Ultimate Anatomical Guide To Building A Barn Door Back Part One!

Researched and Composed by Jacob Wilson, BSc. (Hons), MSc. CSCS

Guide to fully utilizing series

I will assess the bodybuilder's ultimate weapon via five separate, yet inter-correlated articles. Firstly, in order to understand what the muscles of the back do, you must understand the bones they move, the joints they act on, and the movements which are allowed at those particular articulations. That is what this article is about. The guide is simple. Use these five articles in succession, one after the other. They are extremely comprehensive, which means that they will not be as clear when singled out or purely placed on their own. Note: three of the five articles will be displayed this month.

Overview Of The Appendicular And Axial Skeleton

What is of extremely important anatomically, and from a physiological standpoint, is that your skeleton can be divided into two separate divisions. I say important, because one class of muscles only attach and work the first division, while the latter attaches to both divisions, but mainly controls the second.

The first division is called the Axial Skeleton. The definition of Axial is simply central axis. Therefore it literally forms the center of our body, its framework if you will.

The second division is referred to as the appendicular skeleton. The term appendicular refers to something that literally branches off a more central structure, like branches off a tree. However, in this case we are referring to your body's limbs(arms, legs etc.), which seem to sprout off of your central bone structure.

Axial Skeleton In Greater Detail!

The Axial Skeleton is, as stated made up of the bones which form our body's core axis. These bones include the vertebral column, the ribs, the skull, the sternum, and the hyoid bone.

Any muscle that originates(attaches to a point on the skeleton that is not moveable) and also inserts(attaches to a point on the skeleton that is moveable) on the axial skeleton, is known as a deep muscle of the back. What is significant here, is that these muscles only, only, only move the axial skeleton(which makes sense, since they both originate and insert there)! Additionally they are innervated by dorsal primary rami. Innervation means literally controlled by. And a dorsal primary ramus, is simply the spot at which a nerve comes out to instruct a certain muscle group. I have created a separate article on this subject entirely, as I feel it is of extreme importance. For now, just realize that all the deep muscles of the back are innervated separately, and function on a different aspect of the skeleton(the axial that is), then do their more superficial cousins(to be discussed in the appendicular section below).

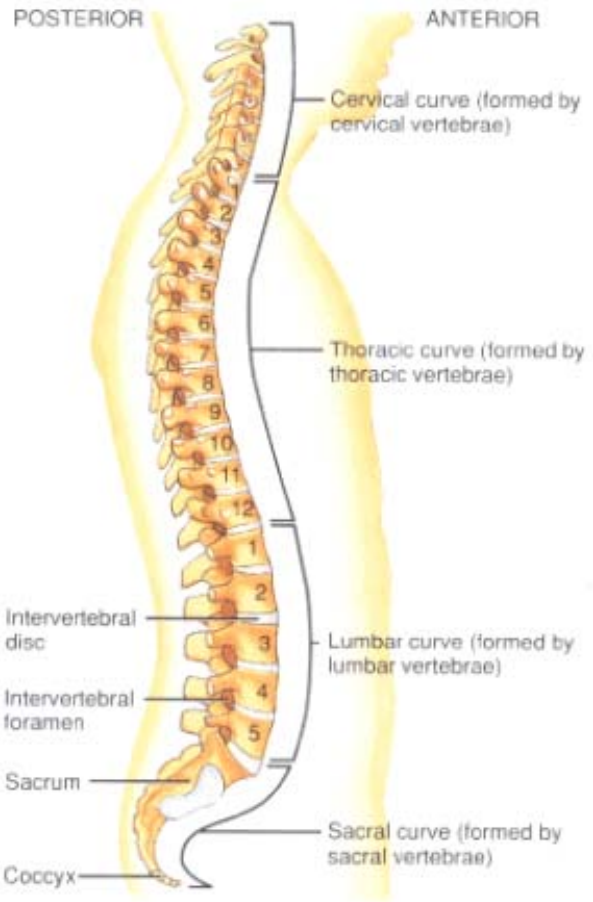
Vertebral Column Dissected

Have you ever contemplated the amazing feet's executed by the upper body on a daily basis? You can twist and turn it, in essentially every direction imaginable. The technology involved here, is locked inside your vertebral column. A masterpiece that contains insane joint mobility, stellar shock absorption, and within a computer system that works at damn near the speed of light! It's one wicked structure. Indeed, it will be a pleasure to map it out.

The first aspect we must realize, is that the vertebral column can be divided into five regions. And more specifically these regions are made up of bones called vertebrae. Here is what a typical vertebra looks like:

These bones then articulate with each other to form specific joints(articulation literally means to form a joint). The first five vertebrae make up your neck region, and anatomically this is referred to as the cervical division of the spinal column. The next twelve vertebrae form the thoracic region of the column. This is easy to locate. Wherever you have a rib on your body, you have a vertebra in your dorsal region(the rear or posterior aspect of your body) that articulates with it. You can see exactly where the thoracic vertebra begins and exactly where it ends.

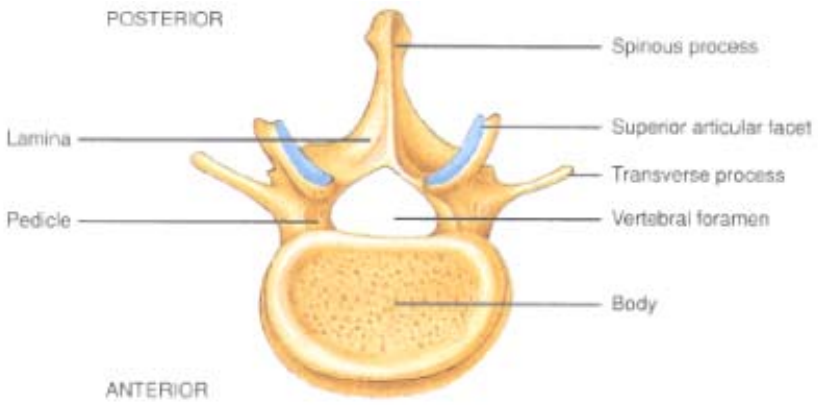
Thirdly we have the ever so popular lumbar division, commonly referred to as the lower back. Five total vertebrae make the lumbar aspect up. Finally we have the sacral region(5 vertebrae), and the coccygeal region(3-5 vertebrae) of the vertebral column(gluteal, hip region). We are not as concerned with these as we are with the former three however, but they will be addressed. Here is a picture of the entire vertebral column.



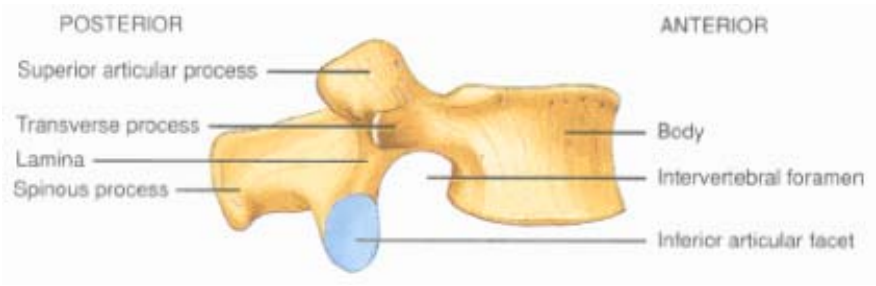
As you can see, there are 5 specific regions, with primary and secondary curvatures.

The Typical Vertebrae In More Detail

One typical vertebra has several aspects to it. The ones of chief concern are aspects of which muscles attach and originate on. I would like you to be familiar with the two transverse processes, and the spinous process in this regard. They are the only two I will refer to directly when a muscle attaches. Otherwise I will just mention the overall vertebra they attach to. Briefly I will cover the other parts, in case they intrigue you.



As you can see the transverse processes stick out from side to side, that is exactly why they are called transverse. It literally means to cut a part into upper and lower halves, to travel side to side or horizontally. The spinous process is the part that you can see in most people when you bend downwards. It always faces posteriorly, or directly behind you.



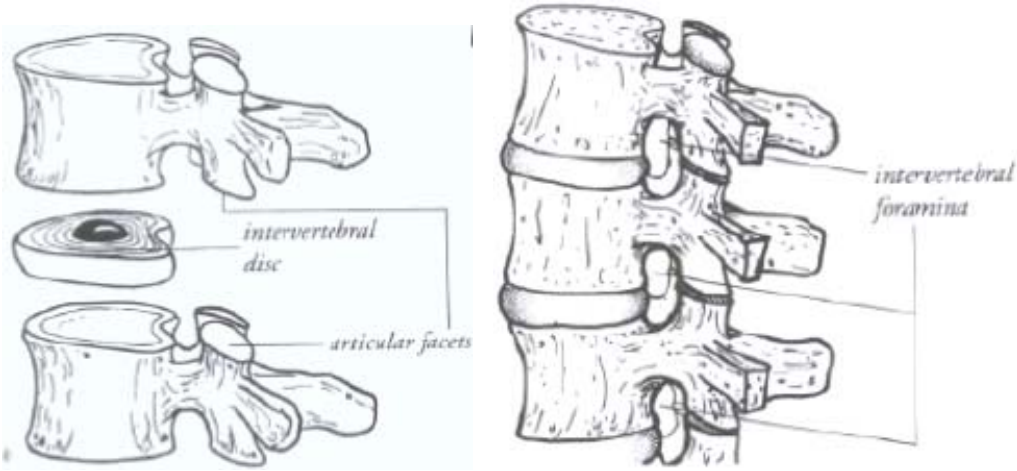
Here's what's cool. The t-processes, have muscles attached to them. Much of their shape is actually determined by those attachments! The tendons literally pull the bony landmarks out further and further, and you will notice that quite a bit on much of these in particular(it also shows that a weight lifter will have quite a difference in bone appearance, then a non athlete would. This same concept can be applied throughout the entire body, from where the deltoid inserts, to the biceps).

The other part of the vertebra that is extremely cool is the neural arch. It's that hole smack dab in the middle of the bone, and as vertebrae stack one on top of the other, they end out housing the vital extension of your brain known as the spinal cord. How many times have you heard the word " CNS? " It's mentioned quite a bit these days. It's a fancy word for being inside of either the spinal cord, or the brain. That's it in a nutshell, that is, if you consider your skull to be a nutshell(I know, that was extremely bad humor).

CNS = Central Nervous System

Finally there are the parts of the vertebrae that articulate with each other, which again means interact so as to form a joint. If you look at a vertebra anteriorly, or from its frontal aspect, you will see a clear oval shaped, thick body. This is called, and quite conveniently I would say, the body. Slap one vertebral disk on one body, stack another body on top of it, and you have just made yourself a joint.

When viewing the lateral(side) aspect of a vertebra you will notice two blunt, horn like landmarks project superiorly(upwards) and inferiorly (downwards) out of the bone. The top two projections are called the superior articular(because they form joints) processes, and the lower two are so named the inferior articular processes.



As you can see from the pictures above, there is one joint formed between the two bodies of adjacent vertebra and two joints formed between the inferior articular processes of the superior vertebra, and the inferior articular processes of the inferior vertebra.

Note: The main reason why I discuss these vertebra in detail, is because if you understand them, you not only understand the back complex, but also will be able to have a much greater grasp of the entire nervous system, which will progressively be discussed in this anatomy section. In fact, you will never, ever understand the complexities of the nervous system without the vertebral column. They go hand and hand.

Movements Allowed In Detail And Why People Rupture and Slip Disks

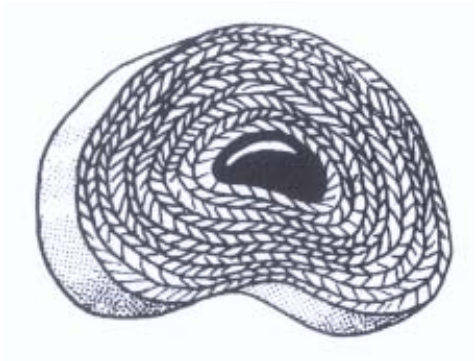
The first joints we will discuss in detail are the ones formed by the bodies of vertebrae. These fit very nicely on top of each other. I would compare it to stacking checkers. However, as mentioned, between each body is a disk that is composed of fibrous cartilage. Therefore this is a cartilaginous joint, or for you athletes that like to use fancy terms, it can also be referred to as a symphysis joint. We all know what cartilage is, just by flicking your ear back and forth when bored. The difference is that the cartilage in your ear is an elastic class, this is made of cartilage and is also packed with dense, strong fibers. In fact, if you took the calcium out of your bones, it would have a similar texture to fibro cartilage. It is necessarily strong, but also has give. Why is that? For obvious reasons we need strength between neighboring vertebra.

Then why not just use bone disks? Because then we couldn't absorb shock very well during activities. That is exactly why we have them between bones. They are extremely fortified shock absorbers. Additionally, there is gliding that can take place between these joints, which allows the vertebral column to have much more mobility.

It is a magnificent machine, there is no doubt about that. However, like any machine, when used wrong you can permanently short circuit it. In fact, a back injury can wreck havoc, not only on your mobility, but also on your very central nervous system!

Explanation of Injury

To fully contemplate the injuries that can occur in the back, and the seriousness of these injuries, we need to take a closer look at the inter-vertebral disk discussed above.



From this view point, you will take careful notice to see that there is a circular object in the middle of the disk. And actually to be more anatomically correct, it is located nearer to the posterior aspect of the disk, then to its anterior aspect.
We have just hit the first key point to injury prevention, so make sure you have a good grasp of this.

The glob if you will, housed inside of the disk is known as the nucleus pulposes. This is actually a remnant of the noto cord, which you needed for survival in embryo(development before birth). The problem here, is that the texture of the old cord is extremely gel like. I liken it to a donut with jelly filling. Do me a favor and create a donut in your minds eye. Now, after its creation, set it on the ground and imagine running up and stomping the hell out it! What happened? The cream filling flew out correct!? You have just demonstrated exactly what a ruptured vertebral disk is. Fortunately for us, this can be prevented by studying the vertebral joints.

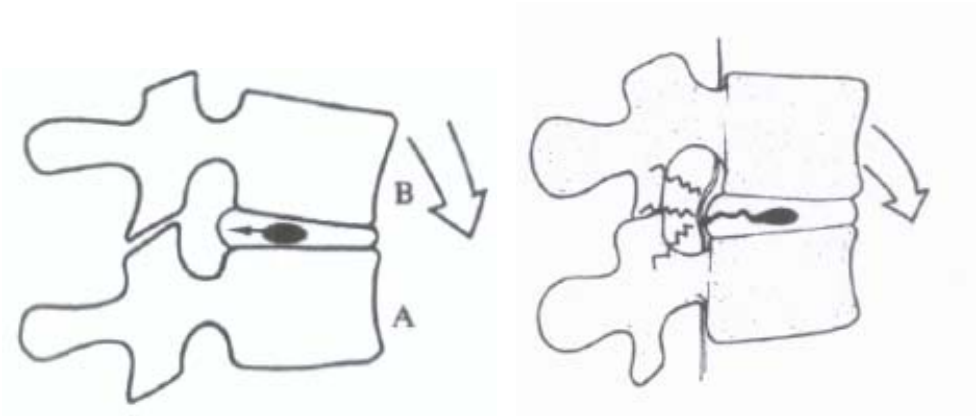
The first thing to understand is that there is a ligament anteriorly, and posteriorly binding every two vertebrae into an articulation. Here's the crux. The anterior ligament is much, much thicker and stronger than its posterior neighbor, and it fuses with the bodies and the disk. Furthermore if you look even closer you will see that posteriorly there is a hole formed between the articulating vertebrae. This hole is only formed when two superior articular processes articulate with two inferior articular processes. Almost as if I made a U shape with my thumb and index finger with one hand, did the same with the other hand, and then made contact between the respective fingers. The U shape has now turned into a circle, or a hole. That's exactly what happens here, and it has extreme significance! This space is known as the inter, meaning between, vertebral foramen. The word foramen is used in anatomy quite often, and means space or hole. The spinal nerves coming out of your CNS, reach every area of your body, from the foramina along your spinal column(hold that thought and we will come back to it).

However, it has more significance than this. You see, if you were to rupture a disk, where would the nucleus pulposes move? It would be almost impossible for it to move through the anterior tendon. If we examine its location within the disk, we see that it is located more posteriorly, and this means that it will most likely move in this direction. Finally, the posterior ligament is protecting the spinal cord. Most likely, the jell like substance will not break through this, but rather move either posterio-laterally(to the rear and outside of your body) or posterio-medially (to the rear and closer to the midline of your body). This is because of the inter-vertebral foramen. And when it ruptures it will meet smack dab with a nerve!

I don't care how tuff you are, or how high your pain threshold is, if you have a ruptured disk making contact with a nerve, you will experience more pain then you ever imagined possible! A slipped disk is similar. But the whole disk slips out of place. Again, this will either move posterio-laterally, or posterio-medially.

Injury Prevention

I want you to think of your disks as accordions. If you press one side down pressure is exerted onto the opposite side. Here is an illustration:



That is what happens when we flex our spines, or bend forward if you will. As you can ascertain, the more force placed on the disk, during flexion, the more pressure is placed on the posterior aspect of the disk. Imagine bending down, flexing your spine, and deadlifting a few hundred pounds. The pressure you just placed on that disk is enormous! It is flawed techniques such as that, that will lead to a ruptured disk, and or a slipped disk. The key to injury prevention then, is to be disciplined enough to maintain back extension throughout all movements. This, as JP as discussed in the forums, is why we as athletes need to keep a strong arch in the lumbar portion of our backs. When you handle weights, or lift them off the ground, you do not want the pressure to be distributed posteriorly where weaker ligaments, and the vertebral foramen reside. By extending, forming an arch in your back, and squaring your shoulders, you can prevent this injury almost entirely! We will come back to the muscular aspect of this, when we cover deep muscles of the back in article four.

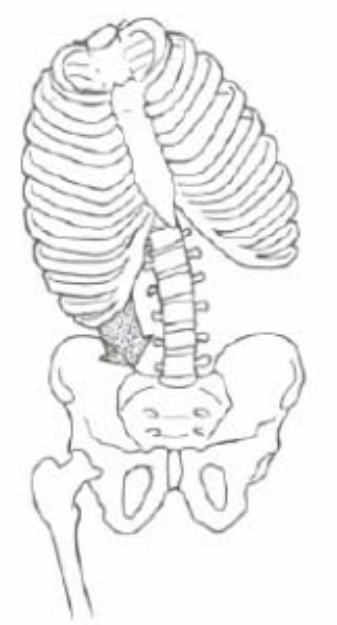
The key point here is to keep your back extended and upright. Be extremely weary when flexing your spine on squats, deadlifts, bent over rows, or any movement that places pressure posteriorly on your disks!

Articular Joints Explained

These joints are again formed by the superior and inferior articular processes. They are classified as synovial articulations. Synovial joints are the most moveable in the body, and to further classify the situation, these are better known as zygopopyseal synovial joints. This allows for several movements

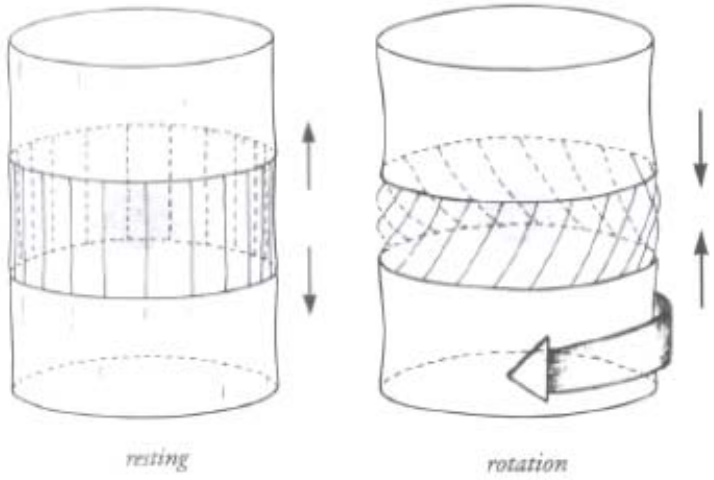
1. Extension and Flexion. The word extension means to straighten out a body part, or to increase the angle between two body parts. Flexion is the opposite of this. It is defined as decreasing the angle between two body parts. If I bend forward with by back, I have just flexed by vertebral column, if I lean back, and straighten my vertebral column I have just extended it. Again, you want to keep it extended! That is how you prevent injury! When you bend forward, keep a tight arch in your lower back, and bend at the waist and hips, not in the vertebral column.

2. Lateral Bending – Here is a secondary movement, which means that it only occurs in certain aspects of the body, namely here. I can bend my vertebral column to my left, and to my right. Both ways I have moved it further away from the midline of my body. This means I have used lateral bending.



3. Rotation Between Vertebrae – The Synovial Joints combined with the movement of the inter-vertebral disks, allows for rotation between joints.

If you turn your head from side to side, you will have a perfect illustration of what rotation is. However, your vertebral column, aside from the very top of your cervical region is no where near as flexible. It is simply very small localized rotations, and as you will see, this is of extreme significance to building a massive deep muscle of the back!



Mobility!

The vertebral column has slight differences at each level. In move-ability, the cervical(neck region) has the most mobility, the thoracic of the moveable vertebrae has the worst mobility because it articulates with the ribs, and the lumbar region is second. In thickness, it descends. With essentially the cervical region, having the smallest vertebrae, to the lumbar having the thickest, due to the amount of gravity it has to hold. This will be discussed further in article four of the series. You can see at the beginning of the article, using the overall picture of the vertebral column, exactly what each vertebra looks like.

The sacral region consists of 5 fused vertebrae and has no movement at all, and the coccygeal contains 3-5 total. The only concern I have with the sacral region in this article are its nervous system properties, and its muscular attachment properties. It has no ability to move, due to fusion between bones. The coccygeal is of no concern for this particular article, but will be for future issues of Beyond Failure Magazine.

Atlas

Lastly, but certainly not least I would like to discuss why the head can rotate with such tremendous mobility. Your skull articulates with vertebra C-1. Now, what I am about to say is extremely important. Vertebrae are simply named by their number. Which means that the first vertebra in the cervical region is named C1, and the second is called C-2. Which means that the first vertebra of the thoracic region is T-1, while the last is T-12. If you understand that, you can literally name every single spinal nerve in your body! More on that latter…

Back in the Ancient Greek days, they believed that Hercules carried the earth on his shoulders. One day, he called Atlas over, a Greek legend, and asked him if he could hold the Earth for a second, while he ran an errand. Lo and behold, Hercules never came back, and Atlas was stuck holding the earth for who knows how long!

If you think of your head as the earth, then C1 can be likened to Atlas, and in fact, that is what its anatomical name is! Here's what happened, and this is why I continually refer to the body as a created masterpiece.

Your DNA has transcripted on it, a code for C1, and C2. It is coded that the body of C1, begins by growing out of this vertebra, but instead of fusing to C1, it is programmed to fuse to C2. Enter the axis! The body is now resting on top of the second vertebra like an axis, and as with C1, that appropriately is its name. It acts as the axis, around which your head revolves. Had that joint not been coded into your DNA, then you would have essentially no ability to turn your head from left to right. Truly an amazing design.

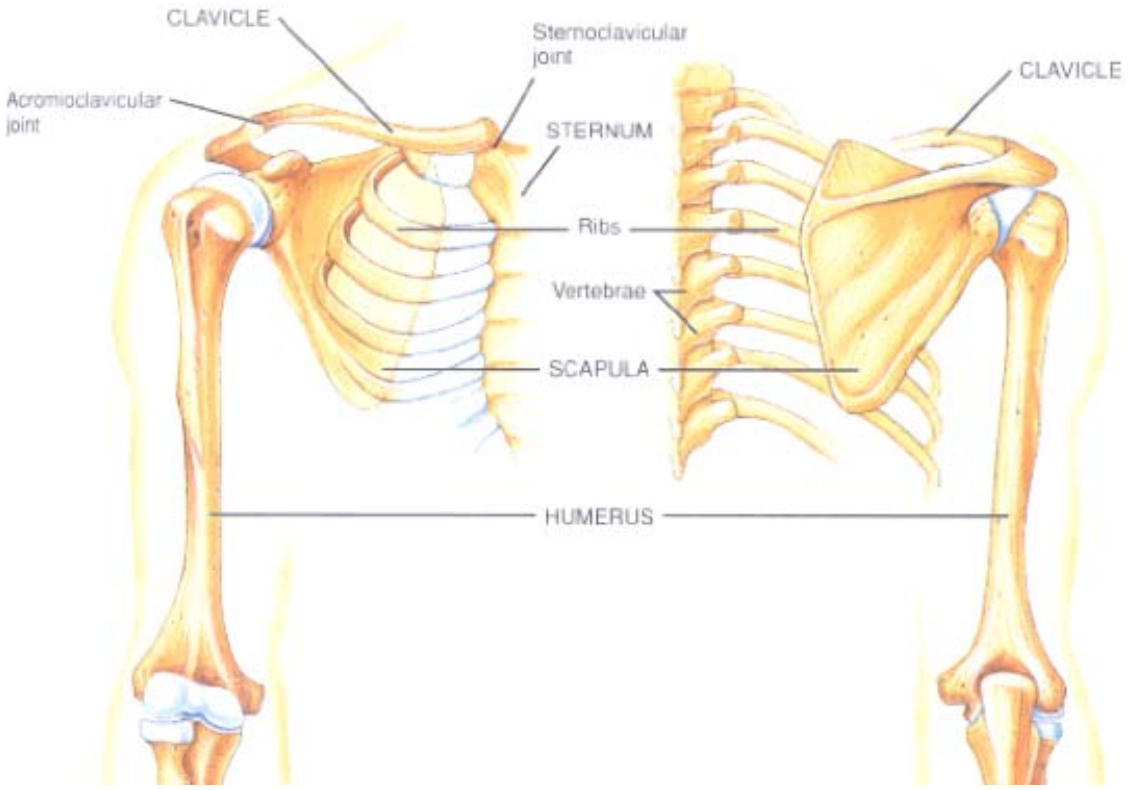
Appendicular Skeleton

The appendicular skeleton includes all the limbs and girdles of the body. This includes the os coxa(pelvic bone), the femur(thigh), the tibia, fibula, radius, ulna(the forearm bones), hands, feet, clavicle and the two we need to discuss in detail which are the humerus and scapula.

The best way to distinguish a deep muscle of the back, from a superficial muscle, is where the muscles originate and insert. If a muscle originates and inserts on the axial skeleton, then it is a deep muscle of the back. If however it originates on the axial skeleton and inserts on the appendicular skeleton, then it is deemed a superficial muscle(so if it originates on the vertebral column and inserts on the humerus, it would be a superficial muscle).

These muscles move the appendicular skeleton, and are nearer to the surface of the body, then their cousins. I will discuss that in further detail, in part two of this series.

Scapula and Humerus



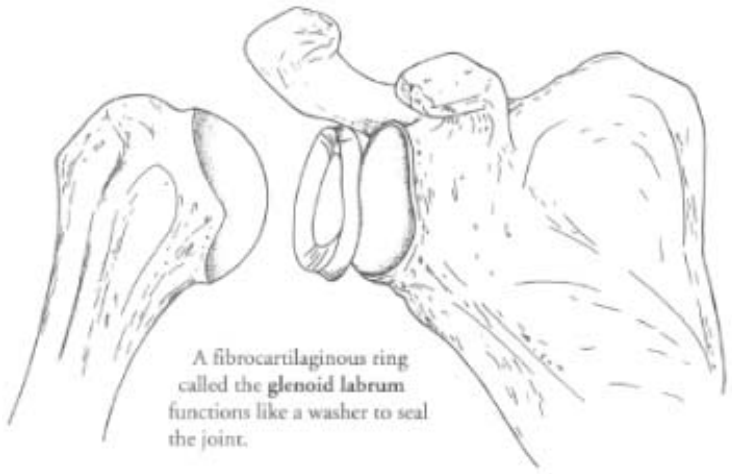
The First aspect of this picture is shown from the front, or anteriorly, while the second is shown from a rear or
posterior view. If you take special notice, you will see a protrusion posteriorly on the scapula. This is called
the spine of the scapula, and is better known as your shoulder blades!

From a surface view, we know the scapula, as the right and left shoulder blades of the back. The humerus, is non other then your upper arm bone.

The scapula forms a joint with the clavicle, and most importantly for this article, it also forms one with the humerus. This is classified as the gleno-humeral joint, or the shoulder joint. In order to get a clearer understanding of this, we should take a closer look at the scapula. This bone has four main fossas. Fossas are simply deep shallow depressions(indents if you will), and in life these are for muscle attachments, and bone attachments(or insertions / origins).

These four are known as the glenoid fossa found laterally, the infraspinous fossa, the supra spinous fossa, and the subscapular fossa. The glenoid fossa, as you already know, articulates with the head of the humerus. It looks like a cup in a way. The other areas, are simply sites of muscle attachment. However, I only want you to be familiar with one of these, and that is the infraspinous fossa. First however ,I need to discuss joint stability.

Joint stability relies on three factors. The first is how well the bony fit, between two joints actually is. The glenoid fossa and the head of the humerus form a pore fit. The second factor is ligament strength. The ligaments that attach to it are not very strong as well. Enter muscular attachment. Muscles originate anteriorly(subscapular fossa), superiorly(supraspinous fossa) and posteriorly(infraspinous fossa) to the scapula, and then insert on the humerus. This forms a cuff, and literally stabilizes the shoulder joint. Here is an illustration of the humerus, articulating with the scapula. If you will notice, cartilage is used to assist in joint stability as well.



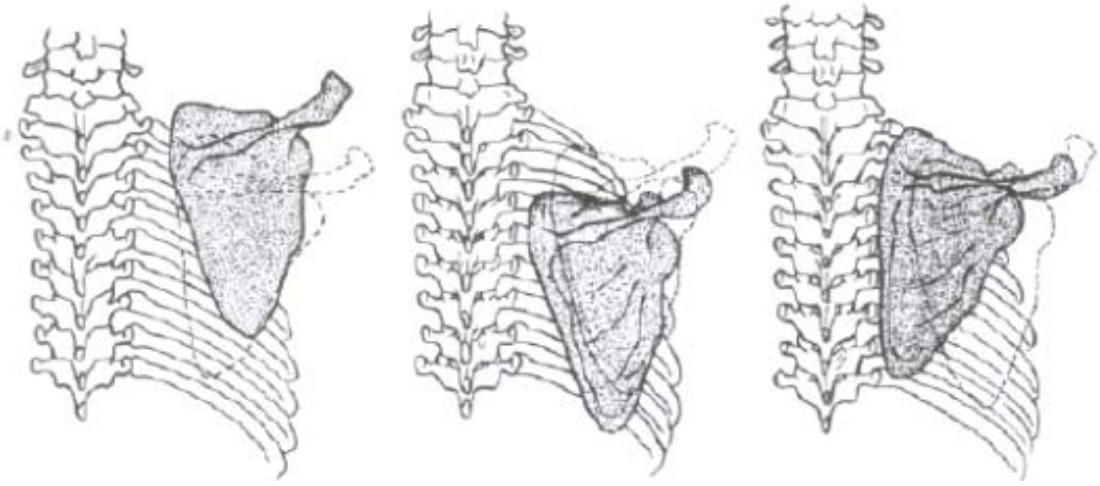
Again, though I simply want you to be familiar with the infraspinous fossa, because several important back muscles insert there. The other fossas will be discussed in future articles.

One more point I need to make, is that this bone is held to the clavicle and humerus by ligaments, and muscles. However both of these are bones of the appendicular skeleton. The only thing that holds the scapula to the axial skeleton are muscles. That is a vital point, and means that your shoulder blades have extreme mobility! Three of these movements need to be understood, as they will be utilized in the following back articles.

Note: For further clarification. The front aspect of the scapula is shallow and this is called the subscapular fossa. A muscle called the subscapularis originates here, which is why there is a fossa here. The supraspinous fossa is on top of the scapula. Supra stands for on top or superior. And a muscle called the supraspinatous originates here. The infraspinous fossa, is found inferiorly to the supraspinous fossa. That's where it gets the name " infra " for inferior. The muscles for this group will be discussed in article four of the series.

Movements Allowed

The first movement is retraction. This is a form of adduction, and that term refers to bringing a body part closer to the midline of the body(an imaginary line drawn straight down the middle of your skeleton). The second movement is elevation, which literally means to lift the scapula to a higher plane. And finally there is the movement of depression which refers to a lowering of the scapula toward the lower back region.



1. Elevation of The Scapula 2. Depression of The Scapula 3. Retraction of The Scapula

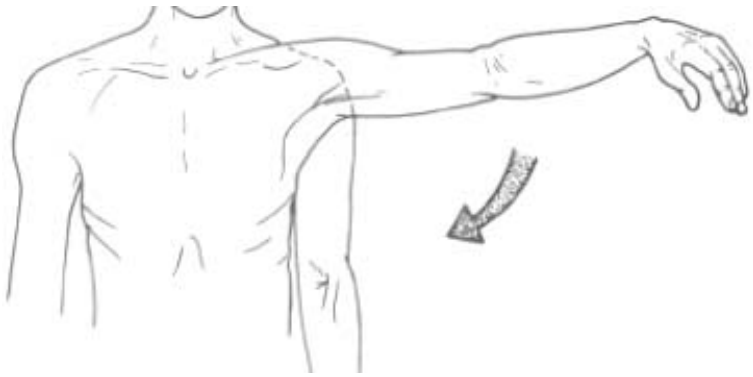
By understanding these movements, you will be able to manipulate the muscles responsible for them.

The Humerus

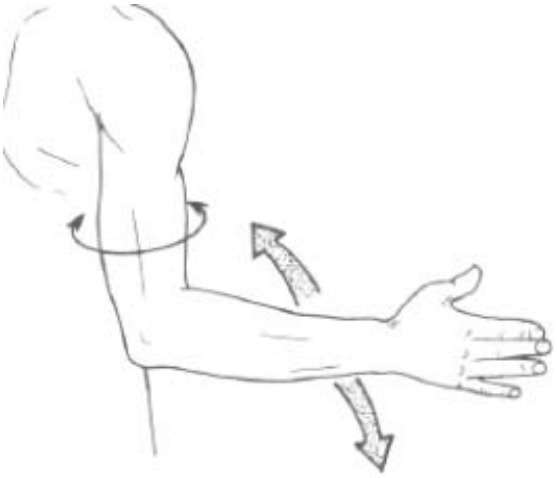
The upper arm bone has three landmarks of interest. The first is the head of the humerus. This is what articulates with the glenoid fossa to form the shoulder joint. As you can see, the head looks like a ball, and the fossa makes a perfect socket.

Hence the name, ball and socket synovial joint. All manner of movements can be performed here, but I only want you to be familiar with three.

The first is again adduction of the humerus. Anytime you bring your humerus closer to the midline of your body you have adducted it. Try it out. Lift your arms out to your side like you are performing a side lateral raise. That is abduction. Now, bring them back in to your sides. That ladies and gentlemen is adduction. And is vital for lat development!

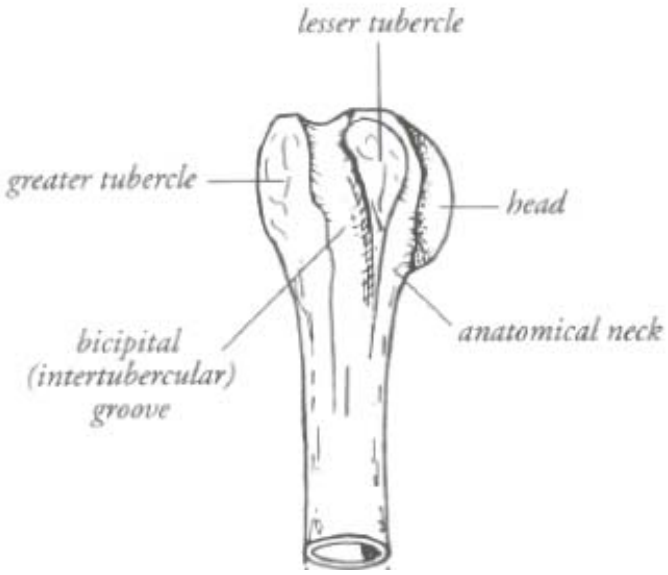


The second is lateral rotation of the shoulder joint. I cannot overemphasize the importance of this movement! Imagine there is a pin at the top of your humerus. That pin is your axis, and when you turn it, the humerus will move in that direction. Now twist the pin laterally(to the outside) and posteriorly(to the rear). Your shoulder joint should mimic this movement exactly. Your forearm joint is an easier illustration. Hold you forearm out in front of you so that your palm is up. Now rotate so you palm is facing downwards. That is medial rotation, from here rotate so that your palm faces upwards. That is lateral rotation. The same applies to your shoulder joint. Literally rotate it laterally and posteriorly for a peak contraction. By doing so, you should feel several muscles in your back contract.



Finally we have extension of the shoulder joint. Stand with your arms at your sides. From here, in a straight line move your arm backwards. That is extension. Again, you should feel several muscles in the back tighten and flex when performing this action.

Last Two Landmarks



The last two landmarks I will address are the bicipital groove and the greater tubercle. The bicipital groove is formed by a tendon that attaches to which muscle? The biceps of course. The tendon simply wears the groove into the anterior surface of the humerus. The last landmark is the greater tubercle. Remember, landmarks are there for a reason. Several muscles attach to the lateral aspect of the humerus, in doing so, they pull on the bone and create a protrusion. The largest protrusion on the lateral, superior(outside and near the top) aspect of the humerus is the greater tubercle. Muscles attach on both the bicipital groove and the landmark just discussed.

Nervous System

I have decided to place this in an article to itself. Click here to read it.

Final Thoughts

We certainly covered a tremendously large amount of material in this article. However, there are several serious athletes on abc, and I felt the need to match that mentality with an equally serious discussion on bones and nervous system function. I will continue to stress definitions throughout the latter three articles, in doing so, the concepts discussed here, will literally become a part of you. And in the iron age we live in, I feel that this is of extreme importance.

Yours In Sport

Jacob Wilson jwilson@abcbodybuilding.com
President Abcbodybuilding / The Journal of HYPERplasia Research