Speaker Notes: Clearing the Kinetic Chain in the Throwing Shoulder

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2	My journey that led to today's presentation actually started about 15 years ago. I had a high school pitcher by the name of Jay Scavalla who had a little glenohumeral instability that had initiated some rotator cuff tendonitis. I felt ready to tackle the task! I had just came back from a seminar on shoulder rehab from a guy who at that time was considered the best the U.S. had to offer, consulting to many MLB teams. "Train the upper body like a distance runner, and train the lower body like a power lifter" was his philosophy. There was a heavy emphasis on EMG studies, and lots of exercises designed to isolate the rotator cuff based on those EMG studies. Jay was the type of kid who would do anything I asked him to. I quickly put him on the recommended program. I'd like to say Jay went on to fame & fortune, but I'd be lying. His shoulder got worse. By the time he got to college, his shoulder was so painful he was forced to stop pitching, & moved to 1st base. I was lost in the woods. People would come to me and say things such as, "you can't save everybody", and "it was probably genetic". I said, maybe- but this kid did everything I said to the letter, and I only made him worse. Where had I gone wrong?
3,4, 5	On one of my lengthy scuba diving trips to the middle of no where, I ran out of reading material on the plane. I had read all my newspapers, the in-flight magazine, even the instructions on the vomit bag! I was bored out of my mind! Yes, it was time to pull out the dreaded professional journals. There I was introduced to a quote by Gary Gray. This was a revelation to me! Finally someone was exploring the neurological component of strength & conditioning. That led me to the works of Vern Gambetta. At the time, he was the S&C coach of the Chicago White Sox. Vern takes Gary's abstract concepts and finds practical, everyday applications that apply them to athletics.
6	Half way through our 1999 baseball season, I was faced with a situation worse than Jay's. Our catcher was diagnosed with multi-directional shoulder instability, rotator cuff tendonitis, long thoracic nerve palsy, and a Hill-Sachs deformity. Two orthopedic surgeons in the area wanted to do reconstructive surgery on him. Finally, we sent him to Dr. Bigliani in New York City. Fortunately, Dr. Bigliani had enough confidence in me that he felt the shoulder could be managed non-surgically. Now, armed with Gary & Vern's techniques, I was ready. These articles were the results of my labor.
7	This cartoon is meant as a joke, but doesn't it look like some of the stuff we put the shoulder through in rehab & training? In the last five years, a plethora of research has come out to support Gary & Vern's concepts (you can find them in the references- please do not take my word for it, after all- I'm just a high school guy). Now we have to ask ourselves, "Is it the rotator cuff's fault? Did it get weak all by itself, or is it overloaded? Was it placed at a biomechanical disadvantage? The injury did not occur in isolation- should we rehab it in isolation?

8	A common argument of the critics of the kinetic chain approach is that the body will choose to compensate for weak joints & muscles by substituting other joints and muscles, so we need to isolate that particular joint or muscle. But was does the research have to say about that? Should we be training & rehabing in an isolated, gravity confused environment?
9	Why do I use the entire body to evaluate the shoulder? Being from New Jersey, I'll use Adriana, from the "Sopranos" as an example. As we all know, Adriana was murdered for ratting out her boyfriend Christopher to the Feds. In that vain, I want to force the shoulder to "rat out" and tattle tale on other body parts who are not contributing to its success. If I test the other joints in isolation, I'm not getting a good idea of how the shoulder is getting along with the rest of the body. **Example**- Shoulder impingement: **Athletic Trainer**: OK rotator cuff, why are you causing this pitcher so much pain? **Rotator cuff**: It's the scapula's fault! It's not getting out of the way! **Athletic Trainer**: Hey scapula, why aren't you getting out of the way? **Scapula**: The thoracic spine is ornery & kyphotic! It's not letting me move!
10	I choose to separate my tests according to the phases of pitching. The phases are windup, stride phase (includes early & late cocking), acceleration, and follow through. I spend most of my time looking at the windup & early stride phases, because that's where I feel most injuries begin. We all know what good pitching looks like. But what do we do with the pitcher who just cannot get into those positions? Is it just force of habit, or are there underlying dysfunctions?
11	You would be surprised how many high level pitchers have a difficult time getting the knee of the stride leg to cross the midline of the body. This is important if we are to get a tri-plane load of the strongest muscles of the body- the glutes. The combination of hip flexion & horizontal adduction creates a powerful bilateral eccentric load to both glutes. This in turn creates what Gambetta refers to as "cross scapular stimulation". Try it. You will feel your front side rhomboids stretching. They're telling the back side rhomboids, "OK, get ready…I'm stretching, so you know I'm going to be asking you to contract next! What might be inhibiting this? Lack of support leg internal rotation? The inability of the subtalar joint to supinate? While I'm here, I'll also take a look at cervical rotation. If the right handed pitcher has poor left cervical rotation, the myofascial sling that forms the deep & superficial front arm lines cannot get a good load.
12	Lack of ankle dorsiflexion causes a pitcher to prematurely flex the hip of the support leg. This lowers the shoulders, causing him to

	compensate by changing the throwing arm angle. Either he will have to elevate the arm (contributing to impingement), or throw sidearm (contributing to medial stress syndrome). What might be causing the lack of ankle dorsiflexion? Is the talocrural joint locked up? Is there lack of posterior talar glide (ALWAYS inquire about previous unresolved ankle sprains)? Is the gastrocnemius, soleus, or Achillis tight? Is the pitcher using the old "drop and drive" method?
13	I know what your thinking- Joe's lost it. What does the calf have to do with the shoulder? Well, if we look at the fiber orientation of the two heads, we see that the origin of the gastrocnemius wraps around the distal end of the femur, and helps transmit not only a sagittal, but a powerful transverse plane load to the bone…and we can't talk about the femur without talking about the hip, because the femur really is the hip, and we can't discuss the hip without discussing the sacroiliac and pelvis, because research tells us that the two work hand in hand with the lumbar spine…and we can't talk about the lumbar spine without mentioning that powerful dorsolumbar fascia, after all, it has connections to the latissimus dorsi, gluteus maximus, part of the external oblique muscle, and the trapezius, which has attachments on the scapula.…and of course it is impossible to get into a discussion of the scapula without discussing the glenohumeral joint. Sounds just like that song my dad used to sing to us on his ukelele when we were kids.
14	It is important to understand that in the stride phase of pitching, we need to keep the body coming forward in the sagittal plane. Some pitchers have interpreted this as meaning they must push off the rubber. This is incorrect. This practice causes the serape musculature to not be loaded, which will be explained in a moment. They may choose to keep their torso back by flexing the torso posteriorly in the transverse plane. This causes the non- throwing shoulder to elevate, causing the pitcher to "dunk the clown". They may compensate by dropping the elbow of the throwing arm, causing medial elbow problems. In order to keep the torso back without lifting the lead shoulder, the pitcher needs great frontal plane flexibility, strength, and power in the gluteus medius & tensor fascia area. The foot of the support leg must have the ability to "collapse".
15	When Logan first developed this concept, he emphasized that he was speaking of the functional, NOT literal connections of these muscles as a group. I don't think he ever realized how right he was. Researchers have since proven that these muscles are indeed linked by fascia into one huge sling. The proper positioning of the pelvis during the stride phase is important to the involuntary external rotation of the glenohumeral joint in the early acceleration phase of pitching; as well as the deceration of the joint in the deceleration phase.
16	These are two good tests to see how the body chooses to load in the frontal plane. In the hip excursion test, we want to see if the gluteus medius, tensor fascia latae, & iliotibial band have enough strength and

	flexibility to translate the hip posteriorly, and more important, can it bring it back home to neutral; all in an integrated, isolated fashion. We also want to look at the same process in the foot. The peroneal musculature is very important here. If we look at the anatomy of the foot, we can see how the peroneus longus runs all the way down the fibula to the distal 1st ray. So, we know by way of the muscles architecture that it has a powerful influence in controlling pronation (loading), and then allowing the foot and body to supinate and bring us back home (unloading). Failure of all of the above to happen will translate into the pelvis moving ahead of the shoulders in the sagittal plane, disengaging the "clutch" and not allowing the serape musculature to be loaded properly.
17	Why test all of the above musculature simultaneously? It's no surprise that all of the muscles mentioned above are a functional & anatomical "train" or myofascial sling.
18	The late stride/late acceleration phase of pitching is a common place where good throwing mechanics break down. There is a reason Roger Clemens and Nolan Ryan pitched into their 40's. Look at the tremendous amount of right hip extension he gets here. I drew a line threw their femurs to illustrate the hip's relation to the shoulder. His torso stays upright because of great hip extension, great sacroiliac flexion & right-on-left sacral torsion, and lumbosacral extension. On the right we see the effect of tight hip flexors, adductors, and sacroiliac dysfunction. On the upper right, the shoulder lags behind the body and literally gets dragged forward, causing stress to the anterior shoulder capsule; and ultimately the anterior rotator cuff musculature. On the lower right, the pitcher chooses to reduce the stress at the shoulder by dropping his arm, but there's no free lunch. Now the medial elbow takes the beating.
20	With the throwing arm overhead, the deep frontal arm line & the functional lines connect to form a myofascial sling. The groin musculature plays a powerful role here. Once we are upright, we know the adductors do not adduct the hip- we have gravity to do that. They DO serve as powerful decelerators of hip extension, and control pelvic & femoral rotation. Often an "inside" hamstring stain is really a gracilis muscle strain. Another crucial part of this myofascial unit is the pectoralis minor. If our typical day is sitting at a desk all day, watching TV, driving a car, and talking on a cell phone, it is going to be very ornery. If you can't load this muscle and this sling, you can't unload it. What do you get? Slower ball speed, and a **SICK** (**S**capular malposition, **I**nferior medial border prominence, **C**oracoid pain and malposition, and dys**K**inesis of scapular movement) scapula syndrome.
21	This is Wade Miller in the late acceleration phase of pitching. Wade spent the early part of the 2004 season on the 60 day DL with a frayed rotator cuff. Notice the hip is at 0 degrees extension. If the adductors and psoas are not loaded, neither are the abs, neither is the pec

	minor…well, you know the rest of the story by now.
22	We see on the right here Randy Johnson, and on the left Seton Hall Prep (N.J.) pitcher Dan Merklinger. We can see the tremendous amount of "relative" internal rotation both hips go through. If we start with good mechanics, this phase should be the Gestalt of everything that came before it. The posterior serape musculature "turning on" the clutch (pelvis), and applying the brake to hips, and ultimately to the posterior shoulder girdle.
23	These are the muscles that make up the two myofascial slings that help decelerate the shoulder. Typically, the pitcher with shoulder pain will present a laterally migrated and winged scapula. You can stand behind them and compare the throwing and contralateral scapulas. The cause of this is a weak rhomboid/serratus complex. BUT…it is important to remember it did not get weak by itself. Rather, it is overloaded because it is being used as the "break"- a role which it is just not strong enough for. While isolating it with progressive resistance exercise will correct the laterally migrated scapula, it will only be temporary. They were never intended to decelerate a humerus that is internally rotating at 7, 000 degrees per second.
24	This is what an improper follow through looks like. Note the foot is in pronation, trying to stop the runaway train effect of a pelvis thrown forward in the sagittal plane. There is very little relative internal rotation of the femur, and the posterior chain & serape musculature have been taken out of the picture. The throwing arm is flung across the torso, hoping the posterior shoulder structures are strong enough to stop it.
25	Notice in this test I choose to keep the left foot next to the right while doing the reach. There is a reason for this. I want to see how much the contralateral hip and ipsilateral lat is contributing to the deceleration process. Does the hip bail out in the frontal plane? Then allow the athlete to counter balance with the opposite leg. How much does it improve the reach? Recently much has been written about the lack of shoulder internal rotation & it's relation to medial elbow injury in throwers. Athletes with poor shoulder internal rotation will have a VERY difficult time doing this test. Remember, in order to do this movement, we need good SI joint counter-nutation and right-on-right torsion. I use this test along with the sleeper stretch as an adjunct to increase shoulder internal rotation. I would like to see research in the future aimed at the relationship, if any, between shoulder internal rotation limitations and the flexed, LOL sacral torsion dysfunction.
26	Ben Kibler describes the scapula as a "funnel" that takes forces generated by other parts of the kinetic chain and filters them to the shoulder, elbow, and ultimately the hand. There are 17 muscles that attach to the scapula, and there is a reason for that. We need to remember this when we are evaluating scapular malposition & dyskinesis. Computer programmers have a phrase: "garbage in-

	garbage out". We can apply that to the forces going in and coming out of this funnel. Let's use the laterally rotated scapula as an example. It's easy to blame the rhomboids. After all, they are the muscles that hold the scapula to its medial border. But based on what you know now, stop and think. Is the lower kinetic chain feeding the correct information? Is that same side hip internally rotating enough to allow proper scapular retraction in the early windup phase? Is there enough internal rotation in the stride leg hip to assist the rhomboids in follow through to assist deceleration of the shoulder? Sure, if you isolate the rhomboids in rehab. & conditioning, the scapular malposition will be corrected. But will the correction last in the long run? Probably not.
27	The thoracic spine is the trouble spot of the new millennium. Dysfunction here can cause inhibition of tri-planar loading in the hips, pelvis, scapula, and cervical spine- all of which will affect the throwing shoulder. Recent studies have shown that emphasis on pre-adolescent sport specific training can have a negative result on thoracic kyphosis, although little league baseball has never been specifically studied. It's always been my beef that the development of athleticism is often sacrificed for sport skill mastery at a young age. The thoracic spine is an interesting link in the kinetic chain. Frontal plane motion is about equal throughout the thoracic spine. The lower portion is more dominant in the sagittal plane, and the upper portion has more transverse plane motion. But remember, if any one plane is inhibited, it will affect the other planes. Hyper-kyphosis is a big rock that inhibits motion. It largely occurs as an adaptation our new lifestyle -keyboarding, sitting at a desk all day, playing video games etc. It is a big contributor to the **SICK** scapula syndrome, being the **I**nferior medial border prominence. Hyper-kyphosis in this region is usually associated with a hypertonic pectoralis minor, irritating the coracoid process, the "**C**" in the **SICK** scapula syndrome. The thoracic spine is very ornery structure, but responds well to muscle energy and functional mobilization techniques.
30	These are the techniques I find effective for treating shoulder injuries. They are by no means the only ones out there; they are the ones I feel comfortable with. 1. M.E.T. is an alternative to manipulation for treating dysfunctions of the spine & pelvis. It is safe, effective, and patient centered. I use the Weiselfish Tri-planar technique, but there are other methods. 2. Myofascial release is a great way to clear out any adaptive muscle & tendon shortening from injury or incorrect mechanics. There are many different types. I prefer Michael Leahy's Active Release Technique because I feel it works the fastest, with the least amount of effort on the part of the practitioner, doesn't require any special equipment, and is patient centered.

	3. Functional Joint Mobilization is a more efficient method of joint mobilization because it is done in weight bearing and is patient centered. Mulligan technique is an example. All of the above is worthless unless followed by multiplane, multidirectional, multi joint, multi speed, proprioceptively enhanced exercise. Any ROM increase which cannot be controlled is dangerous & a waste of time.