in your hands but dislocates are routinely recommended to increase the shoulder mobility for the overhead squat. They are done with barbells, wooden dowels, bands, ropes, or towels.

So, you might start in the standing position and do dislocates for a certain number of reps. Then with the arms in the OH squat position you descend a bit into the squat and do more dislocates. Then you descend a bit more, etc. and so on.

Problem is this teaches you to overcompensate for true functional mobility with hyper-flexibility in the shoulders. Essentially you are using the "over-reaching reach back" as a training method.

A few dislocates may be good as a loosening up exercise for stubborn shoulders but the overhead squat is not a shoulder mobility exercise! It's a squat. Yes shoulder mobility plays a large role but the shoulder mobility should be trained simultaneously with spine mobility as well as overall deep squat mobility.

The reason your shoulders are pulled forward during the overhead squat is because there are fascial lines from foot to head and as these lines are made taut slack must be created somewhere. In this case it's your shoulders. The cure is not to focus on the shoulders but to work on the entire body as a unit.

To improve your mobility for the overhead squat and all other squatting it's best to use actual squat mobility drills. Although "hip mobility" exercises are a useful part of your overall mobility plan the fastest way to develop your deep squat is to use drills that involve an actual squat like position.

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To work on this you need to work on the deep squat as a whole because your body is essentially "stiff". You may want to try the deep squat progression outline by Gray Cook. I will summarize the basics here but for the complete picture see "Athletic Body in Balance":

<http://astore.amazon.com/groupstr-20/detail/0736042288>

The Overhead Squat aka "Deep Squat Test" is an integral part of the so-called functional movement screen developed by Gray Cook and an overhead squat assessment is often an integral part of checking full body mobility. My idea of a "pass" on the overhead squat is a bit different than Cook's however since as a strength trainer I think of what will happen when lots of weight is on the bar and not just what happens during the initial phases of learning a lift. In the next chapter I will give some of my thoughts on this issue.

### **Create Length**

Perhaps the most important thing you can do to correct and master your squat is to "create length" and this simple instruction can have a great general benefit to your overall health (in terms of pain and injury) and performance.

The first thing you want to do as you set up for the overhead squat (and any squat) is to imagine that you are elongating your body. The arms should reach for the ceiling and you should try to do same with your entire body.

The scapula should be elevated throughout the performance of the squat. With the arms and bar in the overhead position shrug the shoulders up and lock them there. During the descent continue to maintain this shrug (and thus scapular elevation) and do not let up. Actively "lengthen" your spine as if you are not only trying to reach your arms to the ceiling but also your head.

Watch other trainees closely while they perform the overhead squat and you may notice that the bar tends to dip forward as soon as they reach bottom and stop descending. At the same time they start to go into flexion. This is because they have stopped extending, to put it simply. Although you are moving down into the squat as you flex your hips, knees, and ankles you should still be thinking "up" with the rest of your body. This keeps you tight and locked into position so that you will not have to re-establish body position and stability before beginning the ascent.



This lesson could be summed up as never think about the floor but about the bar. You go down but you don't think "I'm going down"! When we think about going down, and even go so far as to look down, we tend to go into flexion. Always actively push up against the bar. As Kat Ricker points out in her excellent article "Six Tips for the Overhead Squat" there is a certain amount of instinct involved with having a heavy weight overhead. As you move down the body wants to move the weight away from you to keep it from falling on your head!

One tip that Ricker gives that I don't agree with (it's a very common cue) is to focus on your feet and "push against the floor". Again, focusing your attention on the floor tends to create the very situation we are trying to avoid. And if you want to be able to spring out of the hole then the emphasis should be on a powerful extension of the body not a simple push with the feet.

Always remember that when you perform an exercise you have very little time and opportunity to think and correct. And the heavier the weight is or the faster the movement is the less time you will have, up to almost nil. So use the cue that gives you the best bang for your buck, so to speak. By telling a trainee to think both about extension and about pushing the floor we have simply divided precious resources AND given too many cues.

The trick is to learn to keep the weight centered where it needs to be and then think of your body as a big spring ready to extend. And this is exactly what is happening during the performance of the squat. The joints responsible for the body segments are extending. The result is a push against the floor but the PURPOSE of the muscles action is to EXTEND THE JOINTS by having the bony segments rotate. Don't divide your purpose!

The scapula going into depression as you descend will often force one or both elbows into flexion also causing you to dump the bar. Test both shoulders separately. If you have scapular mobility or stability issues and are unable to maintain elevation and retraction in one or both sides then you will need to work on this separately.

Overhead shrugs can help you train this and lots of other overhead work. Jerks (just the last portion of the clean and jerk) can be a great way to learn to support more weight overhead while also training dynamic stability and force transfer. The advantage is you can get more weight overhead than you can press. Those who develop a heavy

overhead squat may need to use the jerk movement to get the weight overhead anyway so learning the jerk is a good idea and is not as difficult to learn as the clean portion. A push press can also be used but the jerk will still allow more weight to be hoisted for most trainees (after a proper period of practice of course).

A frequent question regarding the jerk is whether it is okay to do it from a behind the neck position. Many feel that this is a dangerous thing since they equate it with behind the neck pressing. During the jerk however you are not actively 'pressing' the bar but instead accelerating the bar upwards with your lower body and hips and then dropping down under it. It is okay to place the bar behind the neck at first and this will allow most to learn the movement faster (if their shoulders allow it). However it is probably best to move the bar to the front as soon as possible since as the weight increase more stress is placed on the shoulders as the weight is returned to them after the Jerk and recovery.

Neck position during the overhead squat is important and can be tricky. Slightly tuck your chin but look up with your eyes while extending the spine.

### **Deep Squat Progression**

- 1.** Stand with your heels on a one or two inch board or platform and your feet shoulder width apart or wider. Have a 4 to 6 inch block centered in front of your feet. Some phonebooks or other large books will do for this. You can gradually reduce the height as you go until you get rid of them altogether.
- 2.** Bend forward until the entire palm can be laid on books or other block or platform. The lower you can use the better. Keep your heels down and the knees extended but do NOT lock them out completely (slightly bent).
- 3.** While keeping your hands flat on the books slowly descend into a squat position by bending your hips, knees and ankles simultaneously. The knees should go to the outside of the elbows so that the elbows are able to push outward on the knees.
- 4.** Try to keep your feet still and in the same position. Push your knees out instead of letting your feet drift out (when you actually squat you will not likely be doing it with your feet straight ahead but for this mobility drill try to point them forward).

**5.** Sit as deeply into a squat as you can. Relax into it. You may feel a stretch. Hold it for about 15 to 20 seconds. If you can't get a deep squat then use a higher heel lift and/or a higher hand platform.

**6.** Once you can sit in the squat without moving the heels or hands progress by raising one arm up high as if reaching for the sky. Do not change your foot or knee position and do not shift your weight. Turn your head toward the working side and look up toward your hand.

**7.** Repeat on the other side. If one side is tighter work it more. The goal is to keep the lower body relaxed with the upper body moving freely. Once you have equal mobility on both side and can do it relaxed move on to doing both hands at once so that they are both overhead in a Y position, taking your hands as far back as possible, again, without changing lower body position.

**8.** Once step 7 is achieved try standing up out of the deep squat position and perform repetitions by repeating the steps starting with the bent forward position and the hands on the platform or books. Do 10 or 12 reps for practice. Once that is easy work on getting rid of the heel elevation and the hand platform.

This is the cliff note version. For the full explanation and other drills see the book. Since this will involve somewhat prolonged holds in a "stretched" position do not attempt to use this drill as part of a pre-workout mobility routine. Your coordination will be compromised greatly and you will be weaker. Use it after the workout or at other times.

Considering those fascial lines I recommend you use the foam roller before you do the drill. You can find a link to download Mike Robertson's Foam Rolling Ebook by clicking on the following link to GUS:

<http://www.gustrength.com/forum/t-138764/mike-robertson-s-foam-rolling-e-book>

Do one more thing in addition to the standard foam rolling. Roll the bottom of your feet. You can use a tennis ball to start. If this is too soft you can move on to a Lacrosse ball or a dime store bouncy ball. If you need to start with a bigger or softer ball make it your goal to move on to a small rubber bouncy ball so that you can really get into the tender areas.

I'd also recommend "The Stick" self massager and the Thera Cane massager to help you target some of the deeper leg muscles and the soleus (not to mention the back and everything else). But a ball at least is a must have item. You can read about these products via the two links below which will take you to the product pages at the Ground Up Strength Store:

<http://astore.amazon.com/groupstr-20/detail/B000671H8G>

<http://astore.amazon.com/groupstr-20/detail/B000PRMCJU>

### **The Swiss Ball Overhead Squat Drill**

I get tired of all the abuse the Swiss ball gets because some trainers misuse it. Just because you can hit someone in the head with a hammer doesn't mean the hammer is a bad tool.

This exercise uses a Swiss ball (fitness ball) against a wall to provide outside support while you practice getting into a deep overhead squat position.

You can do this with or without a dowel and it's best to do it both ways. Most of the guidelines of this exercise are similar to the one above so keep those in mind while performing the drill.

- 1.** Place a Swiss ball between your lower back or glutes and a clear space of wall so that you are holding the ball against the wall. Stand up straight and do NOT lean into the ball. Just allow a light touch between your body, the ball, and the wall. Feet should be shoulder width or a little wider. Hands should be down in front of your body, shoulders squared and chest out.
- 2.** If you are using a dowel it should be placed right in front of your toes so that you can easily access it.
- 3.** While allowing the Swiss ball to provide a little support sink into a deep squat position while your arms make contact with the outside of your knees. (If the ball rolls all the way to your upper back then you will need to place it lower at the starting position).
- 4.** Relax into as deep a squat as possible and if needed let your arms push your knees out. Try to "open" your hips and let your torso sink down BETWEEN your legs, not behind them.

**5.** Hold the deep squat position for around 20 seconds and as you do let yourself "wiggle" deeper into it. This portion of the drill is more a stretch. Do not allow your feet to move or your body to change position. Just sink deeper.

It may be that just getting into the deep squat is enough for you. The ball will provide outside stability allowing your "mobility" to be free so you may find you go deeper than you normally would. Remember that this is NOT a Swiss Ball squat which people do by leaning into the ball and focusing the movement on the quadriceps (much like the 'wall sitting exercise').

Once you feel comfortable with a nice and full squat position move on to the "overhead" portion of the drill, steps 6-8.

**6.** From the deep squat position with your arms between your knees reach and pick up the dowel that you placed in front of your feet at the beginning of the drill. Widen your grip on the dowel a bit but only as much as you need to.

**7.** Bring the dowel overhead and as far back as possible using your entire upper body not just the shoulder joints. Stretch back as if you are doing a thoracic extension. Pull the dowel apart to allow the shoulders to pull back a bit more but keep the dowel lined up between the back of your ears and scapula. The bar should not move back further than this, your body should.

**8.** If you are not using a dowel you can bring up either both hands or one hand at a time, depending on what you are capable of, and then follow the same directions as in step seven, minus the dowel.

Several versions of this can be done. You can start with the dowel already in the overhead squat position and pause at various levels during the descent of the squat to stretch back.

Just as in the first drill this drill should not be used as part of a pre-workout mobility routine. Consider it more a stretch. The sustained periods of time in the deep position will take a lot out of you. And if you do the pauses during the descent you will be spent.

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This eBook chapter, although long and in-depth, is by no means meant to cover every problem a trainee might encounter. Nor does it take into account previous injury history. Never do anything that causes you pain. Discomfort is to be expected but pain is not.

The next considers the overhead squat assessment or “test”. There are many factors that go into the performance of a lift rather than just mobility at various joints and stability. Learning factors are as important as tissue factors, after all. How a person demonstrates and prepares a trainee for a test affects their perception of the movement and therefore the performance.

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## Chapter Three: The Overhead Squat Test

The overhead squat test is an example of a screen for 'faulty movement'. Evaluators are told to look for things like the following:

- a) toes turning outward
- b) knees moving inward
- c) excessive forward lean
- d) arm falling forward
- e) medial longitudinal arch flattening (inner arch)

According to Gray Cook's FNS (Functional Movement Screen) website it is to assess bilateral, symmetrical mobility of the hips, knees and ankles.

This covers most of the people I've taught the exercise to! But much of it is owed to a fundamental misunderstanding of how to perform a squat. Many squat problems can be corrected almost immediately and then honed in with continued practice. Failing that the overhead squat itself irons out these problems with due diligence and the proper drills.

So is the test also the cure for the "dysfunction"? And does the tester even know a decent squat when he sees one or is he just looking at a bunch of disconnected details? The overhead squat is not a collection of characteristics, after all, it's a coordinated movement. Given all this is this an objective test?

These types of products provide materials for assessors to learn to test for movement problems. Many times this may be the "testers" first exposure to the movements themselves. Yes, there are people judging other people's performance on a deep squat who have never taught and coached a deep squat and have only limited exposure to it through the assessment course itself.

I have tried to get a bunch of second graders squatting and the majority of them would have "failed" this test. The idea of a group of eight year olds being labeled as having "faulty movement patterns" is a bit repugnant to me. The squat is not "primal" regardless of what Paul Chek would like us to believe and I cannot think of a more ambiguous and unscientific word than "primal" used in a strength training context. How we sit is cultural and functional but not "primal"

which, in itself is a meaningless word in scientific terms having no one usage.

Even among my second graders there is a lot of variability and much of it has to do with how much 'ground time' they got during infancy and the transition to toddler-hood. I'll discuss some other aspects of this later on in this book.

What is called a 'faulty movement pattern' in these tests is just 'another day at the office' for a trainer. The idea that the average person should be able to perform a deep overhead squat with little to no compensation I think is a bit ridiculous. But if I want a trainee to do an overhead squat I won't treat them like a patient because they don't perform it perfectly the first few times.

But is the test itself reliable and repeatable? Tests are usually to assess something very specific so the protocol needs to be standardized. Little changes in the position of the feet and even the grip on the dowel rod can change things dramatically. And is there a certain perfect overhead squat that fits all people?

According to Mel Siff, upon reacting to the FNS website and particularly the Deep Squat Test:

*"This "Screen" [FMS Screen] offers these tests:*

*1. The Deep Squat - to assess bilateral, symmetrical, mobility of the hips, knees, and ankles. The dowel held overhead assesses bilateral, symmetrical mobility of the shoulders as well as the thoracic spine.*

*[\*\*\* The athlete modeling the overhead squat with a dowel shows that this test can also be an even better test of shoulder mobility in one plane – he would never be able to hold even half body mass overhead in that position.*

*His neck was also thrust far forward and his lumbar spine appeared to rather rounded, so that this test was quite revealing about this specific athlete!*

*There is no universally applicable strategy for overhead squatting since everyone has different relative flexibilities of the joints and different muscle strengths. Thus, one person may have a very arched (concave) lumbar spine and another may have a pronounced thoracic curvature.*



*The depth of one's overhead squat and all other squats depends crucially on one's foot spacing and orientation of toes (and shoes, if one is wearing any), so that one has to somehow standardize the testing "protocol". One way which requires no computation of foot spacing relative to femur length or overall height is trying to squat with parallel feet held together with no space between them - this is a huge challenge to many people (I have seen very few athletes even who can sit in a deep squat like this with little or no body lean). Here you measure the height of one's hip joint above the floor.*

*Moreover, testing with an unloaded wooden pole above the head is seriously inadequate because one's depth and balance are more challenged by using a loaded bar above the head. It would be preferable to conduct the overhead squat test with a variety of different loads to examine what effect some passive loading has on one's depth of squatting. After all, many lifters may not be able to assume their greatest depths of squat without added loading."*

*With the overhead squat the reverse can also be true with many trainees being able to reach great depth with a wooden dowel but fail to reach their greatest depth with added load because of the inability to stabilize the load at these depths. That is they have the mobility and even the balance but they cannot "use" this range of motion under load."*

I don't agree with all of Mel Siff's comments about these kinds of tests. For instance, in regards to the Shoulder Mobility Screen for bilateral and external rotation range of motion he said:

*"...this requires one to try to grip the hands behind one's back with one arm going over the one shoulder and the opposite arm trying to reach it from below. This test does not take into account the fact that its outcome depends very heavily on relative length of arm and forearm and often has little to do with "shoulder mobility" (which after all has to be measured in several different directions, not just in the very restricted manner described in these tests."*

Siff seems to have missed the fact that the test is meant to compare the range of motion between one shoulder and another so that relative differences in forearm or upper arm length would not factor in. Also the test specifically states that it is meant to test for external and internal rotation.

The test is known as the Appley Scratch test and it indeed checks for abduction and external rotation when reaching over the shoulder to the opposite scapula and for adduction and internal rotation when reaching behind the back and to the opposite scapula. Although it is unrealistic to expect NO asymmetries in the human body as we are normally asymmetrical one should not expect a large difference in the ROM between one shoulder and another during this test and it is a reliable means of checking for this.

But notice the crucial difference between the Appley Scratch test and the Overhead Squat test. The Appley is very specific and would much more easily meet the requirements of face validity, content validity and reliability. But does it correspond to a symptomology?

This one test, taken by itself does not mean a whole lot. It could be used as part of a battery of tests to find the cause of a painful shoulder. However, if you have a painful shoulder and find an asymmetry on the Appley Scratch test that does not mean you have found the source of your pain as related to a rotator cuff problem? And the test itself is a “stretch”. You may find you improve from one test to another. Yet the problem remains.

Likewise a bunch of isolated static tests cannot hope to provide a comprehensive prediction of performance potential for all trainees. I agree with Siff then that attempting to measure trainees against an “ideal” or mean which is entirely fictional is not realistic.

What Siff tries to explain in his comments about functional movement screening is that movement is not a stable concept but a *contingent* one. This brings us to another fundamental problem in viewing a squat as a test of function. The “squat” itself is contingent because even an expert’s definition of a squat is based on that experts “schema” of a squat. So the next chapter will explore this important aspect of exercise training AND teaching.

### **What’s a Pass to You?**

Watch the video linked below that outlines the FMS deep squat test. If you “passed” this test perhaps you could consider yourself to have good hip, knee, and ankle mobility. However you would in no way be able to progress on the overhead squat.

<http://www.youtube.com/watch?v=UdragwWQzbc>

Notice how far the tape is from the “doorway” frame. We’re grading on a curve here. Passing a test that lets the bar be basically in front of you does not mean much specifically to the squat. However it’s a test and we’ll let it go with saying don’t consider the test the exercise.

However, what really appalled me was the following statement: “If the height of the doorway prevents you from fully extending the elbows extend them as you move downward”. That consideration changes a lot about the performance of the squat. The fact is that it is easier to squat while holding a dowel with your elbows extended and your hands “pulling apart” the dowel. The mobility required to extend your elbows on the way down is completely different.

Does it make sense during a “test” that some people may be extending the arms on the way down and some people may not? Not at all. Tests must be repeatable and reliable and since the people who were putting pressure on the bar would probably do better I’d call it unreliable. How could a test allow such a variable? It’s like some people being allowed to use a calculator on a math test and some people not.

The fact is that using an ‘exercise’ to test for mobility is a poor predictor of actual performance in the field. The exercise itself depends on so many factors. In fact not only does a trainee’s previous motor learning affect it but also his “perceptual schema” of the squat itself.

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## Chapter Four: Motor Schema Versus Perceptual Schema

I hit on the importance of variety in movement in one of my previous newsletters (<http://www.gustrength.com/newsletter:beginners-variety-creatine-and-more-gripper-guide>).

My hypothetical movement learning experiment proposed that previously untrained group who had practiced a variety of knee dominant and hip dominant movements but without practicing an actual squat would learn the squat faster and out-perform a group who had not had this practice. But I took it further than this. I also proposed that this group could perform just as well and perhaps even better than a group who had practiced JUST the squat for the same amount of time and number of exposures.

This “experiment” was hypothetical but was based on actual studies that compared groups practicing variety versus static practice (for instance throwing a ball three different distances versus one distance).

Let’s take it a bit further. If we were to have a trainee learn the overhead squat using “blocked” practice initial performance would be greater than if we taught him using “varied” practice.

Blocked practice refers to practicing one skill numerous times before learning another skill. Varied practiced is learning several skills which are mingled together during practice.

The typical beginning strength program uses blocked practice. So, if we were to assign the overhead squat to a beginning trainee that would be the only movement using the generalized motor program of “squat” and perhaps of “knee dominant” movement.

This beginner’s performance of the overhead squat would initially be greater than another beginner using varied practice and performing several other similar movements along with the overhead squat.

We should be careful not to confuse initial improvement however with learning. The beginner using varied practice will have higher transfer to other movements in the future and will show learning improvement. In other words the varied trainee will learn things faster whether it is a blocked or random environment. Through time this results in faster

improvement in performance and better retention of new skills. The varied trainee, in effect, would be better than the blocked trainee.

This does not mean that all beginners need a huge amount of variety but it underlines the importance of variety in motor learning and skill foundation. There is no reason to think that performing one movement a little better in the early stages of development through static skill practice results in better performance overall in the long run. And experimental evidence into motor learning seems to bear this out.

The theory for why this happens is called "schema theory", which was developed by Richard A. Schmidt in 1975. The foundation of the schema theory of motor learning is the *generalized motor program* (GMP). According to Schmidt the motor program is a "memory representation of a class of actions that is responsible for producing a unique pattern of motor activity if the program is executed".

To understand this consider the alternative that Schmidt was rejecting (at least partially): The *closed loop theory of motor learning* developed in 1971 by J.A. Adams emphasized accuracy and repetition of skill movements in which internal feedback corrects errors against accumulated "perceptual traces". Repeated exposure to a movement is certainly of primary importance in motor skill learning but Schmidt was dissatisfied with certain aspects of Adams' theory.

This dissatisfaction and resultant discussion with several important colleagues led him to consider the idea of F.C. Bartlett in 1932 that individual movements were not the basis of motor learning but rather "some abstract schema about a class of similar movements". Thus was started his research in to the schema theory of motor programs. Consider the seemingly infinite number of possible human movements and the concept of all of these movements being learned within a "closed loop" with little influence from previous motor learning and you will see how attractive this theory is.

Looking at an exercise learning as nothing more than overcoming deficiencies is clearly short-sighted, especially considering the influence that previous motor skill learning has on skill development. But there are different types of schemas that can be involved in human motor learning.

We not only base skill learning on motor schema but also on cognitive or "perceptual" schema.

Remember my second graders? Imagine that you are showing a young boy how to squat. You demonstrate a nice deep squat and you explain it as best you can. "Now you try it", you say.

He bends over at the waist and sort of wiggles his knees around. You scratch your head and say "bend your knees". He wiggles his knees some more and then bends deeper.

"Let me show you again. Watch closely."

You drop into a perfect deep squat, amazed at your own prowess. How much more clear can this be?

The boy tries again with similar results. You push and prod him until you've basically forced him into the semblance of a squat.

What happened? Surely this child is not so immobile he can't at least squat a little bit?

We have two problems here. One is that we are visual learners. Your demonstration of a squat tends to be the primary learning device. Your verbal cues get cancelled out as the child concentrates on what he 'sees'.

Well, he saw me performing a deep squat, didn't he? No, he saw what he was capable of seeing based on his perceptual schema of your actions which have been influenced by his environment as he grew up.

Basically he saw 'parts' of what you did and then tried to interpret and reproduce what you did by filling in the gaps in his information with previous schema. We don't see with our eyes. They are just the parts that gather the visual signals. We see with our brains.

A schema is an organized and structured set of cognitions about some particular thing. We have schemas about concepts, common events, even people. Schemas are "constructs". One of the key things to remember about them is that they need not bear any actual resemblance to any particular concept, person, place, event, etc. They are a product and tool of the mind only.

For instance when I say the word "bodybuilder" an image of Arnold Schwarzenegger may pop into your head. Arnold would then be your "exemplar" of a bodybuilder. Since there are and have been so many examples of bodybuilders Arnold may not necessarily be the best

example of one especially since he was so extraordinary for his time (and any time). But he need not be the best example to by YOUR schema. However, if we assign all of the characteristics that the Govenator embodies to all bodybuilders we see that our schema fails miserably.

Perhaps the best way to understand these cognitive schemas is to imagine a sport that you know very little about and have seen very few matches. Let's say you are watching a Rugby match with a friend of yours who is an expert on the game, having played it and watched hundreds of matches.

Your perceptual schema will determine what you see going on in the match and in this case, having little experience with Rugby specifically you will see much much less than your friend who will notice tiny details that you are blind too.

Schemas do many things to help us determine behavior. They aid us in processing information and they speed up this processing. They inform our recall. They help us to automatically infer information. They add information that may be missing. They help us to interpret events and infer relationships. They help form our expectation about what should and shouldn't happen. And perhaps the most important yet overlooked aspect of schemas is that they contain emotional content. We have feelings about the content of our schemas. In psychological terms this is known as the schema-driven affect.

When you envision your bodybuilding exemplar there are feelings associated with it. Perhaps you think simultaneously of steroids since steroids are also part of your schema for bodybuilders. You may have negative feelings associated with this. One of the biggest mistakes people make is trying to "find themselves" by using constructs about themselves without considering the emotional effect that comes with these constructs.

Guess what. You have a schema of a heavy squat as well. And it contains all of the elements discussed.

When the second grader failed to reproduce the squat in my scenario above he was relying on his ill formed schema to aid him in processing the information. What I did to show him was not as important as the actual information he was able to gather based on these schema.

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Are you beginning to see that much of our thinking and learning is on auto-pilot? We have scripts, so to speak that help us move through our day to day lives.

A tester demonstrating a deep squat may think that everybody sees the same thing. They do not. Everybody “sees” differently depending on his or her individual schema.

The next time you watch a YouTube video or an image to learn exercise technique remember what you have read here. Even if the “form” were perfect you will only see what your constructs allow you to see. And the form is rarely perfect. You must observe a lot and practice a lot not only to learn from a motor standpoint but also from a cognitive standpoint.

The next chapter is an older post of mine about the problem of using images to learn lifts. They are not all bad and here I discuss legitimate ways to use images. I’ve expanded the posts to form a useful chapter for this free eBook.

## **Chapter References**

Schmidt, R.A., A schema theory of discrete motor skill learning. *Psychological Review*, 82:225-60, 1975.

Schmidt, R.A. Current Contents Citation Classics (Schmidt, R.A., A schema theory of discrete motor skill learning. *Psychological Review*, 82:225-60, 1975.) CC Number 25, June 20, 1983.

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## Chapter Five: Are Weight Training Images 'Picture Perfect'?

A while back I made a couple of posts called Asinine Expectations which I have included below. In one I said that it is a false assumption to expect your "form" to perfectly match someone else's form on a given complex movement. This is something I've come across with trainees again and again. They look at other people lifting, or worse, look at STILL IMAGES and think they are doing it wrong if they don't "match" when they do the exercise pictured.

So, as soon as I came across this page about strength training images I had to call foul: <http://www.buzzle.com/articles/images-strength-training-exercises-picture-perfect.html>.

According to this page, you should study images of exercise to learn "picture perfect" form. There are no images or links to images on the page but it could certainly give a trainee a bum steer.

Heck, chances are a trainee could change his technique from right to wrong as a result of studying a picture. First of all I wouldn't trust an internet image claiming to portray perfect form unless it was from someone I knew (or knew of). But even if the person in the image is using good form that DOES NOT MEAN THAT YOU WILL BE A MIRROR IMAGE OF THEM.

Trainees have a hard enough time when they try to use the mirror in the gym to judge their own form when moving. Using your eyes to look in a mirror tends to give you false spatial information. While you try to adjust your technique based on the mirror it interferes with your natural proprioceptive awareness. It shouldn't be a surprise. All the movements you do well, like, say walking, hopping, skipping, running you learned naturally.

Looking at another person's form will only give you a roundabout idea of how to go about it. But since each person's geometry is different the angles formed by their various body segments will be slightly different on the same movement. Your legs may be longer and your torso shorter. You could have longer or shorter arms. Etc. and so on. To learn the lifts properly you have to LEARN them. Not look at them.

That is not to say, however, that exercise images are never useful or should NEVER be used. Look at it this way, even a moving video cannot teach you exactly how to move with a heavy weight. It's your center of gravity, after all. So a static image really doesn't stand a chance. But there are other things that images can be VERY useful for. A good example comes in this image depicting a barbell in the racked position of clean. This is an Iraqi lifter at the end of the clean phase of the clean and jerk. This is also the position the bar is held in for front squats. So, for instance, if you wanted to know what a "clean grip" was for a front squat, as opposed to a "crossover" or "Cossack" grip, this image would be a good reference.



Two other great example of useful images com from Jim Wendler's article "Casting Your Wrists"

<http://www.elitefts.com/documents/wrists.htm>

This first image to the right shows only the 'wrist' being wrapped. The second shows what Wendler calls a cast wrist in which the wrist and the heel of the hand are wrapped, thus actually bracing the joint. This, in my opinion is also a good example of a problem in semantics.



Image Copyright 2006 by  
<http://www.EliteFTS.com>

As many people look that the wrist as the end of their arm. But it is the articulation between the

proximal carpal bones and the distal ends of the radius and ulna that makes up what we call the wrist "joint".

The wrist itself, or "carpus" from Latin, is actually the eight carpal bones distal to the radius and ulna and before the metacarpal bones of the hand. These are the colored bones in the image below. The two bones labeled 1 and 2 below them are the radius and ulna. The space between these and the carpal bones is the wrist joint. You can find more information here: <http://www.gustrength.com/forum/t-226978/forearm-flexor-and-extensor-muscles-videos>

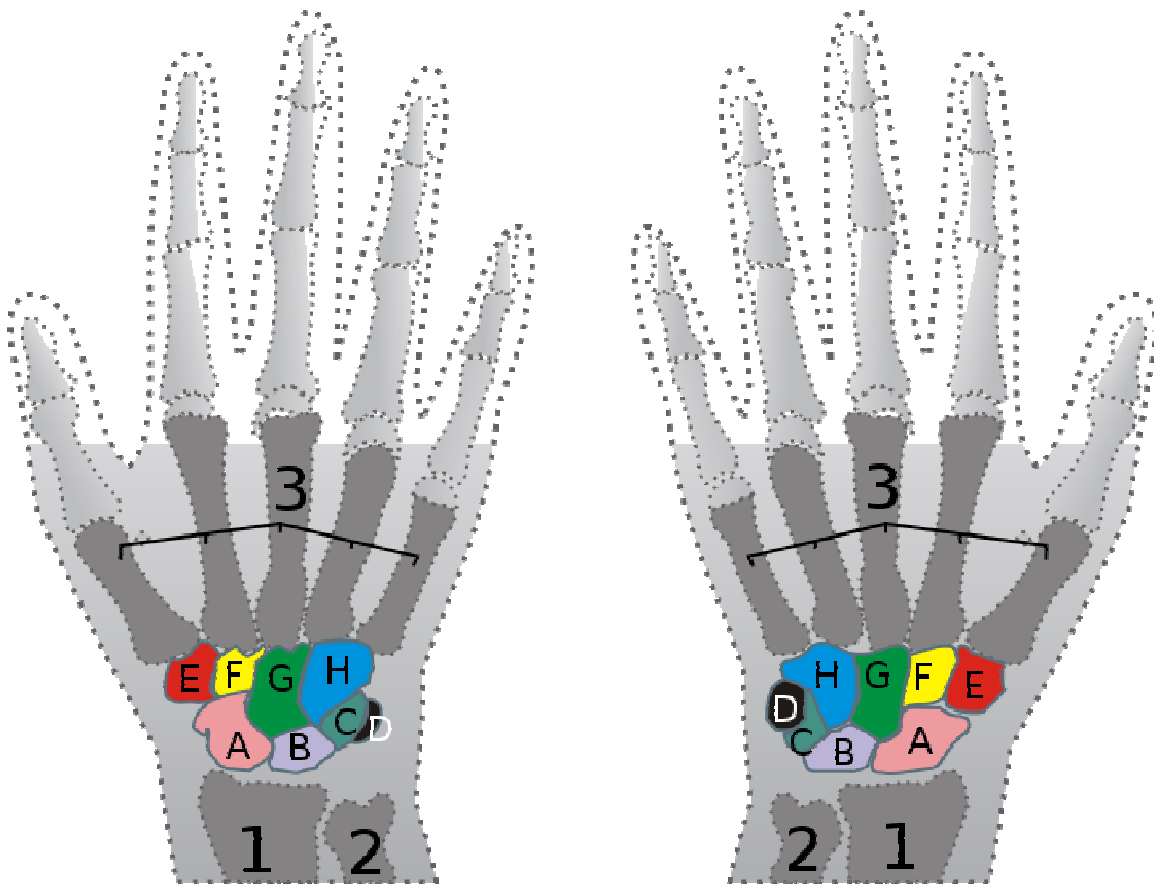


image source: <http://en.wikipedia.org/wiki/File:Carpus.svg>

So if you study the first wrist wrapping image logically will see that it is just wrapping the arm and not actually providing much, if any support to the wrist.

That is, the “joint” is that region between the ulna and radius (the bones of the arm) and the carpal bones (the “heel” of the hand). So the first image is just a wrap around the arm bones.

Before studying these images for a second it never even occurred to me that it may be important to point out the difference between the end of the arm and the **WRIST** as a region. Another score for the usefulness of images.

So the second image shows a way of actually providing support to the wrist. In most sports where wrapping the wrist is desired you will always find the wrap starting a few inches down the arm and then wrapping up onto the hand and around the thumb.



Image Copyright 2006 by <http://www.EliteFTS.com>

On a closing note, when it comes to images of exercise moments, many of those found on the web are of various athletes in the throes of competition where they are going for broke and lifting the heaviest poundage they are capable of. If you were watching them during the competition it would likely look elegant and perfect. But if you were to capture stills of the lift it may not be a picture perfect moment. This is sort of like when someone takes a candid photo of you at the precise moment you have a weird, googley eyed look on your face. Never to

be noticed except for the camera's ability to immortalize one instant in time.

While these "moments" in a sequence of moments were exactly what was needed to get the job done at that time in a competition, and perhaps even set a record lift, if you isolate them and then emulate them it makes no sense. Because a lift is made up of hundreds of moments and minute adjustments, many of which the body makes without conscious effort. One moment glimpsed alone is not representative, necessarily, of how to get from point A to point B when training a lift.

A picture cannot show you everything you may be missing. Mike Boyle told a story once of how one of his trainees was having squatting troubles (I don't remember but I assume front squat) and he got all analytic and ready to prescribe all sorts of interventions and then he realized that she was holding the barbell up with her arms rather than resting it which of course changed everything and as soon as she corrected this little problem she was fine.

But you are not going to see that on a photo. You could be doing something like that and holding the bar up but only millimeters off your shoulders and think that is perfectly right. And you wouldn't know from a photo that this wasn't being done necessarily. Now consider the above image of the front squat again. If the squatter were holding the bar just a tiny bit above his shoulders would you be able to tell? And if you had this habit would this image show you that it was wrong? Questionable.

What about little things like attempting to over-arch the back? You wouldn't know that you were doing that from a photo because that assumes you can analyze someone's position in the first place and remember what I explained about schemas in the preceding chapter.

I think that a beginner is MORE likely to over-correct or imitate something that is wrong than go from wrong to right based on a photo.

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Say that your big problem is that you are using a very low bar position in a back squat but trying to stay perfectly “upright” which so many people are TOLD to do by trainers. A beginner is not going to get bar position out of a photo. Why? Because even a lot of trainers don’t know how much bar position affects things, let alone a novice strength trainee. The subtle things you will discount. You will try to imitate the major things and that’s how you will get in trouble.

Also, a great number of weight training pictures found on the net are from beginners who may have posted an image to their blog for the purpose of critique. To get help from others. The same is true for many of the YouTube videos. But this does not stop these same images from being posted as EXAMPLES by many of the self-proclaimed experts on the internet. Be careful. As you know any one can start a strength training site...even me!

### **Asinine Expectations Part One**

A successful athlete engaged in a certain activity during his or her training. Therefore, if we engage in this particular activity; we too will be successful.

This should be common sense but it obviously is not. Training is cumulative, individualistic, and dynamic. It is the integration of a great many factors, not all of which are training, that lead to success or failure. You need to have a better reason to do an exercise than “so and so did it”. IF YOU DON’T KNOW why you are doing it and can’t find a legitimate reason then you probably shouldn’t be doing it.

Powerlifting is notorious for this kind of spurious logic. The Bulgarians or Russians do something, and they were good, so we must do that thing they did. There are a great many things that these countries did to produce successful athletes that have NOTHING to do with you or I. Or, am I wrong and you were handpicked from an early age and spent years on nothing more than foundational training before you ever trained specifically for your sport? No? I thought not. Be smart. Realize that people can and do succeed despite the things they do and not always because of them.

## Asinine Expectations Part Two

“My squats should look the same as the next guy”.



Image by Rexwar via <http://commons.wikimedia.org/wiki/File:Squat.png>

This expectation that exercise form is universal really gets people into trouble. It's helped along by crapola from sites like bodybuilding.com that lead people to believe that everyone will have the same torso angle, etc. while performing a squat or deadlift (for instance).

Many trainees think that if they have seen someone executing a movement with good technique they have therefore “seen” good technique and now are experts on exercise form. But you cannot take a mental snapshot of what someone looks like doing a lift and then apply this to everyone else! Not to mention that most people wouldn't know good technique in the first place and have NEVER really learned the lifts correctly.

A person's individual body proportions will determine form. Technique is a set of guidelines but body proportions and geometry produce the

results. The most oft given bad form advice has to do with the angle your of your back or torso during the deadlift or squat.

“During deadlifts the back should be at 45 degree angle.”

Sometimes you hear straight up and down as well.

“During squats your body should be upright.”

Both statements are absolutely, one hundred percent, wrong.

Not everyone will produce a back angle of 45 percent while deadlifting. And it is COMPLETELY improper to try to establish some mean or average back angle, based on populations, to give out to everyone as gospel. This is lazy and bad instruction. The relative length of the back and legs will play a huge role in determining all the body angles.

For squats body proportions, bar placement and stance width will determine the torso angle.

### **Conclusion: Learning the Lifts**

It seems that the difference between learning and teaching the lifts has become a standard theme in my writing. Yes, exercises like squat deads, presses, etc. are relatively simple, technically speaking, compared to power lifts (Olympic lifts). But learning is not “receiving instruction” and knowing a set of verbal cues to recite to yourself when you lift. Motor learning is just as important and this is a long and continuing process. Now perhaps you see that motor learning is but one other factor among many that influences learning. I think after reading this eBook you should have gained a much better understanding of these factors.

Many coaches and trainers ignore the importance of repeated exposure. They also ignore the importance of variety. And in so doing they also ignore the importance of quality. Imperfect practice makes imperfection. This does not mean every single lift should or will be perfect. But if the majority of the lifts are of a bad quality then bad things will happen in the long run. The least of which will be failure to progress.

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Thanks for reading!

Eric Troy

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