The Strength Coach’s Guide to Shoulder Training
Injury Prevention at Its Best!

Andrew Paul
Acknowledgments

I would like to thank anyone who has had an impact on me as a coach, starting with my family for giving me a great base of values that I try to instill in all of my athletes. Thank you to all of my mentors and coaches. All of you have played a major part in my development as a person. Without Kevin Kinney and Bob Bunton, two of the best high school coaches anywhere, I would not be doing what I do today. And last, but not least, to all of the professionals and coaches who are sharing information in order to advance this field. Thank you.
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Chapter 1: Shoulder Complex Anatomy/Kinesiology

When discussing the shoulder complex, it is important to call it just that—a complex, not a joint. This is because the shoulder is one of the most complex structures in the human body. It requires the cooperation of several articulations and a host of muscles and muscle groups in order to move appropriately—hence the term, complex.

Understanding the shoulder complex goes beyond a single joint and single muscle creating a single movement. All articulations become involved, and when dysfunction in the shoulder complex is present, injury or pain is inevitable, especially in competitive athletes. Using proper training programs and technique can seriously reduce the risk of injury and allow the shoulder complex to work in exactly the way that it was designed, thereby vastly improving performance.

We will start with the boring stuff—functional shoulder anatomy. It is impossible to understand why the shoulder complex sustains injuries without first having a good level of knowledge of how the shoulder functions. We’ll start with the articulations of the shoulder.

There are four main articulations that are impacted during shoulder movement.

- **Sternoclavicular joint (SC):** This joint serves as the only true connection between the shoulder and the axial skeleton. It binds the clavicle to the sternum in the front of the chest.

- **Acromioclavicular joint (AC):** You may have heard of this joint as a result of an athlete having an “AC” sprain. This joint is the point at which the acromion process meets the clavicle.
- **Glenohumeral joint (GH):** At this joint, the humeral head meets the shallow glenoid fossa of the scapula. The glenoid labrum assists to help deepen the fossa and stabilize the humeral head.

- **Scapulothoracic joint (ST):** This joint may be the most important in terms of athletic development and injury prevention. This joint is not actually a joint at all but the point at which the scapula glides against the thoracic skeleton.

That was the easy stuff. Understanding the bones and articulations is fairly simple. However, understanding the muscles that make them move proves to be a little more difficult.

Take a minute to analyze figure 1. There is one part of the shoulder that I want you to pay particular attention to because it will become very important later. Look just above the humeral head. There is a gap between the head of the humerus and the acromion process of the scapula.

Have you ever heard of impingement of the shoulder? This occurs when that gap is cut down and the range of motion (ROM) of the humerus is restricted. In addition, the tendons that attach to the head of the humerus are irritated. Impingement is an extremely common occurrence among athletes and regular gym goers. I’ll explain how to avoid this later.
Movement of the Shoulder

When looking at the movement of the shoulder complex, we will focus on two articulations and how those two articulations interact. The GH and ST joints are the two of primary emphasis. It is important to understand that the humerus never moves independently of the scapula or vice versa. They move in cooperation with one another. This has been termed “scapulo-humeral rhythm.”

Simply put, the movement of the humerus requires movement of the scapula to maintain functional ROM. If one of the two is out of synch, the whole movement is compromised.

Movements of the humerus

- **Flexion**: Forward movement in the sagittal plane (front raise)
- **Extension**: Return from flexion to anatomical position (dumbbell pull-over)
- **Hyperextension**: Continued extension past anatomical position (downward phase of a dip)
- **Abduction**: Lateral movement in the frontal plane (lateral raise)
- **Adduction**: Movement in the frontal plane toward the midline (pull-down)
- **Horizontal abduction**: Movement away from the midline in the transverse plane; humerus is flexed (rear raise)
- **Horizontal adduction**: Movement toward the midline; humerus is flexed (bench pressing with bad form)
- **Internal rotation**: Rotation medially in transverse plane (palm facing behind you)
• External rotation: Rotation laterally in transverse plane (palms facing in front of you)

Movements of the scapula

• **Upward rotation**: Movement of the acromion process upward and inward (toward the skull) in the frontal plane

• **Downward rotation**: Movement of the acromion process downward (toward the feet) in the frontal plane

• **Adduction (retraction)**: Movement of the scapula toward the midline (spine)

• **Abduction (protraction)**: Movement of the scapula away from the midline (spine); this movement is accompanied by lateral tilt of the scapula in the transverse plane

• **Anterior tilt**: Movement of the scapular spine forward in the sagittal plane

• **Posterior tilt**: A return from anterior tilt (holding the scapula down)

• **Elevation**: Movement of the scapula upward in the frontal plane

• **Depression**: Movement of the scapula downward in the frontal plane

**Scapulo-Humeral Rhythm**

Knowing what kind of movements the humerus and scapula are capable of making is all well and good, but in the real world, the two do not move independently of one another. Having a good understanding of corresponding scapular and humeral movements is crucial.
Here is a basic list to develop an understanding of what the scapula should be doing when the humerus is in action.

<table>
<thead>
<tr>
<th>Humeral movement</th>
<th>Scapular movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Abduction, upward rotation, and posterior tilt</td>
</tr>
<tr>
<td>Extension</td>
<td>Anterior tilt, downward rotation, adduction, and elevation</td>
</tr>
<tr>
<td>Abduction</td>
<td>Upward rotation and abduction</td>
</tr>
<tr>
<td>Adduction</td>
<td>Downward rotation and adduction</td>
</tr>
</tbody>
</table>

This is the general relationship between the scapula and the humerus. The best example of scapulo-humeral rhythm occurs during abduction of the humerus. As the humerus abducts, the scapula must go into upward rotation to maintain room for the humeral head under the acromion process (remember the gap between the two in figure 1).

The scapula should rotate one degree for every two degrees of humeral abduction. This means that when the humerus is abducted 15 degrees, ten of those degrees are created by abduction at the GH joint while five of those degrees are due to the upward rotation of the scapula. Likewise, in a healthy shoulder, a full 180-degree abduction of the humerus is due to 120 degrees at the GH joint and 60 degrees of upward rotation of the scapula. This gives you a good idea of how the scapula and humerus move in conjunction with one another.

**Force Couples of the Scapula**

When it comes to joints as complex as the shoulder joint, it is never as easy as just memorizing which musculature is responsible for which movement. Everything in the shoulder works in what are called force couples.
A force couple is simply combined forces of pull to create a certain movement. For example, set a pen on your desk. Take your right index finger and push the top end of the pen to the left while simultaneously using your left index finger to push the bottom of the pen to the right. The result should have been the pen moving in a circular motion and the center point of the pen not moving at all.

Although neither force was pushing in a circle, their combined force was circular. Your scapula works pretty much the same way. The scapula sits almost on an axis, and a combined effort of many muscles creates the proper movement at the proper time. If one muscle is out of whack, it throws everything off.

Here are the force couples and their corresponding scapular motion.

<table>
<thead>
<tr>
<th>Movement</th>
<th>Muscles*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upward rotation</td>
<td>Middle, upper, and lower traps; serratus anterior</td>
</tr>
<tr>
<td>Downward rotation</td>
<td>Levator scapulae, rhomboids</td>
</tr>
<tr>
<td>Adduction</td>
<td>Rhomboids, middle and lower trapezius</td>
</tr>
<tr>
<td>Abduction</td>
<td>Serratus anterior</td>
</tr>
<tr>
<td>Anterior tilt</td>
<td>Pectoralis minor, biceps brachii, carocobrachialis</td>
</tr>
<tr>
<td>Posterior tilt</td>
<td>Serratus anterior, rhomboids</td>
</tr>
<tr>
<td>Elevation</td>
<td>Upper trap, levator scapulae</td>
</tr>
<tr>
<td>Depression</td>
<td>Latissimus dorsi, lower trapezius</td>
</tr>
</tbody>
</table>

*It’s important to note that some experts debate the amount of involvement each muscle has on the action.

Now, it’s time to use a little bit of commonsense in combination with the chart above. We know that a common injury in a throwing athlete is impingement of the shoulder. This occurs with excessive anterior tilt or downward rotation of the
scapula. Let’s stick with anterior tilt. We know from our length-tension relationships that if the scapula is stuck in anterior tilt, one of the opposing force couples is beating the other into submission.

In this case, the anterior tilt musculature (pectoralis minor, biceps brachii, and caracobrachialis) are overactive. They have become shorter because the musculature in charge of keeping the scapula pinned back (serratus anterior and rhomboids) have been lengthened due to weakness and inhibition. Make sense? Good. Now we can move to a more interesting topic.

**Understanding the Rotator Cuff**

Up until now, we’ve discussed the force couples that move the scapula. We haven’t discussed much about which muscles move the humerus. I won’t insult your intelligence by telling you that the pec major creates extension, horizontal adduction, and internal rotation of the humerus nor will I tell you that the latissimus dorsi creates extension, adduction, and horizontal abduction and also assists with internal rotation. I think I just did.

![Rotator cuff muscles](image)

In actuality, it might help you to know exactly what the largest two muscle groups touching the shoulder girdle do. However, I will spend much time explaining the exact role of the most commonly referenced but least understood muscles of the shoulder—the rotator cuff.
If you train overhead athletes and can’t name the four muscles of the rotator cuff in five seconds, shame on you. The muscles can easily be remembered using the acronym SITS—supraspinatus, infraspinatus, teres minor, and subscapularis.

**Supraspinatus:** This muscle is in charge of assisting with abduction of the humerus, especially the first 15 degrees. This is important and will be on the test.

Because of its position between the head of the humerus and the acromion process, it is the most commonly injured muscle. This is important mainly because this muscle is largely involved in avoiding subluxation (head of humerus moving out of the glenoid fossa) of the shoulder during overhead movements.

**Infraspinatus:** This is a posterior muscle that is largely responsible for external rotation of the humerus, horizontal abduction of the humerus, and extension. As a stabilizer, its responsibility lies in posterior stability, meaning it pulls the humeral head anteriorly to prevent it from moving posteriorly. That is also important.

**Teres minor:** This muscle is very similar to the infraspinatus. It is located just inferior to it and has the same responsibilities (external rotation, extension, and horizontal abduction). It also assists the infraspinatus in the posterior stability of the humeral head.

**Subscapularis:** This muscle covers the anterior side of the scapula and is responsible for internal rotation and extension. It stabilizes the anterior portion of the GH joint. That is, it prevents the humeral head from moving anteriorly (it directly opposes the infraspinatus and teres minor). This is the rotator cuff muscle with the largest cross-sectional area. We will discuss why in further sections.
These muscles are extremely important for one very good reason. They are in charge of stabilizing the already unstable shoulder joint. Because the shoulder joint is designed for incredible mobility, it becomes very unstable. The only joint connecting the shoulder to the axial skeleton is the SC joint, and only the glenoid labrum and rotator cuff musculature are in charge of holding the humeral head in place. That makes this muscle group crucial to shoulder health.

We will discuss how to strengthen this muscle group in later sections, but it is important to remember their primary purpose—stabilization.
Chapter 2: Dysfunctions of the Shoulder

When we examine the length-tension relationships among muscle groups, we see that agonist and antagonist have interdependent qualities. They rely upon one another to supply balance to the body. Over time, a disruption in this balance can cause pain and eventual injury.

Vladamir Janda, a Soviet physical therapist, became world renowned for his research in these interactions among body parts. Janda found that the body compensates in a predictable pattern in which certain muscles become tight or overactive and others become long and weak. This process is what Janda called “upper crossed syndrome” in the upper body and “lower crossed syndrome” in the lower body. We will discuss upper crossed syndrome in detail later. For now, let's use a common example from the lower body involving the ankle joint.

Very commonly, the plantar flexors of the ankle become very tight (gastrocnemius and soleus). The body’s natural reaction to protect itself is to lengthen and weaken the antagonists of the plantar flexors (dorsiflexors—tibialis anterior in particular). This can cause many problems with movement patterns and eventually lead to an ankle injury or knee pain.

There are four ways to deal with this type of problem. The first and most commonly used method is to simply do calf stretches pre- and post-workout in an attempt to lengthen the plantar flexors. This may prove to be successful in some situations, but when an athlete is continually under large loads, more often they tend to tighten right back up again.

The second solution is somewhat outside the box. We know that if we have tight, short, overactive, plantar flexors, something has to give. In an attempt to avoid injury, that means your dorsiflexors will lengthen, weaken, and become inhibited. By activating and strengthening the dorsiflexors, we thereby force our plantar
flexors to lengthen. By creating balance instead of incredible strength in one area and not the other, we put our body in a much better position to perform.

The third solution is my personal favorite. It is also the most proactive approach. We can lengthen the tight, overactive, plantar flexors while simultaneously activating and strengthening the long, weak dorsiflexors. This is a more aggressive approach, which I will discuss in detail later.

The fourth solution may even be more commonly used than the first—simply insulting the athlete’s manhood (assuming the athlete is a male) by ignoring the issue all together. However, I assume you wouldn’t do that if you were actually taking the time to read this stuff.

Now, let’s apply this idea to the shoulder. If the shoulder is stuck in anterior tilt (very common among overhead athletes and lifters who use bodybuilding approaches), what is the issue? We have tight and overactive anterior tilt musculature (pec minor, brachialis, caracobrachialis) and long and weak posterior tilt musculature (serratus anterior, rhomboids).

Using the analogy of the ankle, how would you treat this condition? By using exercises that strengthen the serratus anterior and rhomboids musculature while simultaneously stretching the pec minor and biceps musculature, we can attempt to move the scapula back into proper position and out of harm’s way.

**A Good Offense Is Your Best Defense**

As the heading suggests, a properly structured program is your best defense against injuries. As a strength and conditioning coach, my goal is to make the job easy for the athletic trainer for my teams. So let’s discuss the common shoulder injuries that we as strength coaches can prevent from occurring in the first place.
Impingement of the Shoulder

You've probably heard of this dysfunction. Impingement of the shoulder may be the most commonly referenced injury in any gym across the country. Any pain, discomfort of the shoulder, or anal leakage is always because of shoulder impingement.

Because of genetics, poor posture, poor training, and the demands of daily life (working at the computer), many people put themselves (and their scapula) in a position that predisposes them to certain kinds of impingement of the shoulder.

Impingement is simply a narrowing of the gap between the acromion process and humeral head (see figure 3). In figure 3, the bursa of the shoulder is pinched between the head of the humerus and the acromion process of the scapula. Under the bursa is an inflamed rotator cuff tendon. This condition can cause pain and, if it persists, could eventually cause a tear of the rotator cuff tendon. So let’s try and understand what a strength and conditioning coach can do to prevent athletes (particularly overhead athletes) from getting this condition.

First, we have to identify the different types of impingement that may occur. There are three main types of impingement syndromes that occur in the shoulder—primary impingement, secondary impingement, and internal impingement. Primary and secondary impingements are what we call hyper-mobility injuries. Internal impingement is what we call a hypo-mobility injury.
Hyper-Mobility Impingement

Primary and secondary impingements are very similar and, therefore, can be prevented in a very similar manner. Hyper-mobility means that the humerus is too mobile and has too much wiggle room within the glenoid fossa. Remember that the rotator cuff’s main job is to stabilize the humeral head. Having a weak rotator cuff complex causes severe instability of the joint and eventually pain.

Primary impingement

Primary impingement syndrome is a condition where the deltoid overpowers the rotator cuff. The pull of a strong deltoid muscle pulls the humeral head upward. This must be counteracted by the rotator cuff musculature pulling downward to hold the humeral head in place. If the rotator cuff is weak when compared to the deltoid, the humeral head will be pulled into the acromion process of the scapula and will pinch the bursa of the shoulder and rotator cuff tendon.

This is a prime example of why all the weekend warriors at the gym who are doing Ronnie Coleman’s shoulder routine that they found in Muscle and Fitness magazine are prime candidates for this type of injury. They can do all the lateral raises and military presses in the world, but what they are creating is a strength imbalance between their deltoid and rotator cuff, which creates a very painful shoulder.

Secondary impingement

Secondary impingement is believed to be very similar to primary impingement. It occurs after the rotator cuff weakens and allows the ligaments of the humeral head to be stretched out, thus creating enhanced laxity within the shoulder joints. Again, pain with overhead movements is due to the tendons of the rotator cuff coming into contact with the acromion process. Weakness in the rotator cuff is the primary cause of the instability.

Preventing primary and secondary impingement
This is where strength and conditioning coaches make their big bucks. We already know that a weak rotator cuff leads to shoulder instability. Now, let’s think a little more outside the box.

Figure 4 provides a good look at the bony structures of the shoulder complex. Look at the space between the humeral head and the acromion process. In a perfect world, this space would be the same in everyone’s shoulder. However, due to genetics, daily life, and poor training habits, this isn’t the case.

I first mentioned genetics. Due to genetics, each person’s acromion process develops differently. Some are flat (type I), allowing for maximal space between it and the humeral head. These individuals are at a lower risk for impingement. On the other hand, some are curved down or beaked (type III), placing them at greater risk for impingement. Type II acromion processes lie somewhere in the middle. Genetics and even daily lifestyle may be out of our control. However, proper training habits can move the scapula into a more ideal position.

Let’s look at figure 4 again. Imagine that someone had short, overactive, downward rotators of the scapula and long, weak, inhibited, upward rotators. What would this look like? If you said that the acromion process would shift downward and the inferior border of the scapula would shift medially, you’re correct! If you have a great imagination, you would see that by the scapula going into downward rotation, the humeral head has less room to move.
Now, let’s imagine one more scenario. Imagine a person had overactive, short, internal rotators of the humerus and long, weak, inhibited, external rotators of the humerus. Also, imagine that the person had short, overactive, anterior tilt musculature of the scapula and long, weak, posterior tilt musculature. What you have is internal rotation of the humerus combined with anterior tilt of the scapula. The gap for the humeral head gets smaller as we speak.

What I’ve just described to you are some of the most commonly found problems in the shoulder, not just in the athletic population but also in the general public. Overactive and short pec majors (internal rotation), pec minors (anterior tilt), and levator scapulae (downward rotation) combined with long and weak infraspinatus, teres minor (both external rotators), serratus anterior (upward rotation and posterior tilt), and middle and lower trapezius muscles (upward rotation) leave the scapula in a position of anterior and downward tilt and the humerus internally rotated. Can you picture this scenario? How much more room can we take away?

By lengthening the short, overactive musculature and strengthening the long, weak musculature, we can reposition the scapula into a better, less injury prone position. This doesn’t mean that we should never strengthen an overhead athlete’s internal rotators. That would take benching, pull-ups, and rows out of the picture. It also doesn’t insinuate that we should never strengthen a muscle like the levator scapulae. That would take all the Olympic lifts out as well. This just means that we must understand the mechanisms and train accordingly. This brings us to the third type of impingement.

**Hypo-Mobility Impingement**

Hypo-mobility is another way of saying “tight” or “lack of mobility.” This type of impingement is different from the other two. It occurs not because of instability but because certain regions of the shoulder capsule have become tight causing posterior shoulder pain. While slightly less common than primary or secondary
impingement, internal impingement is still caused by overhead motions. Internal impingement can actually be made worse by continuing to strengthen the external rotators of the shoulder. Here’s why…

Take a look at the amount of external rotation this baseball pitcher gets during the throwing motion in figure 5. During this movement, the internal rotators of the shoulder are undergoing huge eccentric forces. This can cause damage and eventually weaken the subscapularis. Remember, this is the only rotator cuff muscle in charge of internal rotation and also has the largest cross-sectional area of any rotator cuff muscle.

You might think that having a little weakness in the internal rotators would be acceptable considering what we talked about in the hyper-mobile section but think again.

What is the major job of the rotator cuff muscles? Stabilization. What is the primary rotator cuff muscle preventing anterior glide of the humeral head? The subscapularis. Now, think about benching. While benching, the large pectoralis muscles are pulling the humeral head anteriorly. The infraspinatus and teres minor (external rotators) exaggerate that by preventing the humeral head from moving posteriorly. With a weak, inhibited subscapularis, very little is opposing the pull of the pecs. The subscapularis also has to depress the humeral head. If it
is not firing correctly, the infraspinatus and teres minor begin to work overtime. What we get is a stiff posterior capsule, a glenohumeral internal rotation deficit (GIRD) and impingement of the superior, posterior surface of the glenoid and glenoid labrum. Athletes who have this will lack internal rotational range of motion (ROM).

Again, by strengthening the subscapularis and lengthening our external rotators, we will gain ROM in internal rotation, and posterior shoulder pain can be diminished. If the condition is allowed to continue, it can progress into a tear of the posterior labrum. Remember, the labrum of the shoulder is connective tissue that helps to stabilize the shoulder joint.

You can easily observe GIRD by asking your athlete to do a posterior capsule stretch. There will be an obvious difference between the arms when an athlete is tight. The test is also a treatment. This stretch can be performed daily in order to resist anterior glide of the humerus.

Be sure to maintain proper posture when doing this exercise. Never allow the scapula to fall into anterior tilt.
Chapter 3: Acromioclavicular (AC) Injuries

Let’s take another look at the bony structures of the shoulder girdle. On the front view, you can clearly see where the acromion process and the clavicle meet. This is the very fragile acromioclavicular (AC) joint. Ever hear of a dislocated shoulder? This is not a dislocation of the humeral head (separated shoulder) but rather a dislocation of the acromion from the clavicle. These types of injuries can also be less severe and are called AC sprains.

This joint seems to be particularly predisposed to shoulder injury because there isn’t much hiding it. Often in collision sports such as football, AC sprains occur through a direct blow or falling on an outstretched arm when trying to get the extra yard or reaching for the first down. This seems unavoidable, but once it occurs, it can be severely limiting to performance. There isn’t much our athletic trainers can do for it.

So the question is, how can we keep this from happening in the first place? Interestingly enough, the answer is quite similar to what we discussed in the hyper-mobility impingement section. Take a look at the guys on your teams who have a history of AC joint injuries. Chances are these athletes have scapulae (or possibly only the injured shoulder) that lay with more of an anterior tilt and an internally rotated humerus. We’ll talk more about how to spot this later, but this position exposes an already fragile joint. By keeping the scapulae better retracted and depressed, we can hide this joint and reduce the risk of AC injury.
Just like the hyper-mobility injuries, we must train the rotator cuff to help stabilize the humeral head. When an athlete falls on an outstretched arm, the humeral head is pushed up into the acromion process, which causes a dislocation or sprain of the AC joint. Remember that our rotator cuff muscles help to depress the humeral head and keep it away from the acromion. By strengthening them as stabilizers, we can help them depress the humerus more effectively, thereby protecting the joint from injury.
Chapter 4: Labrum Tears

Let’s go back and try to remember the purpose for the glenoid labrum in our shoulder capsule. The shoulder is a ball and socket joint in which the humeral head is large and sits on top of a shallow glenoid fossa. It has commonly drawn the analogy of a golf ball sitting on a golf tee. The labrum then serves to deepen that fossa, thereby increasing stability of the joint. Labrum injuries are more common among overhead athletes who continually put large amounts of stress on their shoulder capsules.

Superior labrum from anterior to posterior (SLAP) is an injury that can be debilitating for an overhead athlete or an athlete involved in contact sports such as football. Again, our focus shifts to prevention. I will continue to harp on the importance of the rotator cuff, but this time we are going to discuss training the rotator cuff. Without a doubt, a strong rotator cuff will help prevent labrum tears. Let’s first take a look at the mechanism for a SLAP tear.

The most common mechanism for a labrum tear is falling on an outstretched arm. Think about a football player diving for a tackle. His arms are outstretched as he reaches for the opponent. As he dives, he is hit from behind and lands on his side with his arms in an overhead position.

Think about the running back trying to break that tackle. He may lose his balance and try to gain an extra yard by using his hand to keep his feet. As his hand is planted on the ground and his arm is straight, he is hit from behind, forcing his body weight to be supported by his outstretched arm.

These are two common mechanisms for labrum tears. So how do we avoid it? In the first example, the athlete had his arms in an overhead position when the injury occurred. The solution is simple. We need to make the athlete’s shoulders strong in that position. What I’m suggesting is what many coaches stay away
from—overhead pressing. If done correctly, overhead pressing movements have a ton of benefits including the improvement of scapulo-humeral rhythm and improvements in the mobility of the thoracic spine. If done incorrectly, they can cause some damage.

There are two things to stay away from when using overhead lifts. The first is the use of a back support. This compresses the scapula and restricts its mobility. The second is behind the neck variations. This puts the humerus in abduction, horizontal extension, and external rotation. That is the formula for pain.

In the second scenario, the athlete was put in a position that resulted in massive compressive forces in the shoulder capsule. Our shoulders can handle that to some degree, but we must train them to do so. This means push-up variations and a lot of them. Alter hand positions and surfaces to allow the shoulder to adapt to a ton of different positions. With all the new training tools, it’s easy to forget that push-ups may still be the best exercises out there.

Now, let’s talk about posterior labrum tears. As I mentioned in the internal impingement section, untreated internal impingement usually turns to a posterior labrum tear. Prevent internal impingement and more than likely you will prevent posterior labrum tears. Just remember, external rotation is a great exercise to target the rotator cuff, but it isn’t the only exercise. Be balanced in rotator cuff training. Not doing so can create imbalances in the rotator cuff itself, thereby creating more problems.
Chapter 5: Identifying Shoulder Dysfunction

Before we begin describing exercises, we will spend a brief amount of time identifying a couple common dysfunctions. Most of this can be done by simple static assessment. Let’s start with the most common abnormalities. I’ll take that back. This may be so common that it has become a normality.

An internally rotated humerus and anteriorly tilted scapula have become the norm in today’s athletes. Think about our lifestyles. How am I typing this right now? My arms are internally rotated, and my posture is slightly kyphotic, which leads to anterior tilted scapulae.

Think about the musculature that is involved with the movements described:

- Internal rotation (pectoralis major, latissimus dorsi)
- Anterior tilt (pec minor, biceps brachii)

Think about the antagonistic musculature:

- External rotation (infraspinatus, teres minor)
- Posterior tilt (serratus anterior, rhomboids)

I haven’t heard many gym rats walk into the gym and say, “Today is my rhomboid and serratus anterior day. Tomorrow is my ass and head day.” The fact of the matter is many football coaches don’t want to hear about how strong their athletes’ low traps are. The big lifts (bench, pull-ups) produce the big muscles (pecs, lats). These muscles become stronger in those areas, thus producing
dominant muscles (short, overactive) and weaker muscles (long, weak, and inhibited). Who wins?

Figure 8A and 8B are a bit exaggerated, but you get the point. On the left is someone with good posture and scapular lay. When looking straight ahead, you should be able to see the knuckles of his index and middle finger but no more.

On the right is the posture of someone with tight lats and pecs. Because you can see more than just two knuckles, you know that he is in humeral internal rotation.

Anterior tilt is best seen from the side. If his shoulders tilt forward, he is more than likely anteriorly tilted as well. Seeing the scapula “winging” in the back will seal the deal. This indicates weakness of the serratus anterior. This scapular position is very common and not easily fixed. We know we can stretch the lats and pecs while strengthening the lower traps and serratus anterior, but think about your lifestyle. Most of the time you’re internally rotated and kyphotic (me typing on the computer).

Eric Cressey refers to this as his 23:1 rule. We spend 23 hours a day with bad posture and one hour training good posture. What wins? We will discuss ways to strengthen muscle groups like the lower traps and serratus, but consciously altering your posture throughout the day is your best remedy.

Figure 9 shows winging of the scapula. The left serratus anterior is strong and active while the right is weak and inhibited. This may not be as apparent in many athletes because very muscular backs will hide it well. This case is probably
more severe (possibly a temporary paralysis of the serratus) than most that we see in athletes.

When it comes down to it, identifying shoulder issues usually has more to do with understanding the force couples of the shoulder than memorizing pictures of possible dysfunctions. To make it easier, the next section will give a list of commonly short, overactive musculature and commonly long, weak, and inhibited musculature along with the exercises to improve them.

Figure 9
Chapter 6: Training the Shoulder Complex

So far, we have discussed the anatomy of the shoulder and the various types of movements it is capable of. We have also been reminded that due to lifestyle, training habits, and genetics, we have some muscles that are what we call short, overactive musculature and long, weak, and inhibited musculature.

Short, overactive musculature are usually strong muscles that we tend to work more than their antagonists. They then overpower the antagonists and become shortened while the antagonists become lengthened. Over time, this becomes reinforced, creating deficiencies.

Below is a list created by Vladamir Janda in his book, *Muscle Function Testing*. This list includes the most common long, weak musculature in the upper body and the short, overactive musculature. Also included are the movements for which they are responsible.

Long, weak, inhibited musculature

- **Rhomboids**: Scapular adduction, downward rotation
- **Infraspinatus**: Humeral external rotation, horizontal abduction, extension, and humeral head stabilization
- **Teres minor**: Humeral external rotation, horizontal abduction, extension, and humeral head stabilization
- **Middle trapezius**: Scapular elevation, retraction, upward rotation
- **Lower trapezius**: Scapular depression, adduction, upward rotation, posterior tilt
- **Posterior deltoid**: Humeral horizontal abduction, extension, abduction, and external rotation

- **Serratus anterior**: Scapular protraction, upward rotation, and posterior tilt

Short, overactive musculature

- **Pectoralis major**: Humeral extension (sternal fibers), horizontal extension, flexion (clavicular fibers), horizontal adduction, internal rotation, adduction, and abduction

- **Latissimus dorsi**: Humeral extension, adduction, internal rotation, horizontal abduction, scapular depression, retraction, downward rotation, and posterior tilt

- **Teres major**: Humeral extension, internal rotation, and adduction

- **Anterior deltoid**: Humeral abduction, flexion, horizontal adduction, and internal rotation

- **Subscapularis**: Humeral internal rotation, adduction, extension, and humeral head stabilization

- **Upper trapezius**: Scapular elevation, upward rotation, and retraction (sometimes)

- **Levator scapula**: Scapular elevation, downward rotation, and anterior tilt

- **Pectoralis minor**: Scapular abduction, downward rotation, depression, and anterior tilt

Take a look at the groupings. Experts like Eric Cressey, Mike Robertson, and Bill Hartmann do a great job of pointing out common themes in the book, *The Inside-*
Out Manual, as well as in many of the articles that they have written. Former Oakland A’s physical therapist, Daniel Cassidy, confirmed these findings. In working with overhead throwing athletes (the Oakland A’s are a baseball team), he finds that their upper traps are more active than their lower traps, and they have overactive levator scapulae and short pec minors. Contrary to Cressey and Robertson, Cassidy sees that his clients have short, overactive rhomboids (which are downward rotators), and maybe most importantly, they have underactive serratus anteriors.

Take one final look at the charts above. Remember, we want to keep the scapula out of downward rotation and anterior tilt and keep the humerus out of internal rotation. This proves to be a difficult challenge.
Chapter 7: Exercises to Improve Long, Weak, Inhibited Musculature

Training the Rotator Cuff

We have already discussed the importance of the rotator cuff at length, but let’s recap anyway. We know that the rotator cuff consists of the four muscles (SITS—supraspinatus, infraspinatus, teres minor, and subscapularis). We also know that the main role of the rotator cuff is to depress and stabilize (in all directions) the humeral head. They are in direct opposition to the deltoid, which has an upward pull of the humeral head. A weak rotator cuff will succumb to the pull of the very strong deltoid, causing the space between the acromion process and the humeral head to shrink. The SITS muscles are also involved in internal and external rotation and abduction of the humerus.

But wait, there’s more! The human body is interesting. It won’t allow itself to get hurt. This is the weakest link theory at work. Your body won’t allow itself to become stronger than it can handle. Once something becomes your limiting factor, progress halts. In most cases, weak joint stabilizers limit the amount of weight that you can lift. Nowhere in the body is this more evident than in the effect that rotator cuff strength has on your bench press.

Charles Poliquin once reported adding 50 lbs to a client’s bench in six weeks simply by adding external rotations into his daily workout. If that doesn’t sound...
crazy enough, he also reported that this particular client didn’t even bench during that six weeks. This is a lesson learned in body balance. That particular client was severely limited by stabilizer strength in his shoulder. Needless to say, hitting the rotator cuff is critical to training any athlete.

Let’s get down to it. There are two ways we can go about training the rotator cuff. The first is directly strengthening the SITS musculature by hitting them in isolation exercises. This works very well. The second is to train them proprioceptively using their roles as stabilizers and decelerators (as in throwing). This also works well. See what I’m getting at? We must train the rotator cuff in a multitude of ways in order to ensure that this will not be our limiting factor.

**Strengthening the Teres Minor and Infraspinatus**

**Exercise #1: External rotation**

The best way to isolate and strengthen these muscles is through external rotation. This exercise uses the infraspinatus and teres minor as the prime movers (posterior deltoid assists also) and also recruits the subscapularis and supraspinatus as stabilizers in the movement.

There are several ways to do this exercise, but let’s just stick with one (see figure 11A and 11B). I like to do this movement in the transverse plane because less can go wrong. Some like to do this movement in the sagittal plane with the humerus abducted, which works fine, except some athletes compensate for rotator cuff weakness with lumbar extension.
This is an easy exercise that can be done as a warm-up to activate the stabilizers before benching. Put simply, if you aren’t doing this now, start.

Exercise #2: Cuban press variations
This exercise is very similar to the external rotation exercise as far as recruitment patterns go (see figures 12A, 12B, and 12C). It can be done with barbells, dumbbells, or plates, and it can be done standing or face down on an incline. The key is to stay out of scapular anterior tilt in the elbows up position, which allows the shoulders to roll over and the scapula to wing in the back.

Exercise #3: L-lateral raise
This is a great exercise to hit both the supraspinatus (via abduction) and the external rotators (see figures 13A, 13B, and 13C). While this exercise is self-explanatory, it should be mentioned that doing lateral raises with a 90-degree bend at the elbow changes the lever arm so that it places a greater load on the rotator cuff.
All of these exercises target the infraspinatus and the teres minor, which are both very important. However, let’s talk about ways in which we can target the subscapularis.

Although this muscle is in our short, overactive column, it needs to continue to be strengthened. It works in internal rotation and sometimes can become weak because the large pectoris muscles and lats are the prime movers in internal rotation.

A weak subscapularis can result in internal impingement or a strained pectoralis major or minor. It also must sustain heavy eccentric forces in overhead throwing athletes so it must be strengthened. Although these types of exercises may not deserve the same attention that external rotation receives, they should be recognized as important.
Strengthening the Subscapularis

Exercise #1: Prone internal rotation
You may be thinking, “Why prone?” Many people do this exercise in the transverse plane (much like external rotations), which works well, and many do it in the sagittal plane with the humerus abducted. Figure 14 shows the latter performed with a miniband.

Here the athlete can only go from zero to ninety degrees. In this case, the major movers tend to be the pectoralis major, latissimus dorsi, and teres major with the subscapularis just going along for the ride.

Performed prone, this exercise consists of 90–180 degrees of rotation (see figures 15A and 15B). In this zone, the pecs and lats have already shortened, and it’s the subscapularis’ time to shine. Be sure that the humerus is supported and anterior tilt is avoided. Anterior tilt is an attempt to gain range of motion (ROM). In this exercise, ROM is small. Wrist flexion is another attempt to gain ROM.
Exercise #2: Subscapularis pull
The name of this exercise lacks creativity, but don’t count it out just yet. Due to the difficulty that some athletes’ may have with this exercise, you will most likely need to use a theraband. This is another attempt at reaching maximal internal rotation and avoiding the pecs and lats. Remember to maintain good posture throughout the entire movement (see figures 16A and 16B)
Finally, we’ll hit the supraspinatus. This muscle assists in abduction of the humerus, but it’s important to note that its major role is only in the first 15 degrees of abduction.

This is important because of compensation patterns seen in lifters with a weak supraspinatus. In a regular lateral raise, the lifter will compensate by elevating the scapula and using the upper traps to reach 15 degrees of abduction (figure 17) so that the strong deltoid can take over the movement from there.

**Strengthening the Supraspinatus**

In order to avoid compensation by elevating the scapula and using the upper traps, we need to strengthen the supraspinatus. The exercises that follow will do just that.

**Exercise #1: Leaning lateral raise**

If performed in a leaning position, elevation of the scapula proves to be unsuccessful in creating abduction. The lifter is forced to use the supraspinatus. The ROM may be less, but at least we’re using the correct musculature.
I’ve found this exercise to be awesome for athletes just out of shoulder rehabilitation. It does a great job of activating a dormant supraspinatus (figure 18).

**Exercise #2: Empty can**

This isn’t my favorite exercise to hit the supraspinatus, but it deserves mention (figure 19). It’s performed in a plane called the scapular plane. This is the natural plane of the scapula and is about 30–45 degrees in front of the frontal plane (lateral raise). By internally rotating the humerus, we can better target the supraspinatus. However, internal rotation also cuts down on the subacromial space.

Some individuals may have issues with this lift, especially those with tight pec minors.

**Exercise #3: Scaption**

In my opinion, this movement is the better option over the empty cans exercise. With the thumbs pointed upward, the subacromial space remains. In the scapular plane, the shoulder should function optimally. It hits all three heads of the deltoid about equally and recruits all four of the
rotator cuff muscles. Throw in upward rotation of the scapula and you have a
great exercise (see figure 20).

This is a much better option than front raises, which place the humeral head
anterior to the acromion process and greatly increase the likelihood of
impingement.

**Exercise #4: Not the upright row**

Eric Cressey is famous for his hatred of the upright row. By internally rotating the
humerus and abducting it, it may seem as though we want to have impingement
issues. By simply internally rotating, we cut down on subacromial space, and
now we want to fire up our deltoid in abduction. It is a recipe for pain. It should be
noted that due to scapular type (type I, II, or III acromion process), some people
are more susceptible to shoulder pain than others.

So I agree with Cressey. There are just better ways to hit the delts and traps than
using the upright row. I’m not even going to give you an image for this one. If you
don’t know what it is, great! Just keep *not* doing it.

Now, let’s discuss how to train the rotator cuff proprioceptively. The answer may
make some strength coaches a bit angry. This is where I condone instability
training. I’m not a strength coach who centers a strength training routine around
Swiss balls and 3-lb dumbbells. Most of the time, those who do use these
implements do so incorrectly. While performing Swiss ball push-ups and
medicine ball push-ups as exercises to fire up the stabilizers have merit and
should be used, they should not be used as strength exercises.

Dumbbell variations do a great job of walking the line between stability and
strength exercises. You will find that for an unstable athlete, dumbbell work is
almost exclusively stability work. However, in a very well-trained, stable athlete,
dumbbell work is almost exclusively strength work.
The other way in which we train the rotator cuff proprioceptively is in deceleration training. Doing medicine ball decelerations is a great way to train the rotator cuff eccentrically. This mimics the muscle action while throwing in not only the rotator cuff musculature but also the middle traps and rhomboids.

Another rarely used method is Inno Sport’s reflexive isometric lateral, rear, and front raise. To do these, use light weight (1–2 lbs) in a drop and catch manner so that the shoulder must respond to sudden changes in tension and length. Think of it as plyometrics for the rotator cuff.

**Rhomboids and Middle Trapezius**

These two muscles are easy to group together because of their position on the skeleton. The rhomboids lay deep to the middle traps and have similar but not identical lines of pull. While the rhomboids assist in downward rotation of the scapula (something we want to stay away from) because of their line of pull (see figure 21 and 22), they also retract the scapula and assist in posterior tilt by pinning down the medial border of the scapula.

The middle trap is part of a force couple that upwardly rotates the scapula (something that we want to work toward).
Like the rhomboids, the middle traps retract the scapula but also assist in elevation of the scapula.

The key with hitting these two muscle groups is retraction or, more importantly, retraction without elevation. While elevating, we also activate our upper traps. Remember, this muscle is already short and overactive. We need to learn how to recruit our rhomboids and our middle traps separate from the upper traps.

**Exercise #1: Retraction**

We’ll start simple. This is as basic as any exercise gets for the rhomboid and middle trap region. There are numerous variations of this exercise. It can be done with bands (standing or bent over) or dumbbells (like a bent over row or lying prone on a bench), on a machine, or like an inverted row. The key to this exercise is just as described above—retraction without elevation. This may sound easy, but it proves more difficult than you think. Figures 23A and 23B show correct retraction while figure 23C shows retraction done with elevation. The difference is subtle but important.

![Figure 23A](image)
![Figure 23B](image)
![Figure 23C](image)

**Exercise #2: Wall slides**

In my opinion, this might be the best exercise for recruiting the rhomboid and the middle trap dynamically. You will also get some good low trap recruitment out of the deal as well. This exercise is actually a glenohumeral ROM exercise and scapular stability exercise all in one.
To do this exercise, make sure the feet are about 10–12 inches from the wall (see figures 24A and 24B). The athlete’s head and upper, middle, and lower back as well as the back of the hands and forearms should stay in contact with the wall. Start with both elbows at 90 degrees and slowly move the arms up and down the wall, keeping all points in contact. Again, the key is to keep the shoulders depressed. This is another simple exercise with big results.

*Figure 24A*

*Figure 24B*
Exercise #3: Prone T

This exercise has two variations, each able to preferably target either the middle trap or the rhomboids. This is done very simply by lying prone while keeping the arms straight, performing a version of a rear raise. The two versions differ by the rotation of the humerus.

When targeting the rhomboid, the scapula should be elevated slightly (the rhomboids are a weak elevator even though they’re not on the earlier list), rotated downward slightly, and adducted (see figure 25). We can reach this scapular position simply by turning our thumbs down (internal rotation of the humerus).

On the other hand, the middle trap can better be reached by
pointing the thumbs up (external rotation of the humerus). This position puts the scapula in an upwardly tilted, depressed, and adducted (retracted) position (see figure 26).

Exercise #4: Rowing the right way
We know that there are virtually limitless versions of a horizontal row—bent over barbell rows, seated cable rows, single arm dumbbell rows, and more. The key is to make sure they’re done correctly (see figures 27A, 27B, and 27C).

The first movement in any row should be retraction of the scapulae. Again, this involves depression, not elevation. There are a few compensation patterns for weak retractor patterns that can be seen when observing an athlete performing rows. None of them are more obvious than the head bob. This is when the athlete looks like he is bobbing for apples while doing a row. The athlete is usually using too much weight and needs to focus on holding the bar on his chest for a count before allowing it to come down.

The other major compensation pattern is elevation of the shoulders. This allows the athlete to feel as if he is keeping his back tight but by using the upper traps in elevation. This is something we want to avoid.

![Figure 27A](image1)
![Figure 27B](image2)
![Figure 27C](image3)
Exercise #4: Face pulls
This is another one of my favorite exercises. This is done by retracting and then horizontally abducting the humerus. By doing this, we can recruit the posterior delt and external rotators (see figures 28A and 28B). Again, keep the shoulder out of elevation. As seen in figure 28A, go with a neutral grip to better hit the external rotators.

This is a must have auxiliary exercise in just about every program.

Exercise #5: Prone Y, T, and W
This is another exercise that has made its way into many shoulder programs and warm ups and for good reason (see figures 29A, 29B, and 29C). Some of you may have heard of it under the name Blackburns, but it’s the same idea.

To perform this movement, go into retraction and put the humerus at different joint angles in order to recruit slightly different musculature. Always remember to squeeze with the scapulae. Those are your money makers. Figures 29A, 29B, and 29C are done on the ground. Ask your athletes to keep their noses close to
the ground to avoid lumbar hyperextension. These can be done as isometric holds or for repetitions.

Lower Traps

The lower traps become a very important muscle group by playing a few different roles (see figure 30). First, they play a major role in upward rotation of the scapula. This gives our humeral head room to breathe. Second, they play a major role in depression of the scapula, a movement usually overshadowed by their antagonist in that motion—the very sexy upper traps. Finally, they play a major role in extension of the thoracic spine.

The lower traps are an odd muscle group to get to, but there are a few exercises that do a good job at firing them up.

**Exercise #1: Prone Y**

This exercise is just like the prone T, except the arms are raised in a Y shape and the thumbs are pointed upward (see figure 31). By doing this, we put the arms in line with the line of pull from the lower
traps, and we also put the scapula in an adducted, upwardly rotated, and depressed position. On this exercise and in exercises like the prone T, you may feel your upper traps activating. This is because they are major stabilizers in the movement, not prime movers. This action, which we’ll discuss later, serves them well.

Exercise #2: Sit, roll, and reach
This exercise looks awkward, but it hits the lower traps very well by depressing the scapula and getting the body into thoracic extension unilaterally (see the thoracic region chapter), much like an overhead athlete (see figures 32A and 32B). It is performed on the knees.

Sit your butt on your heels and rest your elbows on the ground. From this position, keep one elbow on the ground. Take the other hand and roll the palm so that it faces up. Then, extend your arm and reach your palm to the ceiling. I
promise that this works, and I warned you from the beginning that it looks awkward.

**Exercise #3: Dip depressions**

This exercise actually uses the lats as the major prime mover but hits the lower traps as well (see figures 33A, 33B, 33C, 33D, and 33E). Think about all the shoulder elevation work that our athletes do (shrugs, Olympic lifts, etc.).

We need to balance it out a little. Luckily, our body was smart enough to put a huge muscle—the latissimus dorsi—in charge of opposing those forces. However, our lower traps play a large role also.

This exercise can be done in two ways. For the first way, sit on a bench and put your hands down directly on each side of your butt. This is important. Do not allow your butt to go over the front of the bench (see figure 33B). This puts you in humeral hyperextension and takes away from your ability to retract your shoulders. Your chest should be tall, and your scapulae should be retracted to truly target your lower trap.

Do you see the difference between the correct start position (figure 33A) and the incorrect start position (figure 33B)?
The second way is performed like a regular dip. Again, the chest is up and the scapulae are retracted. All movement is done at the shoulder (see figures 33D and 33E).

Exercise #4: Pull-up depressions

This exercise takes dip depressions to the next level by doing it from a chin-up position (see figures 34A and 34B). By externally rotating the humerus (as in a chin-up grip) and putting the humerus in full flexion, we can lengthen the lats to the extent that the lower and middle traps must take charge of this lift.

By pulling the chest up, we work retraction and depression at the same time. This is a “can’t lose” exercise. However, we must not rely solely on this version.
Start in a full hang and then depress the shoulders with no elbow flexion. The chest should come up, and the scapulae should retract and depress.

**Serratus Anterior**

This muscle may be one of the most important muscles in the upper body. Its main role is to protract the scapula. However, it also plays major roles in upward rotation and posterior tilt (by locking the scapula to the ribs). As we know, both of those are desired positions for the scapula.

This muscle also seems to be the first muscle to “shut down” in the face of trouble. For example, if the pectoralis minor is strong and tight, it pulls the scapula into anterior tilt. To avoid injury, the serratus anterior lengthens and becomes inhibited to allow the scapula to follow the path of least resistance. The body thinks that it is helping, but actually, it is aiding the problem.
Studies show that serratus anterior dysfunction is a huge indicator of shoulder issues, especially in overhead athletes. Hitting this muscle is hard but a must. Unfortunately, there is only one real way to target the serratus anterior and that is through protraction of the scapula. Here are a few tips to strengthen this forgotten muscle.

**Exercise #1: Push-ups**
Serratus activation is far higher when doing push-ups than while benching (it’s pretty much dormant when benching). The key is protraction at the top of the push-up. This is sometimes called a “push-up plus.” My thought is why don’t we just call this a push-up and perform our push-ups correctly? Can you see the difference at the top in figures 36A and 36B?

![Figure 36A](image1) ![Figure 36B](image2) ![Figure 36C](image3)

**Exercise #2: Scap push-up**
This is just like above, only it takes the push-up out of it. It just becomes a shoulder movement. Look at figures 36B and 36C and you have a scap push-up.

**Exercise #3: Single arm medicine ball push-up**
This is a push-up variation that allows you to get extra abduction on the down arm, as you can see in

![Figure 37A](image4) ![Figure 37B](image5)
figure 37B. Be sure to make your athlete get all the way up on their down arm (see figures 37A and 37B).

**Exercise #4: Supine single arm dumbbell protraction**
This is virtually the same exercise. However, it can be done if the issue is unilateral (the injury or dysfunction is present in only one arm). See figures 38A and 38B.

**Exercise #5: Bridges**
This concept can be reinforced while doing other exercises as well. Bridges are well known as one of the best core exercises out there (see figures 39A and 39B). However, simple modifications can make these more than just a core exercise.

Figure 39A shows the athlete doing bridges with an unstable shoulder capsule. In figure 39B, the athlete engages the serratus anterior and makes the exercise much more shoulder friendly.
Chapter 8: Exercises to Improve Short, Overactive Musculature

Take another look at the short, overactive musculature list in Chapter 6. Most of these are major muscle groups that will be trained enough in regular training programs. They should be kept that way. I would never tell anyone that bench pressing or pull-ups are overrated exercises. Both, or some variation of the two, are must haves in a quality training program. However, make sure that you keep these movements loose.

A majority of the issues that athletes have can be solved by doing full range of motion (ROM) exercises. This creates strength in the entire ROM. However, doing extra dynamic or static stretching certainly helps. Self-massage techniques (foam roller, tennis ball) and active release therapy (ART) work is also very helpful in loosening chronically tight tissue.

Pectoralis Major and Minor

Figure 40 shows the pectoralis major, and figure 41 shows the pectoralis minor. The pectoralis minor lies deep in relation to the pectoralis major and assists in
many of the same movements. However, note the different insertion points. The pectoralis major connects to the humerus and also broadly along the clavicle while the pectoralis minor attaches to the coracoid process of the scapula. You can see how tight pecs could very easily lead to humeral internal rotation and anterior scapular tilt.

Keeping these often overworked muscles long is key. Simple standing pec stretches can do wonders. However, getting a tennis ball or a lacrosse ball (for bold individuals only) on the pec minor can do unbelievable things. It will hurt like hell but does loosen up the pec.

**Exercise #1: Tennis ball massage**

Lie on your stomach with your arm out to the side and place a tennis ball under one pec. Put some body weight on it and roll it around while digging the tennis ball in. This is quite painful but does a great job of loosening up tight tissue.

**Exercise #2: Bar hangs**

As simple and ridiculous as this exercise looks, it’s a great way to loosen up your pecs and lats (see figure 42). The key is to relax. Other than that, it’s exactly what it sounds like.
Exercise #3: Bar dislocates
This is my favorite shoulder ROM exercise (see figures 43A, 43B, and 43C). The key with this one is smooth movement. Don’t cheat by going into lumbar extension and swaying back and forth.

Exercise #4: Pec wall stretches
These are simple yet effective (see figure 44). Put the elbow at 90 degrees and the shoulder in horizontal abduction and external rotation to get a maximal stretch. Then, let it ride.
Levator Scapulae

This muscle is rarely mentioned but very important (figure 45). You can tell by the line of pull that this muscle contributes significantly to scapular downward rotation and assists the upper traps in elevation of the scapula. Due to lifestyle, this muscle becomes shortened and therefore pulls the scapula into downward tilt. Again, we want to avoid this. There is also a high incidence with chronic headaches due to tight levators. By simply stretching this muscle daily, you can avoid many problems.

Exercise #1: Levator scapulae stretch

The variation in figure 46A targets the levator scap while the variation in figure 46B targets the upper trap. Both are great stretches and should be done daily with overhead athletes.

Upper Trapezius (Special Case)

The upper traps (see figure 47) create a special problem for us. Athletes tend to have overactive upper traps (ask them to retract without elevating). However, the muscle is extremely important in preventing brachial plexus type injuries such as “stingers.” It does a great job of protecting the cervical spine and oddly enough assists the levator scap and rhomboids in downward rotation. It also is a major part of the upward rotation force couple.
In almost every training program, the traps are trained by doing some shrug variation. How an athlete performs shrugs has a great impact on how the athlete’s entire trapezius complex functions. Let’s start with simple shrugs.

**Exercise #1: Shrugs**

This exercise is seemingly simple, but as Paul Chek and Mike Robertson point out, it can have bad consequences in athletes if performed incorrectly. There is a right way and a wrong way to shrug. Most people do it incorrectly. The key to a good shrug is scapular retraction. This keeps all muscle groups functioning optimally.

Take a look at figures 48A and 48B. That’s a nice shrug!
Now, notice the difference in figures 49A and 49B. The athlete carries the dumbbells in front of his body. This creates an internally rotated humerus and an anteriorly tilted scapula. This lengthens an already long, weak middle trap and rhomboid region, which isn’t good.

Notice the barbell shrugged as well (figure 49B). It’s not as bad, but it still isn’t as good as using dumbbells while retracting.

**Exercise #2: Overhead shrugs**

Enter my favorite trap exercise (see figures 50A and 50B). As Eric Cressey points out, regular shrugs have a tendency to lengthen the upper traps, which makes them less effective upward rotators and balls up an already tight levator scapula. Doing this style of shrug puts the scapula in an already upwardly rotated position, thereby lengthening the levator scapulae.
This exercise also has great input from the middle and lower traps as well as the serratus anterior. Don’t be afraid to load this exercise.

**Latissimus Dorsi (Special Case)**

The lats may be one of the most important muscles in the upper body. They take part in numerous humeral motions as well as scapular depression (see figure 51). They also attach to the lumbar spine and play a huge role in lumbar stability. While the lats need to be stretched regularly and kept at length, they also need to be incredibly strong. Exercises such as bar hangs can be helpful in keeping them long. Standing lat stretches are also useful.

*Figure 50A*  
*Figure 50B*

To do these exercises, stand tall with your arms extended over your head as far as possible. From there, slowly bend side to side. These types of stretches should be done on every training day. Here are a couple exercises to help you...
optimally train the lats. As you will see, the lats are vital to athletic performance.

**Exercise #1: Pull-up the right way**
The major mistake that most individuals make when performing pull-ups is they don’t go through a full range of motion. By not going through a full range of motion, we reinforce short lats, which causes the problems that we’ve discussed.

Another mistake is the absence of scapular depression. There should be two distinct motions when performing a pull-up (see figures 52A, 52B, and 52C). The first motion is scapular depression (the arms stay straight and the head rises), and the second motion is the pull. Keeping the scapulae depressed is key. Bringing not just the chin but the sternum to the bar also helps.

We all know that our lats can help us do more pull-ups and make us look jacked, but Eric Cressey points out how important this muscle actually is in his article, “Lats: Not Just for Pull-downs!” Take a look at figure 53, which was taken from Cressey’s article on t-nation.

In this diagram, the number “1” marks the thoracolumbar fascia by which the lats connect to the lumbar spine. Number “2” is gluteus maximus muscle fiber. Note the striation of the muscle fibers (direction of pull). Number “3” is the latissimus dorsi muscle fiber. Again, note the striation of the muscle fibers. Both connect to the thoracolumbar (TL) fascia.
Now, imagine that the TL fascia wasn’t there. It appears as though the gluteus maximus and latissimus dorsi muscle fibers could be a continuation of one another running diagonally across your back. Imagine them as one muscle (this takes some imagination) connecting contra-lateral hips and shoulders in a diagonal pattern. Lengthen one of the diagonals and what do you get? Arm flexion and hip flexion of the opposite hip and shoulder.

Now, shorten the other diagonal at the same time. What do you get? Arm extension and hip extension of the opposite hip and shoulder. Do you see what I’m getting at? If you’re having trouble imagining this, take a look at figure 54.
Figure 54
Chapter 9: Targeting the Thoracic Spine

When looking at the human body, it becomes very clear that there is a large amount of interdependence between the various parts of the body. Nowhere in the body is this more evident than in the overlap between the shoulder and the thoracic spine (t-spine). It’s important to note that the t-spine also overlaps with the lumbar spine and even the hips.

The t-spine may be one of the most overlooked parts of the body when it comes to training. When we discuss anatomy, it will become very clear as to how much of an impact the t-spine has on the rest of the body, especially when discussing shoulder health. It wasn’t until recently when physical therapists like Shirley Sahrmann started to pay attention to t-spine mobility that the region got attention from strength and conditioning coaches such as Bill Hartmann and Mike Robertson.

T-Spine anatomy

The bony anatomy of the thoracic spine is very simple yet very important. It really involves two structures that have a huge impact on a structure discussed in Chapter 1.
The thoracic region of the spine is 12 vertebrae long and is built for maximum stability. The reason for such stability is the attached ribcage. These two structures are designed to protect the vital organs of the body. There is one joint that isn’t shown in figure 55 but is very important. It’s also the joint that bridges this chapter with Chapter 1. That joint is the scapulothoracic joint. Let’s play a little game of six degrees of separation with the thoracic cavity.

If the thoracic spine is connected to the ribs and the ribs interact with the scapula, the structure of the spine will affect the structure of the ribs, which will affect the lay of the scapula that we’ve already identified as being vital to shoulder health.

**Normal structure of the t-spine**

When looking at the structure of the t-spine, it is important to note the natural kyphotic arch. Kyphosis refers to the forward sway of the spine in this region. Figure 56 shows this curve.

While a natural kyphotic curve is healthy, problems occur when it becomes exaggerated. This can be caused by a number of factors (which we’ll hit on later), but for now, we will focus on how important it is to keep this area in an optimal position.

Look at figure 56 and imagine where the

![Figure 56](image-url)
scapula lays. In the picture on the right, we have a healthy kyphotic curve, and the scapula will normally lay accordingly. In the picture on the left, the kyphotic curve is exaggerated. Again, the scapula will lay accordingly. This puts them at an extremely anterior tilted position.

Think back to Chapter 2. This is something that we try to stay away from. Because of this, we end up with the same type of muscle imbalances that we discussed in that chapter. Short pectoralis muscles and long, weak rhomboid, middle, and lower trapezius muscles will then become a problem.

Other problems caused by a kyphotic posture are outside the scope of this writing and my expertise, but if you talk to a chiropractor or neurologist, they will tell you that poor posture puts a ton of pressure on nerves and can disrupt many motor recruitment patterns. Shoulder health may be secondary.

**Thoracic mobility**

When looking at the structure of the spine, we can learn a lot about what our thoracic spine is meant to do. After all, the old cliché tells us, “structure dictates function, and function dictates dysfunction.”

The area of the spine that is built to be mobile is the thoracic spine. It is in this area that flexion, extension, and rotation are meant to occur, not at the lumbar spine. Training to mobilize your thoracic spine can have some major benefits.
In the example of kyphosis, the t-spine lacks the ability to extend. This becomes a huge problem, especially when lifting, and has major implications with shoulder health as well as with the health of the lumbar spine. As a general rule of thumb, the lack of mobility in one area will lead to compensatory mobility in another. In this case, an immobile thoracic cavity leads to unwanted movement in the lumbar region.

It is also important to understand that the spine is unlike most joints in that it is built to move on all planes. Therefore, a stiff t-spine region does not just lack the ability to extend but also lacks the ability to laterally flex and maybe, most importantly, rotate.

Let’s take a look at a lifter in figure 57 with the inability to extend his t-spine. This lifter has a hard time getting his chest up tall. Any attempt to do so leads to lumbar hyperextension. Again, an immobile t-spine leads to compensatory motion elsewhere.

In this situation, we can continue to tell the athlete to get his chest up, but we aren’t doing his low back any favors. Attacking him with t-spine mobility exercises is our best bet. Figure 58 shows a lifter with good thoracic extension.
In the *Inside-Out Manual*, Hartmann and Robertson do a great job of emphasizing the role of the t-spine in rotation. When looking at the degrees of freedom of the spine, a majority of rotation occurs in the thoracic region (about eight degrees on average) when compared to the lumbar region.

Let’s do one more example. Take a look at figure 59, which shows Tiger Woods in the middle of a golf swing. Compare the difference in rotation between the lumbar spine and the thoracic spine. A majority of the rotation occurs in the thoracic region. The lumbar region remains stable for most of the movement. Because Tiger Woods is about to uncoil and put the ball 450 yards down the fairway, we can assume that he is doing things correctly.

As we can see, having proper mobility of the thoracic region is essential, not only to shoulder and low back health but to our overall performance as well.
Chapter 10: Training the Mobile Thoracic Spine

Thoracic Extension

We’ve already briefly discussed why mobility of the thoracic region is so important. We’ve also discussed the difference between a healthy kyphotic curve and an exaggerated kyphotic curve (figure 56). Now, we can begin to think about how this relates to shoulder and lumbar health.

Imagine going into a full 180-degree shoulder flexion. We know from Chapter 1 that many things go on in our shoulder that we don’t have to think about. Our scapula will go into posterior tilt in order to create room for our humerus. If it doesn’t, the humerus meets with the acromion process, which causes the pain from impingement.

Now, imagine that you have a kyphotic and immobile thoracic region. Remember, your rib cage structure is set by the structure of your spinal cord, and your scapula lies on your posterior rib cage. Even if our serratus anterior and rhomboids are doing a good job of pinning our scapulae down, they still have to go into posterior tilt in order to go into full humeral flexion. Where can the scapulae

Figure 60
go if the thoracic spine is immobile? They certainly won’t be able to make room for the humerus.

One of two things will happen. The first is impingement of the shoulder due to the lack of the ability for the thoracic region to go into extension. The other option is for our lumbar region to pick up the slack and go into extension in order to give the humerus room to move. What we have are two scenarios, each of which ends up in an injury or pain in the area above (the shoulder) and below (the lumbar spine) the actual cause of the dysfunction (the thoracic spine). We haven’t even discussed the effects the lumbar motion will have on the hips and the hips on the knees and so on down the kinetic chain.

You can test this on yourself. Sit in a chair with good posture. Have one arm straight and the hand in a neutral position (thumb up). Keeping your arm straight, go into full (180 degree) extension. Notice if one of two things happen—use of your upper trap or lumbar extension. If you use your upper trap, your shoulder will travel toward your ear. If you have to lean back (evident by your chest getting big and your stomach going out) in order to get your arm in full flexion, you may have identified an issue. Chances are it isn’t a huge problem, but it’s worth taking into consideration. Imagine the implications on overhead lifts.
As stated earlier, the implications of a stiff kyphotic thoracic spine go beyond the thoracic region and spread up and down the kinetic chain. The most affected areas are the ones closest to the t-spine as well as the shoulder and the lumbar spine. Let’s take a look at how the lumbar spine compensates for a stiff kyphotic t-spine during static posture.

Take a look at figure 61. Imagine that the thoracic spine had a more kyphotic curve to it and no other part of the spine moved. What would happen? If no other part of the spine moved, the individual would be looking straight at the ground. Obviously, that doesn’t happen. In order to compensate, the lumbar spine goes into a hyperlordotic curve along with the cervical spine. This puts a great amount of stress and pain in these areas, not to mention the disruption of nerve signals. By simply icing and massaging the lumbar spine, we are ignoring the problem. If we adjust the thoracic spine, we can return to normal spine alignment.

**Training Thoracic Extension**

Before I begin with the exercises, let me explain the process by which we will achieve thoracic extension. The first group of exercises is meant to target the muscles that act in extension. By strengthening the weak musculature (erector spinae, trap complex, rhomboids), we will enable the body to pull the spine back into alignment. The second group of exercises is meant to mobilize the t-spine. These exercises put us in exaggerated thoracic extension. By putting our t-spine in these positions, we loosen the area and decrease its ability to resist the musculature that we are strengthening. Both of these methods are interdependent and necessary.

**Exercise #1: Overhead squat**

This lift may be one of the best exercises for the total body. At first glance, it may not look like much of a workout for the thoracic area, and with light weight it may not be. However, once you begin loading this exercise, you can quickly identify
weaknesses within the kinetic chain. Doing a proper overhead squat progression can help tremendously (figures 62A and 62B). This may include beginning with a simple overhead squat and working toward more complex lifts such as a squat and press or a snatch balance.

Figure 62C shows someone who may need more thoracic mobility work. His upper body is unable to get full extension. In this case, adding a light amount of weight to the lift may work but caution should be used. Adding too much weight will make the lift impossible to perform correctly.
Exercise #2: Wall slides
I told you this was one of my favorite exercises (see figures 63A and 63B).

See Chapter 7.

Exercise #3: Sit, roll, and reach
This exercise was also described in Chapter 7. This is another exercise that may not look difficult but really does a good job of targeting the often ignored and weak lower trap (see figures 64A and 64B).
Exercise #4: Prone T and Y
If you haven’t figured this out by now, the muscles that control the scapula are also the same muscles that extend the thoracic spine. By putting these into your program, you’re essentially “killing two birds with one stone.”

The prone T and Y fits into this category (see figure 65A and 65B). They have already been described, but to review, thumbs up preferentially recruits the middle and lower traps while the thumbs down moves the emphasis to the rhomboids.
Exercise #5: Overhead Romanian deadlifts
This is much more difficult than it looks (see figures 66A and 66B). Hold a light weight directly overhead with your arms locked and then proceed to do a Romanian deadlift. Be sure to keep the weight directly overhead by not letting it drop down. It’s easier said than done. And just like a Romanian deadlift, your lower back stays tight.

Exercise #6: Overhead pressing correctly
Doing overhead lifts may be a bit of a controversial subject. Personally, I believe that the pain associated with overhead lifts has more to do with genetics (see the three types of acromion processes) than anything. Regardless, we can force our thoracic spine to extend correctly by doing these types of exercises correctly.

The first mistake is using a back support to perform an overhead press (see figures 67A and 67B). Using these back supports disrupts the normal stabilization of the thoracic spine and makes people want to turn the overhead press into an incline press.
The second big mistake is hyperextension of the lumbar spine (figure 68). This is a natural compensation for those who lack the ability to extend the thoracic spine and is an unconscious attempt to use the stronger musculature of the chest. It also teaches the lumbar spine to become mobile while putting it in a risky position.

The correct way to overhead press is to keep the lumbar tight and in a neutral position (see figures 69A and 69B). Preferably it should be done standing. However, some beginning lifters may have an easier time seated with no back support because of the lack of stability.

**Mobilizing the Thoracic Spine**

While those exercises are meant to strengthen the often ignored musculature of the thoracic cavity, the next group of exercises is meant to mobilize the thoracic spine. These should be used in combination with the strengthening exercises.
**Exercise #1: Foam roller crunch**
This exercise is simply an active extension of the t-spine (see figures 70A and 70B). By using the foam roller, we are able to separate the thoracic spine from the lumbar spine and give our t-spine a fulcrum on which to extend. The key is to keep your glutes in contact with the ground and avoid extra lumbar extension by bracing with the abdominals. The hands are placed behind the head or are extended overhead. Other variations of this exercise can be done seated by using the back of the chair as a fulcrum.

![Figure 70A](image)

![Figure 70B](image)

**Exercise #2: Tennis ball crunches**
This is a Mike Boyle exercise and is very similar to exercise number one. The contraption in figure 71A is simply two tennis balls duct taped together. The exercise is done by placing the tennis balls so that one is on each side of your spine (see figures 71B and 71C).

Start by placing the tennis balls at the thoracic and lumbar junction and perform 5–10 crunches. Then, move the tennis balls up an inch or two and perform 5–10 more. Repeat this process all the way up the thoracic spine. It doesn't feel good, but it does a great job of loosening up the thoracic musculature.
Exercise #3: Cats and camels
This exercise has been done for a while, but most people do it incorrectly (figure 72A and 72B). It’s performed to loosen the thoracic spine, not the lumbar spine. A large, overexaggerated hump should be seen in the upper back. This is immediately followed by extension of the spine. Do not go into full extension or flexion ranges of motion. Instead, stop just before that point. Each position should only be held for a second or two. Switch from motion to motion slowly.

Training Thoracic Rotation
Earlier, we mentioned the importance of rotation of the thoracic spine. This may be the most underestimated role of the thoracic spine.

Let’s go back and look at the picture of Tiger Woods in his backswing (figure 59).
Looking at figure 59, you can tell that there isn’t much rotation in the lumbar region. A majority of his rotation takes place in the thoracic region of his spine. Indeed, this is how the spine is designed to work.

Let’s look at another example.

Figures 73 and 74 are of Albert Pujols (figure 73) and Derek Jeter (figure 74). Both are in about the point in their swing in which their bodies are coiled and about to produce some impressive power.

Take a look at their mid-sections. For the most part, their lumbar regions move with their hips. Their hips and lower abdominals (belly button region) are square to the pitcher. It is their thoracic region that travels behind. This changes our idea of rotational training. Doing Russian twists may not be the best idea after all.

These types of exercises teach our lumbar spine to be mobile. If we teach our lumbar spine to resist rotation and teach our thoracic spine to mobilize rotationally, we can create the same type of coil that Albert Pujols, Derek Jeter, and Tiger Woods have produced.

Here are some simple exercises that can mobilize the spine rotationally.
Exercise #1: High step rotations
These are done with very light weight (PVC pipe). Place one foot up on a box or bench so that the femur is elevated slightly above parallel. This position puts the hips in a laterally tilted position. In this position, the lumbar spine becomes locked into place, putting all the rotation in the hands of the thoracic spine.

Simply twist and look over the shoulder of your “up” leg, hold for a couple seconds, and return back to the starting position. Try to go further the next time. Seems pretty simple, right? It can also be done in a lunge position as long as the front foot is elevated and the hips are laterally tilted (see figures 75A and 75B).

Exercise #2: Seated twists
Again, here’s another easy one (see figures 76A, 76B, 76C, 76D, and 76E). Sit with your legs crossed, your chest up tall, and your arms out in front of you. Twist one direction and hold. When you have gone as far as you can laterally flex, return upright and then rotate further.

By laterally flexing (figures 76C and 76E), we can force the vertebrae to loosen, thereby enabling us to increase the range of motion. Do this exercise about three
times and return back to start. This means rotate, laterally flex, rotate some more, laterally flex again, and rotate some more. That should be good.

If you’re really ambitious, you may throw in another lateral flex and rotation but only if you really like seated twists.

Exercise #4: Kneeling/quadruped rotations
Both of these versions are essentially the same exercise. In the kneeling position, place your butt on your heels and your elbows on the ground. This puts your lumbar spine in almost full flexion, making it unable to rotate.

Keeping those body parts in position, rotate back and reach as far as you can behind you. Hold this position for a couple seconds and return back to the start position (see figure 77).
Clearly, the thoracic spine is often ignored in most strength and conditioning programs. Incorporating very simple exercises into your warm up or pre-lift activities can help enormously.

These exercises can decrease the incidence of shoulder and low back pain and at the same time, improve performance on the field and in the weight room. You can’t beat that!

Figure 77
References


**Figures**

All diagrams were obtained from internet image searches on [www.google.com](http://www.google.com). In addition, figure 3 was obtained from [www.safepitching4youth.com](http://www.safepitching4youth.com); figure 53 was used with permission from Eric Cressey; figure 55 was obtained from [www.maturespine.com](http://www.maturespine.com); figure 56 was obtained from [www.drchengmd.com](http://www.drchengmd.com); figure 60 was obtained from [www.oldtimestrongman.com](http://www.oldtimestrongman.com); and figure 61 was obtained from [www.drchengmd.com](http://www.drchengmd.com).
Andrew Paul currently serves as the assistant director of strength and conditioning at the University of Missouri. As an athlete, he was a standout as an Olympic weightlifter at the junior level. A three time Joe Joseph Award winner, Paul was also a Junior National and Junior Olympic Medalist. Paul also enjoyed a successful career in college baseball, lacrosse, and football. At the University of Missouri (Mizzou), he is in charge of the development and implementation of strength and conditioning programs for the football, softball, and volleyball programs. He has also developed a functional movement screening system that is used for numerous sports at Mizzou. His work was been greatly influenced by professionals such as Mike Boyle, Eric Cressey, Mike Robertson, Bill Hartmann, and Vladimir Janda as well as numerous Eastern Bloc legends in the field.