

ONBASE UNIVERSITY

LEVEL 1 PITCHING SEMINAR MANUAL

SPONSOR



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ONBASE UNIVERSITY PITCHING WORKSHOP INSTRUCTORS

STEVE JOHNSON

Steve is the co-founder of Advanced Baseball Training and Performance Center in the Northern Virginia. Steve is a Certified Performance Analyst for the rotational player and holds a degree from the University of Maryland. Through his affiliations with Major League Baseball International, Steve joined the MLB staff of Jim Lefebvre, Rod Carew, Bruce Hurst and many others in raising the level of play by teaching the Major League way to players and coaches from seventeen different countries. For two years Steve appeared weekly on ESPN Radio as a Performance Analyst for the striker thrower player. His work has been featured in such arenas as MASN sports network and MLB International. Steve also created and developed the hitting program and DVD “Train the Swing” with former NL Rookie of the Year, hitting coach and Manager, Jim Lefebvre. He also co-authored the book “The Art & Science of Throwing” with Dr. Tom House and was a contributor to the book “Building the Million Dollar Arm”.



DR. GREG ROSE, DC

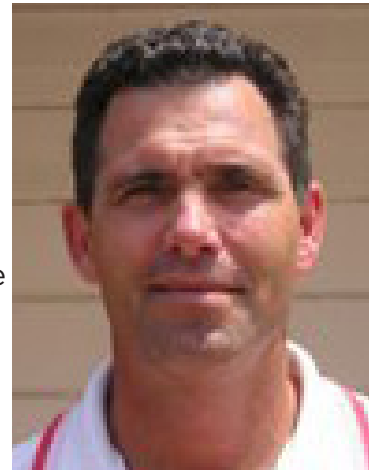
Greg is a Doctor of Chiropractic and holds an engineering degree from the University of Maryland. Greg specializes in assessing human movement, treating rotational players, capturing and analyzing 3-dimensional biomechanics, strength and conditioning, manual therapy and therapeutic exercises. Combining an engineering background with an expertise on the human body, Greg helped pioneer the field of analyzing 3-dimensional motion capture models for rotational players. That research has helped coaches all over the world gain a better understanding of how the body works during rotational sports. Greg is the co-founder of TPI, the leading research and science center in the world dedicated to the study of golf. Greg is also an owner of Functional Movement Systems (FMS) and was a co-developer of the Selective Functional Movement Assessment (SFMA).



ONBASE UNIVERSITY PITCHING WORKSHOP INSTRUCTORS

DON SLAUGHT

When it comes to baseball, Don Slaught considers himself to be a passionate student of the game. This has been true from his Little League days, through his high school and college years, and throughout his 16 yrs in the Major Leagues. He attributes his longevity to his commitment to learning and improving. In his first eight years in the Big Leagues, Don hit .269 compared to his last eight years where he averaged over .300; and in his final five full seasons, he had a .310 average. Don said he didn't get any stronger or faster but he did get smarter. He said it was the elimination of some poor information and the understanding of some good information on both mechanics and his approach that allowed him to improve late into his thirties. Since retiring in 1997, Don has spent most of his time coaching at just about every level from Little Leaguers to Major Leaguers. Don is the founder of the video analysis company RightView Pro and was the Big League Hitting Coach for the 2006 American League Champion Detroit Tigers. Don is quick to point out that the success of a coach is not based on knowing how to hit but rather on knowing how to get others to hit.



ANTHONY VITTESE, PT, CSCS

Anthony currently practices as an outpatient orthopedic and sports medicine physical therapist. In his clinical practice, Anthony treats a patient population that extends from professional players to active young adolescents. Anthony received his strength and conditioning specialist (CSCS) certification from the NSCA in 2003, a year prior to graduating with his master's degree in Physical Therapy from Quinnipiac University in 2004.



JOE YAGER, PT, CSCS

Joe has a Bachelor Degree in Exercise Science and is a Certified Personal Trainer through A.C.E. (American Council of Exercise). Joe is certified in F.M.S. (Functional Movement Systems) and T.P.I. (Titleist Performance Institute) Level 1 and Level 2. He currently trains all levels of baseball players, works as a college baseball recruiter, and is a motivational speaker. Joe's clients include professional players, doctors, personal trainers, senior citizens, children, and weekend warriors.



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ONBASE UNIVERSITY

MODERN COACHING

MAXIMIZING PERFORMANCE IN
PITCHING

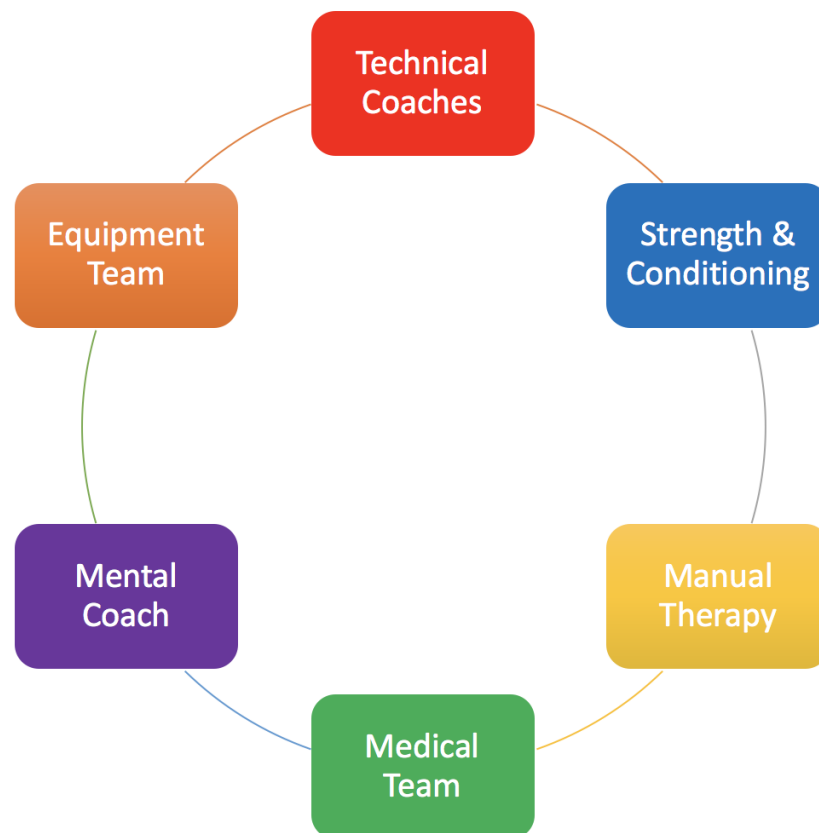
THE TEAM APPROACH TO COACHING

TODAY'S TEAM APPROACH TO PLAYER DEVELOPMENT

Today there is a shift towards the complete player evaluation. The modern coach acts like a NASCAR driver and the player acts like the car. The coach drives the car around the track and reads the important dials on the dashboard to determine how to improve performance. Those dials include, technical skills, mental skills, physical skills and equipment fitting. A good driver (coach) has the ability to test, read and interpret all four dials.

If a certain indicator shows a deficiency in any of those four areas, a modern coach has a supporting team (i.e. a pit crew) that can quickly improve the players performance in any needed area. Those team members include:

- **Assistant Technical Coaches:** Pitching Coach
- **Fitness Coach:** Strength & Conditioning Coach / Movement Specialist
- **Medical Team:** Manual Therapist / Doctor / Nutritionist
- **Mental Coach:** Sport Psych / Mental Management Coach / Motor Learning Specialist
- **Equipment Specialist:** Manufacturer / Fitting Specialist



TODAY'S PITCHING EVALUATION



- History
- Basic technique evaluation (Efficiency and Style Testing)
- Pitching evaluation
- Equipment evaluation
- Mental evaluation
- Physical conditioning evaluation
- Interpretation of gathered data
- Prioritization of data
- Development of treatment plan
- Report of findings
- Prescription

The list above represents the ideal evaluation to perform on each player. The problem becomes time and knowledge! Most professionals believe it will take too long to evaluate each of these for every player. Some professionals are not educated in an area, so they eliminate it completely.

IF YOU DON'T TEST, IT IS JUST A GUESS!

Our goal is to add each of these components to your bag of tricks by teaching you how to implement screening procedures in short periods of time. You'll have the confidence to talk about the all aspects without sounding like you're less than an expert!

BASIC TECHNIQUE EVALUATION



TWO OPTIONS:

Determine Efficiency (3D Analysis)

Helps determine if the player's style is working or if it needs major modifications.

Determine Style (2D Video Analysis)

Lets us know how the player likes to pitch (style) - not if it works or not!

OnBase UNIVERSITY'S PHILOSOPHY OF PITCHING:

"We don't believe there is one way to pitch. We believe there are an infinite number of ways to pitch. But we do believe that there is one efficient way for each player to pitch and it is based on what they can physically do."

THE KINEMATIC SEQUENCE

THE KINEMATIC SEQUENCE

Have you ever wondered how players with such unorthodox mechanics have had successful careers? Fortunately, with the aid of 3D motion capture systems, researchers have been able to identify the true measurement of efficient pitching. The answer is not in how close your pitching resembles Nolan Ryan or Randy Johnson on a video camera, the answer is in the efficiency of your pitching compared to the best players in the world. In other words, there are a lot of strange styles of pitching in MLB, but they all seem to get the job done. The question you should be asking yourself is “How can I make my pitching get the job done?”

Using data collected from 3D motion analysis systems, we can look at how players generate speed and transfer the speed or energy throughout their bodies. We have found the most efficient sequence of how they transfer this speed to the ball. We call this the “kinematic sequence.” The amazing thing is that all great pitchers have a remarkably similar kinematic sequence of generating speed and transferring speed throughout their bodies. That means if you compare Nolan Ryan’s kinematic sequence to Greg Maddox’s kinematic sequence, it would be hard to see a difference. That is a bold statement since there is such an obvious difference on 2D video. All great pitchers begin by generating speed from their lower body and transferring that speed through their torso, then into their arms, and then into the ball. But what pitching style they use to complete this sequence is completely unique to each player.

THE KEY POINTS TO KNOW ABOUT THE KINEMATIC SEQUENCE ARE THE FOLLOWING (REFER TO GRAPHS ON FOLLOWING PAGES):

There is an identical sequence of speed or energy initiation followed by an identical sequence of energy transfer for all great pitchers. The sequence of energy initiation for efficient pitchers is: lower body starts, thorax moves next, throwing elbow extension goes third and throwing shoulder internal rotation starts last. Then the lower body decelerates first (red line on the graph), thorax second (green line), throwing elbow extension third (blue line) and throwing shoulder internal rotation last (yellow line). This occurs during the acceleration phase of pitching.

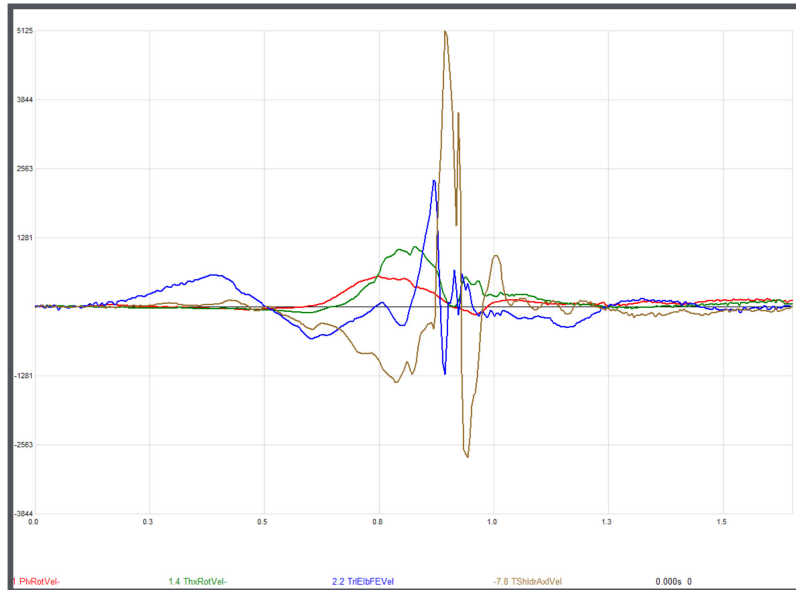
Each segment of the body builds on the previous segment, increasing speed up the chain. (Red is less than green, which is less than blue, which is less than yellow).

Each segment of the chain slows down as the next segment continues to accelerate.

The sequence is the key to repeatability and consistency. Energy transfer or deceleration is the key to power.

THE KINEMATIC SEQUENCE - PITCHING

EXAMPLES OF EFFICIENT PITCHING



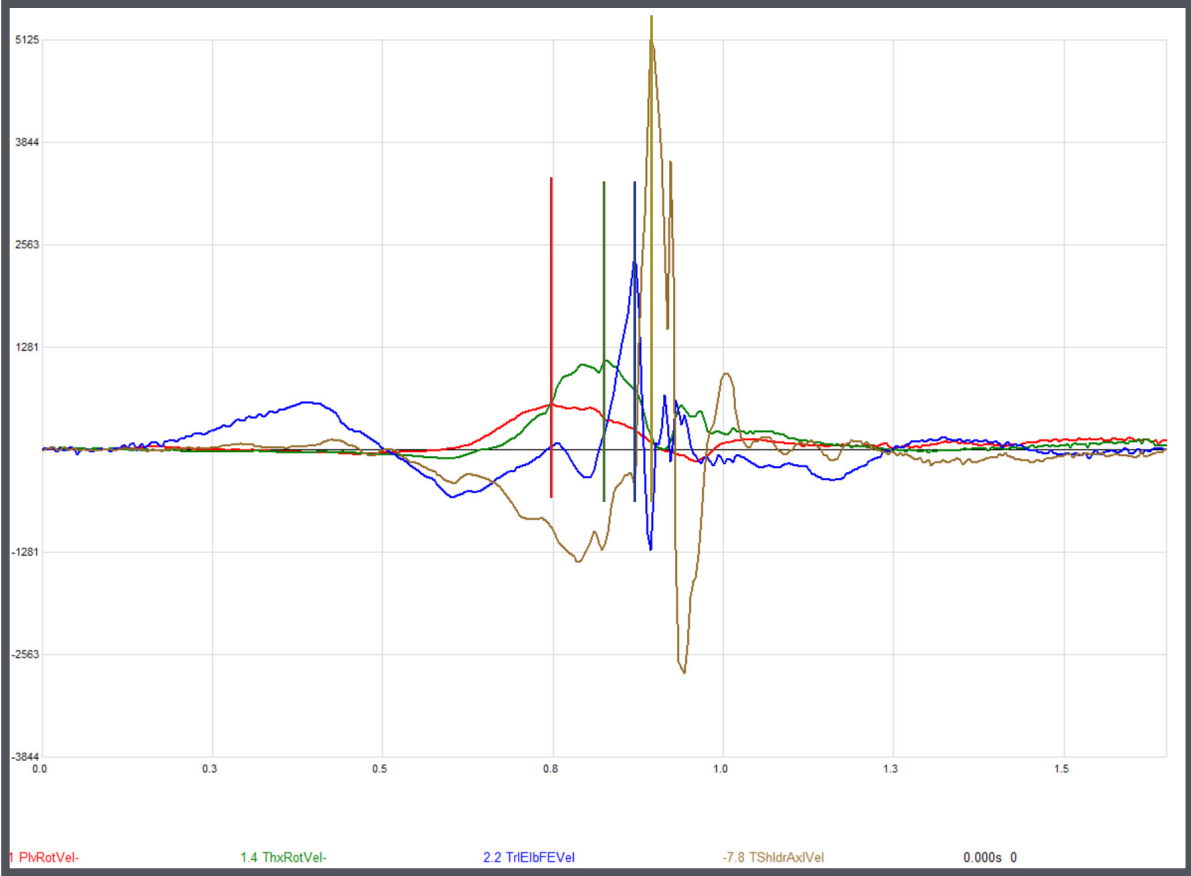
COLORS:



Pelvis = Red
Thorax = Green
Trail Elbow Extension. = Blue
Trail Shoulder Internal Rotation = Yellow

THE KINEMATIC SEQUENCE - PITCHING

DECELERATION SEQUENCE EXAMPLE - A

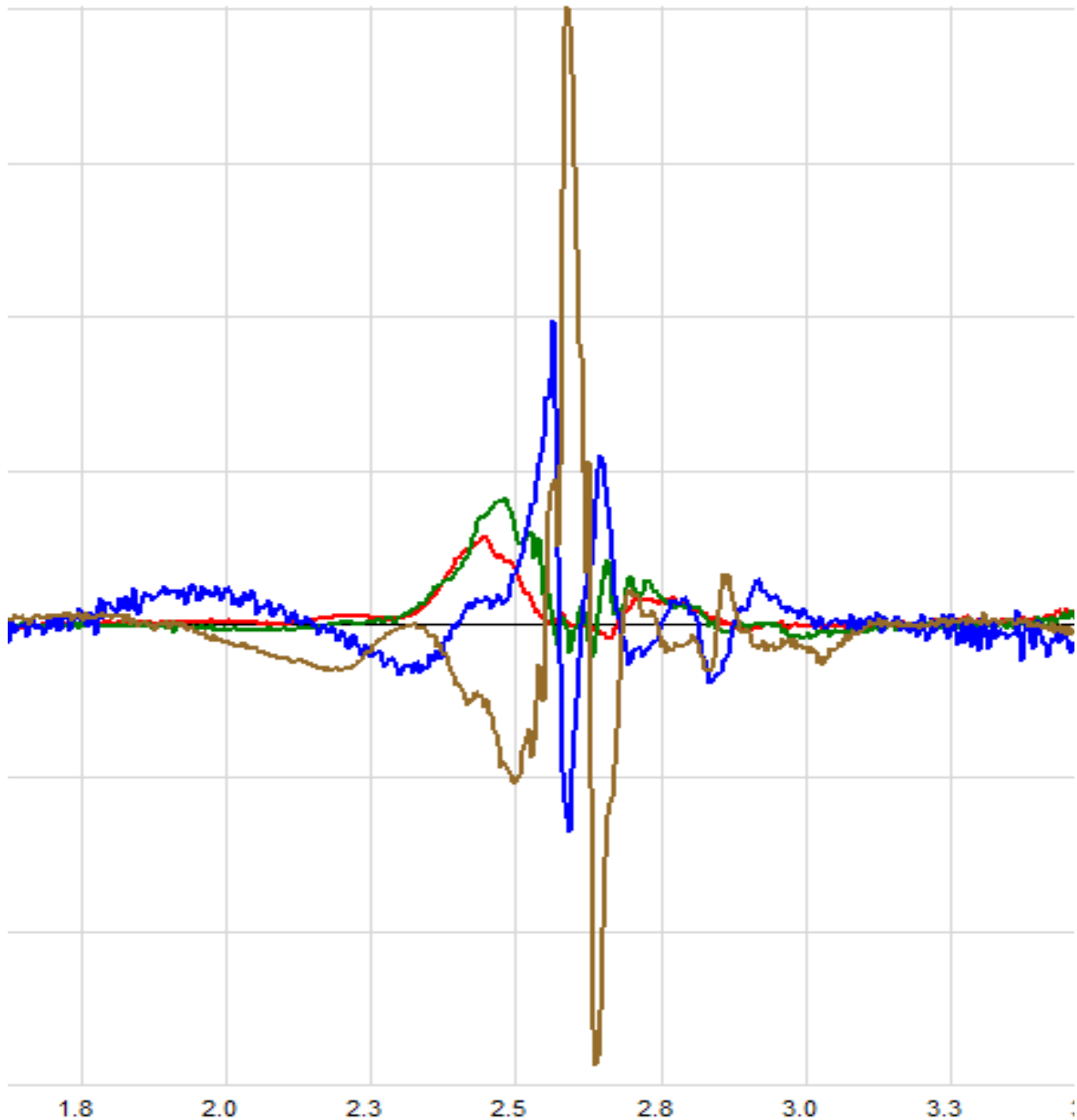


NOTES:



THE KINEMATIC SEQUENCE - PITCHING

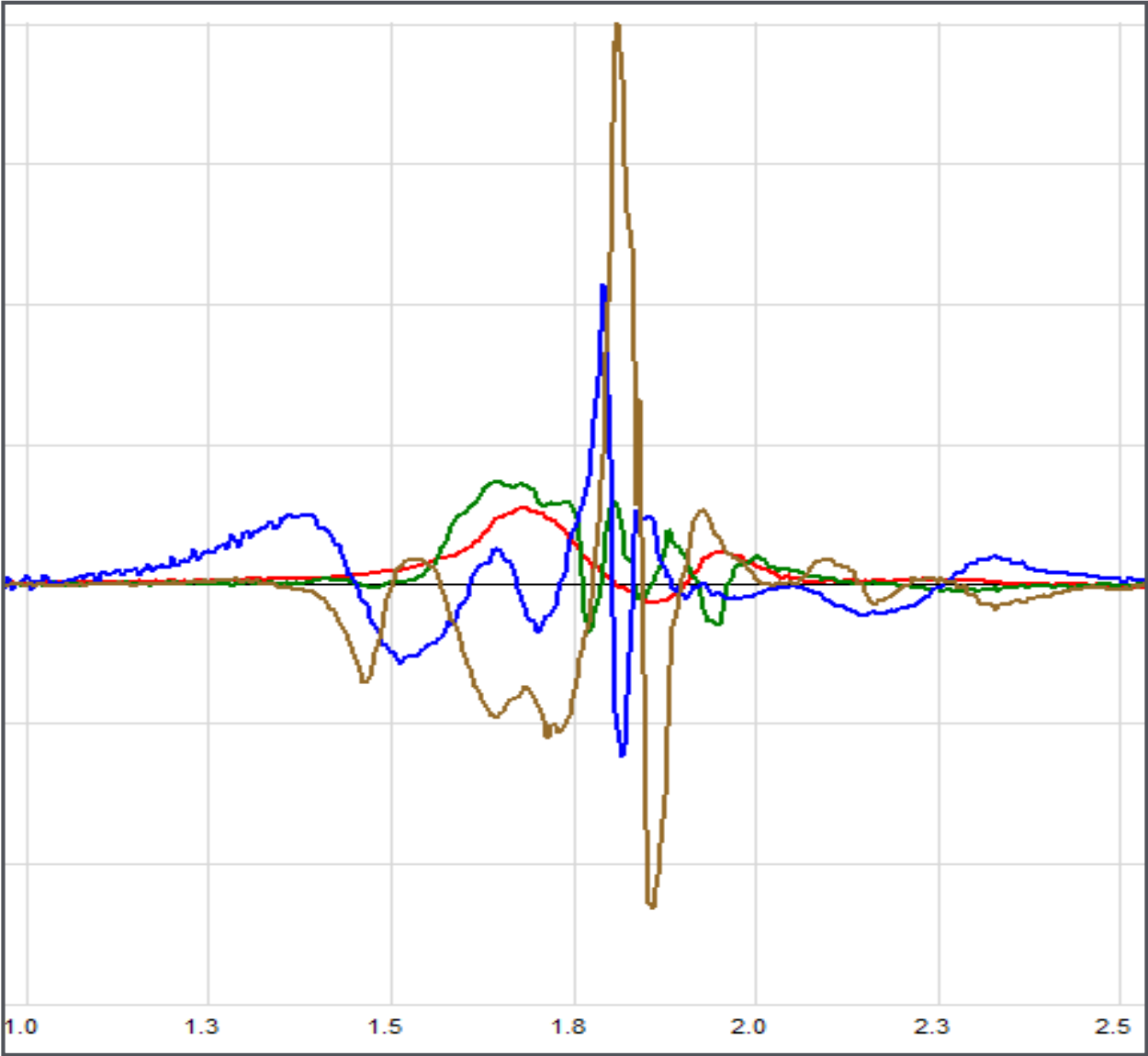
DECELERATION SEQUENCE - EXAMPLE B



NOTES:

THE KINEMATIC SEQUENCE - PITCHING

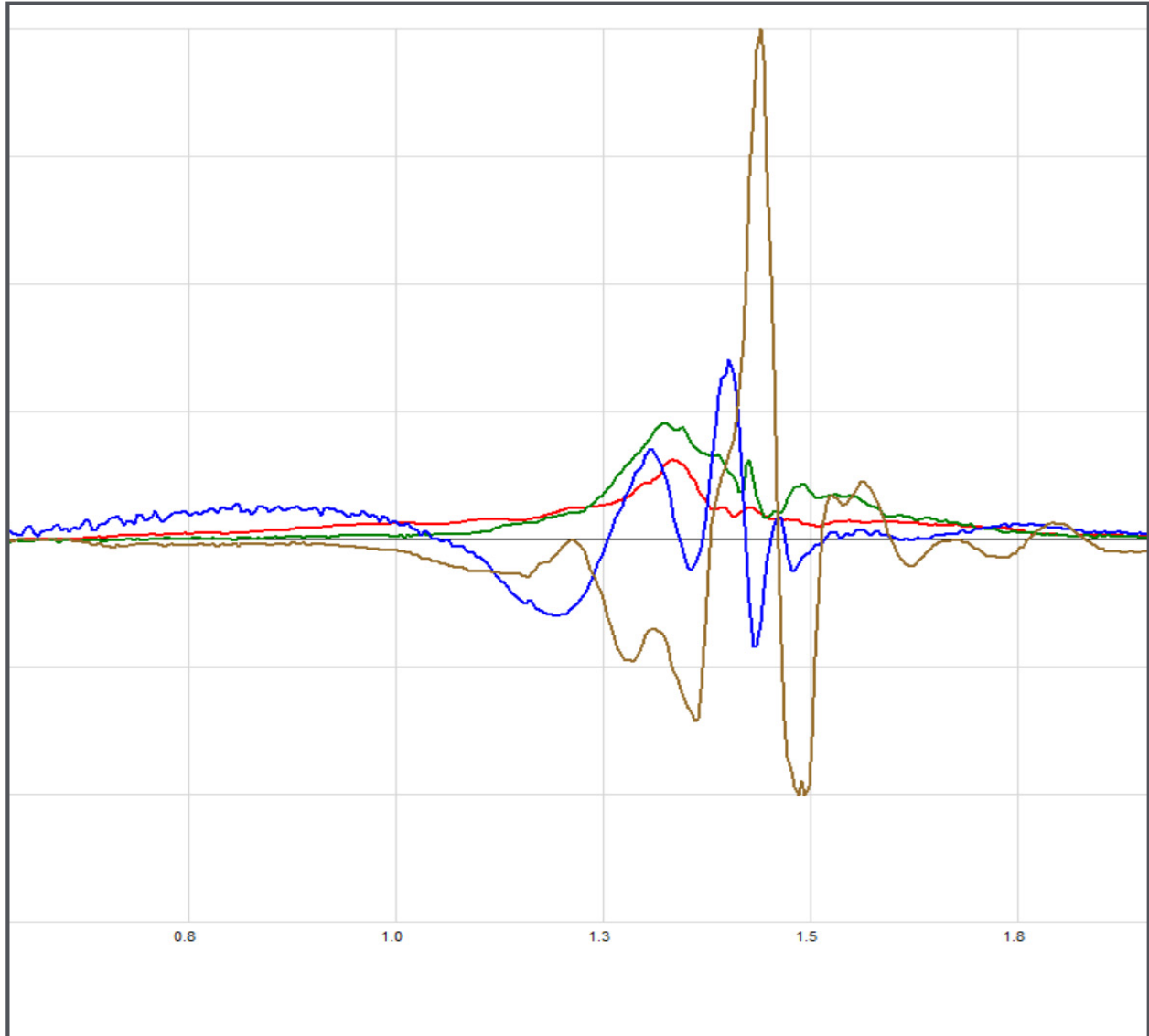
DECELERATION SEQUENCE EXAMPLE - C



NOTES:

THE KINEMATIC SEQUENCE - PITCHING

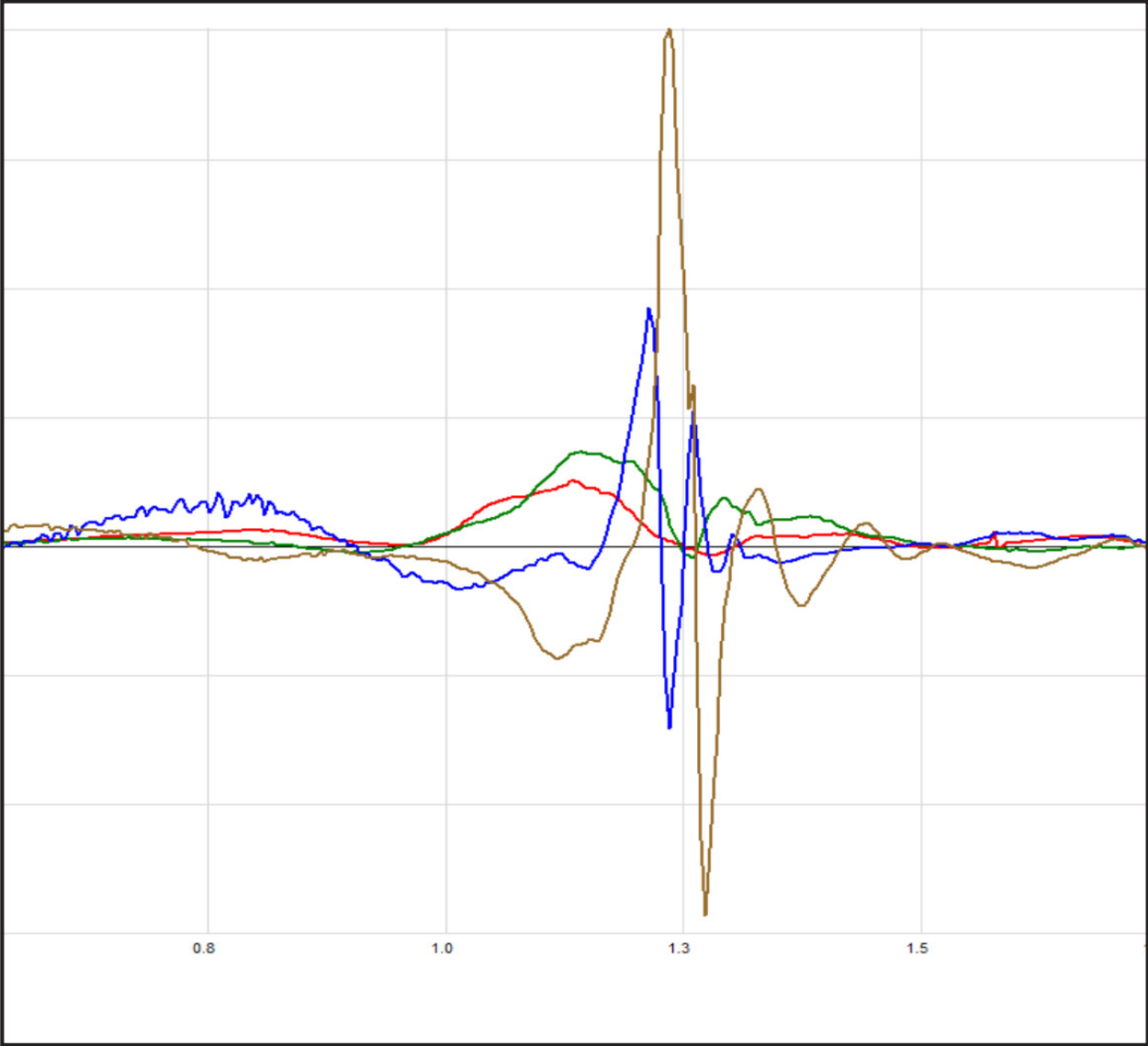
DECELERATION SEQUENCE - 5 SEGMENT - EXAMPLE D



NOTES:

THE KINEMATIC SEQUENCE - PITCHING

DECELERATION SEQUENCE - 5 SEGMENT - EXAMPLE E



NOTES:

THE KINEMATIC SEQUENCE - PITCHING

NOTES



ONBASE UNIVERSITY

THE BIG 12

THE 12 COMMON INHIBITORS
TO AN EFFICIENT PITCH

THE PHASES AND KEY POSITIONS OF PITCHING

THE FIVE PHASES OF PITCHING:



As you can see from the picture above, we have divided the pitching motion into five distinct phases. Those phases include:

1. **The Wind-Up** - this begins with the initiation of the stride leg and ends when the ball separates from the glove (this is usually when the stride leg reaches highest point).
2. **The Cocking Phase** - This is broken into two smaller phases - Early Cocking and Late Cocking. Early Cocking Phase begins with the end of windup and ends when the stride leg contacts the mound/ground. The Late Cocking Phase begins from the point stride leg contacts the ground to the point of maximum external rotation of throwing arm. So the entire Cocking Phase is from the end of the Wind-Up to the point of maximal external rotation of the throwing arm.
3. **The Acceleration Phase** - this begins from point of maximum shoulder external rotation and ends at the point of ball release.
4. **The Deceleration Phase** - this occurs from the point of ball release to maximal humeral internal rotation and elbow extension.
5. **Follow-Thru Phase** - this is where the body continues to move forward until the arm has ceased motion.

THE EIGHT KEY POSITIONS OF PITCHING:

There are also 5 key positions/frames that we use to evaluate a pitcher. They are as follows:

1. **Set** - the start of the pitching motion.
2. **Pivot** - when the weight first comes out of the stride leg.
3. **Top of Knee Lift** - the point where the stride knee reaches its maximum height - usually at the end of the wind-up.
4. **Bottom of Arm Circle** - the lowest point the ball reaches in the pitch.
5. **Foot Touch** - the first frame where the stride foot touches ground.
6. **Foot Plant** - the first frame where the stride foot is firmly planted on the mound or ground.
7. **Maximum External Rotation** - the point of maximum external rotation of the throwing arm.
8. **Ball Release** - the first frame where the ball has left the throwing hand.

THE 12 COMMON INHIBITORS OF AN EFFICIENT PITCH

THE 12 COMMON INHIBITORS FOR PITCHING:

| | |
|-----------------------------------|------------------------------|
| 1. Sway | <i>MAXIMUM LEG LIFT</i> |
| 2. Hanging Back | |
| 3. Closing the Front or Back Side | <i>BOTTOM OF ARM CIRCLE</i> |
| 4. Getting Out In Front | |
| 5. Late Riser | <i>FOOT TOUCH</i> |
| 6. Flying Open | |
| 7. Early Extension | |
| 8. Short Stride | <i>FOOT PLANT</i> |
| 9. Collapsing Front Knee | |
| 10. High Hand | <i>MAX EXTERNAL ROTATION</i> |
| 11. Early Flexion | |
| 12. Early Release | <i>BALL RELEASE</i> |

THE 12 COMMON INHIBITORS OF AN EFFICIENT PITCH

All 12 Inhibitors have the following things in common:

1. **They Can Be Found on MLB Players** - even though we call these inhibitors, you can find most of these on a few current MLB pitchers. These players have the athleticism and talent to adjust or recover from these and still make a living playing baseball. The problem is most average players are not so lucky and these tend to cause efficiency breakdowns in the kinematic sequence.
2. **They Have a Strong Physical Link** - All of these inhibitors can be linked to some possible physical limitation. In other words, these are the 12 most common characteristics that are caused by physical limitations. The key fact to remember is - *motor patterns are created around physical limitations*. For example, if a pitcher's back hip can't internally rotate, they may learn to Sway instead of rotate. Once that new motor pattern is ingrained, just removing the physical barrier will not be enough. Relearning the correct motor pattern will be required.
3. **You Can Predict These From a Physical Screen** - Since there is such a strong link between certain physical limitations and these inhibitors, we are able to make good predictions about pitching mechanics after evaluating a pitcher's body. That is the purpose of the physical screen, it allows us to predict which inhibitors a player may have.

The Four Measures of Pitching:

1. Power
2. Control
3. Deception
4. Health

DESCRIPTION

Sway is characterized by any excessive lateral shift or change in posture that occurs during the leg lift. Many times the pitcher will Sway away from the hitter when lifting the stride leg in the wind-up. This will directly affect their overall balance and dynamic posture. Posture is unique to every pitcher, but it is normally maintained throughout the whole delivery. Sway can be due to the pitcher having a square stance or too wide or narrow of a stance. Normally the toe of the back foot is in line with the center of the arch of the lead foot. If the stance is too wide, the head usually shifts towards 2nd base to counterbalance the lift of the front foot. Conversely, if the stance is too narrow, many times the head goes towards 1st base. An open stance can also make the head move back during the wind-up.

VIDEO ANALYSIS

It is best to diagnose a Sway from the face-on camera angle. Take the pitcher to the start of their pivot and draw a vertical line straight up from the inside of their back knee extending beyond their head. Now advance the pitcher to Maximum Leg Lift. If the head or body moves farther away from the hitter, they have a Sway.

VIDEO PITFALLS

- Make sure you are perpendicular to the target line to see any Sway.



NORMAL

SWAY

PHYSICAL CAUSES

Several physical limitations may cause a Sway:

- **Backside Hip Rotation Mobility** - Foremost, backside hip internal rotation is paramount for full rotation into the back hip without any lateral Sway during the wind-up or leg lift. If the body is unable to rotate around the back hip due to joint or muscular restrictions, lateral movements will dominate the pattern.
- **Backside Ankle Mobility** - backside ankle mobility (eversion) is extremely important for proper loading and ground force reactions during the wind-up and leg lift. If ankle mobility is limited, it is difficult for players to maintain a solid base foundation with the back leg.
- **Limited Spine Disassociation** - The ability to separate the upper body from the lower body allows the lower body to laterally stabilize while rotating during the wind-up. Limited thorax-to-pelvis separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Limited Lower Body Stability** - The ability to laterally stabilize the backside during the wind-up and leg lift is directly proportional to the strength and proper motor control of the musculature of the lower extremity, gluteal and other core muscles.
- **Front Side Hip Flexion Mobility** - Finally, the player's ability to lift the stride leg can directly influence backside leg stability. If there is a restriction in hip flexion, the player may lose backside stability to help improve front side hip flexion.

HANGING BACK

MAXIMUM LEG LIFT

DESCRIPTION

As the pitcher begins their wind-up, normally they lift their stride leg and begin to move towards home plate immediately. If they shift away from home plate (towards 2nd base - Sway), remain vertical during the entire wind-up or stop at the top of their wind-up, it is called Hanging Back. Many young players are taught to pause at the top or take their time finishing the wind-up on their back foot. That is not what we see in most of the top pitchers in MLB. The average MLB pitcher's stride time from first forward movement to front foot contact is .95-1.05 seconds. Hanging Back tends to make this time much longer.

VIDEO ANALYSIS

The easiest way to diagnose a Hanging Back using video is to view the player from the face-on camera angle. Start by drawing a vertical line just outside their front side hip at the pivot. Now advance the video to Maximum Leg Lift. Ideally the player's front hip should have moved across the vertical line, getting closer to the hitter. The best pitchers typically move towards the hitter as fast as possible once they begin their leg lift.



NORMAL

HANGING BACK

PHYSICAL CAUSES

Several physical limitations may cause Hanging Back:

- **Hip Mobility and Stability** - Foremost, if the player does not have good front or backside hip mobility and stability they might not be able to drive and shift properly into the front hip and therefore, Hang Back.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate and shift laterally early in the wind-up. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Backside Ankle Mobility** - Backside ankle mobility (eversion) is extremely important for proper drive and ground force reactions during the wind-up and cocking phases. If ankle mobility is limited, it is difficult for players to properly weight shift early in the throwing motion.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the thorax to become over active and force the player to Hang Back with the lower body. Overall leg strength and power is also essential for maintaining a proper sequence during pitching.
- **Front Side Hip Flexion Mobility** - Finally, the player's ability to lift the stride leg can directly influence backside function. If there is a restriction in hip flexion, the player may lose backside stability to help improve front side hip flexion.

CLOSING THE FRONT / CLOSING THE BACK

BOTTOM OF ARM CIRCLE

DESCRIPTION

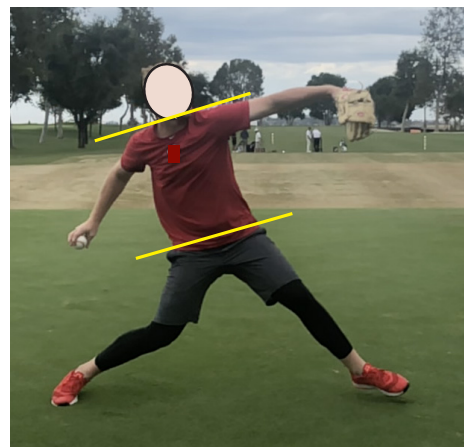
Closing the Front or Closing the Back are characterized by an uneven lateral change in posture that occurs during the pitch. Normally, a pitcher will keep their trunk and pelvis relatively parallel to each other (in the frontal plane) during the pitch. Many times the pitcher will break parallel by laterally tilting the trunk or laterally tilting the pelvis when they lift the stride leg. This will directly affect their overall balance and dynamic posture. Posture is unique to every pitcher, but it is normally maintained throughout the whole delivery.

VIDEO ANALYSIS

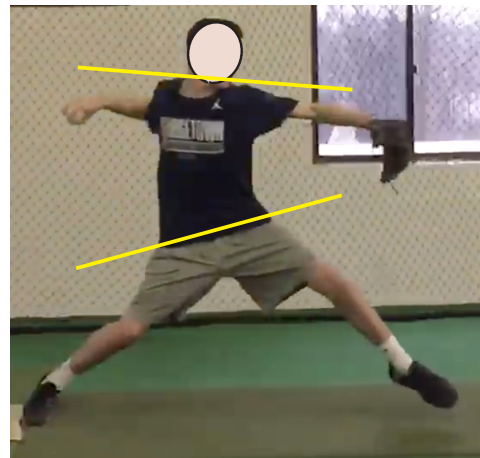
It is best to diagnose this characteristic at the bottom of the arm circle using the face-on camera view. Advance the video to the bottom of the arm circle and draw two lines. The first should be parallel to the player's shoulders. The second should be parallel to the player's pelvis. Now compare the relative orientation of both lines to each other. If the two lines converge towards the hitter, they have a Closing Front Side. If the two lines converge towards second base, they are Closing Back Side.



NORMAL



CLOSING THE BACK



CLOSING THE FRONT

GETTING OUT IN FRONT

FOOT TOUCH

DESCRIPTION

Getting Out In Front occurs when the trunk or head gets ahead of the lower body too early. This can be seen when the pitcher's head or trunk moves closer to home plate too early when viewed from the face on camera. Getting Out In Front is a sign of poor loading into the back hip or poor disassociation between the trunk and pelvis and can greatly reduce overall pitch velocity.

VIDEO ANALYSIS

The easiest way to diagnose a Getting Out In Front is from the face-on camera view. Advance the video all the way to foot touch. Next, draw a vertical line (yellow line below) that is centered over the middle of the player's head. Finally, compare the location of the player's belt buckle (center of their hips) to the vertical line. If the belt buckle is behind the vertical line, the player has a Getting Out In Front.



NORMAL



GETTING OUT IN FRONT

PHYSICAL CAUSES

Several physical limitations may cause Getting Out In Front:

- **Limited Spine Disassociation** - Foremost, the ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate freely without forcing the trunk to open up early. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Limited Thorax Mobility (Spine Extension)** - Thorax mobility is important for proper turn and shoulder function during the wind-up and cocking phases. Specifically, spine extension is extremely important to not Getting Out In Front. If the thorax is unable to rotate and extend due to joint or muscular restrictions, then it may be easier for the pitcher to Getting Out In Front instead.
- **Hip Mobility and Stability** - If the player does not have good front or backside hip mobility and stability they might not be able to drive and shift properly into the front hip and therefore, Getting Out In Front.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the upper body to become over active too early. Overall leg strength and power is essential for maintaining a proper sequence during pitching.

DESCRIPTION

A Late Riser is defined as a pitcher with the throwing hand still below the throwing elbow at foot touch. Most pitchers will have their throwing hand above the throwing elbow by foot touch. This puts less stress on the throwing elbow. If a player's throwing hand is still below their throwing elbow by foot touch, we call this a Late Riser.

VIDEO ANALYSIS

The easiest way to diagnose a Late Riser is to look at the relationship between the throwing hand and the throwing elbow at foot touch. Using the face-on camera angle, stop the pitcher at foot touch and draw a horizontal line through the throwing elbow. If the hand is still below that line, they are a Late Riser.



NORMAL



LATE RISER

PHYSICAL CAUSES

Several physical limitations may cause a Late Riser:

- **Limited Back Shoulder Mobility** - Any reduction in back shoulder external rotation can limit a player's ability to get into an early hand up position. Many players who struggle with shoulder mobility problems are Late Risers.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate freely without forcing the trunk to open up early. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Spine Extension** - The ability to keep the spine extended allows the shoulder to externally rotate much easier. Spine extension is a key factor in proper shoulder rotation timing.
- **Limited Back Scapular Stability** - Limitations in back shoulder scapular stability can also create a Late Riser.

DESCRIPTION

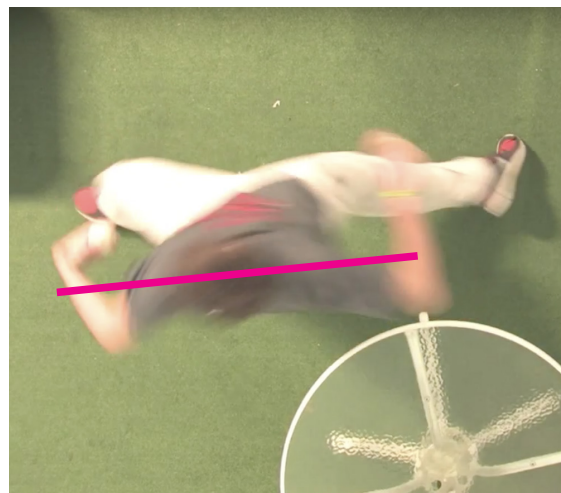
Flying Open is a common characteristic affecting the pitcher's disassociation. If the pitcher's torso starts to rotate too early in the delivery, it is called Flying Open. After foot touch we should see the largest disassociation/separation between the torso and the pelvis, normally this is 40-60 degrees. Some players have large hip turns and small shoulder turns. Some have large shoulder turns and minimal hip turn. Some have a good balance between the two. How they do it doesn't matter, as long as they do it. Players that are Flying Open start to rotate their upper body/torso too soon and therefore reduces the overall separation between the upper and lower body. If the pitcher starts their torso before reaching 70% of their stride length, they are Flying Open.

VIDEO ANALYSIS

The easiest way to diagnose Flying Open is from overhead with a drone camera, but the back view and down-the-line view is also an option. Using the overhead view, advance the pitcher to foot touch. Now draw a line parallel to the pitcher's shoulders. If the shoulders/torso start to unwind anytime before foot touch, they are Flying Open.



NORMAL



FLYING OPEN

PHYSICAL CAUSES

Several physical limitations may cause Flying Open:

- **Limited Spine Disassociation** - Foremost, the ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate freely without forcing the trunk to open up early. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Limited Thorax Mobility** - Thorax mobility is important for proper turn and shoulder function during the wind-up and cocking phases. If the thorax is unable to rotate and extend due to joint or muscular restrictions, then it may be easier for the pitcher to Fly Open instead.
- **Hip Mobility and Stability** - If the player does not have good front or backside hip mobility and stability they might not be able to drive and shift properly into the front hip and therefore, Fly Open.
- **Limited Shoulder Mobility and Stability** - Limitations in shoulder mobility or stability can also cause a player to Fly Open. If the shoulder joint (abduction) or scapulas have limitations in retraction (bringing the shoulder blades together), this may prevent a player from creating a good separation of the upper body from the lower body during wind up and cocking phases. This is specially true if they also have thoracic restrictions which will require more scapular retraction to complete the separation.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the upper body to become over active too early. Overall leg strength and power is essential for maintaining a proper sequence during pitching.
- **Short Stride** - Due to many of the physical reasons above, a short stride can force a player to Fly Open.

Quick Note of all player images seen in this manual: In no way has any player given their endorsement or approval of OnBase University or any of OnBaseU's materials. This is just for learning purposes and there are no player's representing OnBaseU or its associates.

DESCRIPTION

Early Extension occurs when the hips of the pitcher start to go into extension, or the pelvis thrusts forward towards the 3rd baseline, before foot plant. Early Extension causes the upper body to lift up or tilt backwards, allowing the player to maintain their balance, but lose their posture.

Players will often complain of stepping closed or poor alignment off the mound. The result can be a slinging motion of the arm across the body, since the body is now in the way of the elbow and arm.

VIDEO ANALYSIS

The easiest way to diagnose this characteristic is from the 2nd base camera (down-the-line). When the player assumes their stance, draw a vertical line centered over the back ankle. Advance the video all the way to foot plant. Remember, the pelvis is elliptically shaped (not circular). Therefore, since the best pitchers will not move closer to the 3rd base line (for right-hander), their back hip will sit deep into the line during the wind-up and stride. If the pelvis moves in front of the line, the player has Early Extended.



NORMAL



EARLY EXTENSION

PHYSICAL CAUSES

Several physical limitations may cause Early Extension:

- **Backside Ankle Mobility** - Backside ankle mobility (eversion) is extremely important for proper drive and ground force reactions during the wind-up and leg lift. If ankle mobility is limited, it is difficult for players to properly weight shift early in the throwing motion.
- **Backside Hip Mobility and Stability** - Foremost, if the player does not have good backside hip mobility and stability they might not be able to load and shift properly in the back hip.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate and shift laterally early in the wind-up. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the thorax to become over active and force the player to Early Extend with the lower body. Overall leg strength and power is also essential for maintaining a proper sequence during pitching.
- **Front Side Hip Flexion Mobility** - Finally, the player's ability to lift the stride leg can directly influence backside function. If there is a restriction in hip flexion, the player may lose backside stability to help improve front side hip flexion.

DESCRIPTION

Many experts believe one foot of distance closer to home plate equals 3.49 mph of perceived velocity to a hitter's eyes, and if you look at most MLB pitchers, they can stride 85% of their own height. We believe that there is an optimal stride length for each pitcher and it correlates to whatever distance allows them to throw with the most velocity. One of the biggest concerns with a Short Stride is the problems it may lead to with timing of the other body parts. For example, a Short Stride may not give the player enough time to get their arm up into the correct position before foot touch (Late Riser).

VIDEO ANALYSIS

The easiest way to diagnose a Short Stride is to measure the distance from the front of the rubber to the toe of the lead foot at foot plant. Using the face-on camera angle, stop the pitcher at foot plant and measure that distance. That distance should be equal to or greater than 110% of their height when the pitcher is standing tall.



NORMAL



SHORT STRIDE

PHYSICAL CAUSES

Several physical limitations may cause a Short Stride:

- **Hip Mobility** - Foremost, any limitations in mobility for either hip will make it really difficult for a pitcher to achieve a large stride length. Hip abduction, extension, flexion and rotation are all necessary for good stride length.
- **Spine Extension** - The ability to keep the spine extended allows the player to remain upright longer without putting the front foot down. Spine extension allows the player to keep their center of mass back as long as possible.
- **Ankle Plantarflexion** - The ability to drive off the back foot is also a critical factor involved in achieving a large stride length. Limitations in ankle plantarflexion can severely limit the pitcher's ability to push-off the mound.
- **Ankle Eversion** - Limitations in ankle eversion can also limit the pitcher's ability to push-off the mound properly.
- **Lower Limb Reciprocal Pattern** - The ability to flex one hip and extend the other while maintaining postural stability is a complex movement pattern. It requires hip mobility as mentioned above and the ability to control two opposite movements. Any limitations in the player's ability to perform this motion will make it really difficult for a pitcher to achieve a large stride length.
- **Poor Balance** - Any limitations in back side leg balance can lead to a Short Stride.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can limit the distance a player can travel towards the hitter. Overall leg strength and power is also essential for maintaining a big stride length.
- **Limited Core and Lower Body Stability** - Limitations in balance or lower body or core stability can cause an unstable base. If the lower body has a hard time stabilizing on one leg, striding or keeping the pelvis stable, this may cause a Short Stride.

DESCRIPTION

Collapsing the Front Knee is a common characteristic affecting the pitcher's front side stability and their ability to transfer energy to their upper body. If the pitcher's front knee continues to flex after foot plant, it is called Collapsing the Front Knee. After foot plant we should see the maximum amount of knee flex in the front knee, the degrees of this angle can vary dramatically. Some players have up to 90 degrees of flex, while others have very little flex. How they do it doesn't matter, as long as they don't increase the flex of the front knee after foot plant. Players that Collapse the Front Knee reduces their lower body stability and can dramatically reduce power into the upper body.

VIDEO ANALYSIS

The easiest way to diagnose a Collapsing the Front Knee is from face-on camera. Advance the pitcher to foot plant and draw the angle of the front knee using the angle tool on the computer. Now, slowly advance the player into ball release. If the front knee flex increases (the angle becomes more acute or decreases) at any point, the player is Collapsing the Front Knee. The best of the best will actually reduce the front knee flex (angle becomes straighter or more obtuse) as they go into ball release.



NORMAL



COLLAPSING THE FRONT KNEE

PHYSICAL CAUSES

Several physical limitations may cause Collapsing the Front Knee:

- **Front Side Hip Rotation Mobility** - Foremost, front side hip internal rotation is paramount for proper loading into the front hip after foot plant. If the pelvis is unable to rotate around the front hip due to joint or muscular restrictions, the player's knee will typically bend to absorb the load.
- **Limited Lower Body Stability** - The ability to stabilize the front side at foot plant is directly proportional to the strength and proper motor control of the musculature of the lower extremity, gluteal and other core muscles. If there is a weakness or motor control dysfunction, the player will typically Collapse the Front Knee.
- **Tibia Rotation** - The ability to orient the front foot in a position to properly stabilize the player's mass can be critical in maintaining a firm stable front side at foot plant.
- **Front Side Ankle Mobility** - Front side ankle mobility (plantar flexion, dorsiflexion, inversion and eversion) is extremely important for proper loading and ground force reactions during the foot plant. If ankle mobility is limited, it is difficult for players to maintain a solid base foundation with the front leg.
- **Poor Balance** - Any limitations in front side leg balance can lead to a Collapsing Front Knee.

HIGH HAND

MAX EXT ROTATION

DESCRIPTION

A High Hand is when the pitcher's throwing hand is always above the throwing elbow. Normally, the pitcher's throwing hand will drop down (layback) due to the shoulder externally rotating during the Cocking Phase. The pitcher's hand should get level with or below the throwing elbow. If the throwing hand stays above the throwing elbow throughout the Cocking and Acceleration Phases, we call this a High Hand.

VIDEO ANALYSIS

It is best to diagnose a High Hand from the face-on camera angle, but it can also be seen from the down-the-line view. Advance the video to Maximum External Rotation. Now draw a horizontal line that bisects the elbow. If the ball is entirely above that line, they have a High Hand.



NORMAL



HIGH HAND

PHYSICAL CAUSES

Several physical limitations may cause a High Hand:

- **Limited Back Shoulder Mobility** - Any reduction in back shoulder external rotation can limit a player's ability to get into a full layback position. Many players who struggle with shoulder mobility problems have High Hands.
- **Spine Extension** - The ability to keep the spine extended allows the shoulder to externally rotate much easier. Spine extension is a key factor in proper shoulder range of motion.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can limit the dynamic loading of the shoulder. The momentum of the weight shift aids in loading the shoulder to its full potential.
- **Elbow Mobility and Stability** - The ability to rotate the forearm and stabilize the elbow is important for proper loading of the shoulder.
- **Limited Back Scapular Stability** - Limitations in back shoulder scapular stability can also create a High Hand.

DESCRIPTION

As the pitcher goes from the cocking phase into the acceleration phase the trunk remains tall and upright with a large arch (lordosis) in the lower back. As the arm begins to uncock and extend the lower back flattens and the trunk flexes forward to assist in arm acceleration and core stabilization. If the trunk flexes forward too soon, during the late cocking phase, it is called Early Flexion.

VIDEO ANALYSIS

The easiest way to diagnose Early Flexion is to observe the pitcher from the face on camera. Advance the video to the Maximum External Rotation position. Observe the lower back and trunk. The pitcher should be tall and upright with a large arch in the lower back. The lower back should remain arched until the throwing hand gets to the ear of the pitcher. If the lower back flexes early and the trunk tilts forward, then the pitcher has Early Flexion.



NORMAL



EARLY FLEXION

PHYSICAL CAUSES

Several physical limitations may cause Early Flexion:

- **Spine Extension** - Foremost, the ability to keep the spine extended allows the trunk to remain upright as long as possible. Limitations in spine extension almost always force Early Flexion.
- **Front Hip Flexion Mobility** - If the player does not have good front side hip flexion mobility, the lumbar spine ends to flex instead of the hip. This compensation causes Early Flexion, but it also leads to disc and lower back injuries.
- **Lower Limb Reciprocal Pattern** - The ability to flex one hip and extend the other while maintaining postural stability is a complex movement pattern. It requires hip mobility as mentioned above and the ability to control two opposite movements. Any limitations in the players ability to perform this motion will make it really difficult to not Early Flex.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the pelvis to rotate freely without forcing the lumbar spine to flex. Limited pelvis to thorax separation is usually caused by oblique abdominal restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder flexibility.

DESCRIPTION

Early Release is when a pitcher lets go of the ball too early. This affects the release point and allows the hitter to see or read the ball sooner giving them a better chance for solid contact. This effectively increases the time the batter has to see the pitch, since an Early Release will make the total distance the ball travels longer. Normally, the release point will be 8-12 inches in front of the landing foot big toe and occur .25-.35 seconds after front foot plant.

VIDEO ANALYSIS

Early Release is easily diagnosed from the face-on camera. Take the pitcher to release point and stop the video. Draw a vertical line up from the front toe. Now measure the distance between the hand and the line. The best pitchers in the world release the ball approximately 8-12 inches in front of the front big toe line. If the pitcher releases the ball behind their big toe line, they are Early Releasing.



NORMAL



EARLY RELEASE

PHYSICAL CAUSES

Several physical limitations may cause an Early Release:

- **Short Stride** - For all the same physical reason that caused a Short Stride, this can lead to an Early Release.
- **High Hand** - For all the same physical reason that caused a High Hand, this can lead to an Early Release since the arm doesn't have to travel as far into ball release.
- **Early Extension** - For all the same physical reason that caused a Early Extension, this can lead to an Early Release since the body is move more forward than lateral towards the hitter.
- **By Product of Many of the Other Inhibitors** - Most of the previous inhibitors can lead to an Early Release.



ONBASE UNIVERSITY

VIDEO CAMERA BASICS
FILMING TECHNIQUES, CAMERAS, VIDEO
REVIEW SOFTWARE

FILMING FROM FACE ON CAMERA ANGLE

KEY POINTS TO FOCUS ON FROM THIS VIEW

- Make sure the camera is always at the same height and position. We like hip high focused on the center of the body.
- Check the shutter speed and make sure it is at a minimum of 1/2000 of a second.
- The camera should be aligned perpendicular to the target line.



PITCHING CHARACTERISTICS THAT CAN BE VIEWED FROM FACE ON

1. Sway
2. Hanging Back
3. Closing the Front / Closing the Back
4. Getting Out In Front
5. Short Stride
6. Late Riser
7. High Hand
8. Head Shift
9. Collapsing Front Knee
10. Early Flexion
11. Early Release

FILMING FROM DOWN-THE-LINE CAMERA ANGLE

KEY POINTS TO FOCUS ON FROM THIS VIEW

- Make sure the camera is at the same height for all filming.
- The camera should be aligned parallel to the target line and pointing directly at the player's belt buckle.
- Check the shutter speed and make sure it is at a minimum of 1/2000 of a second.



PITCHING CHARACTERISTICS THAT CAN BE VIEWED FROM FACE ON

1. Early Extension
2. Flying Open
3. Head Shift

FILMING FROM OVERHEAD / DRONE CAMERA VIEW ANGLE

KEY POINTS TO FOCUS ON FROM THIS VIEW

- Make sure the camera is hovering and still the entire time.
- The camera should be aligned directly overhead.
- Check the shutter speed and make sure it is at a minimum of 1/2000 of a second.



PITCHING CHARACTERISTICS THAT CAN BE VIEWED FROM FACE ON

1. Flying Open
2. Early Extension
3. Head Shift
4. Early Release



ONBASE UNIVERSITY

PHYSICAL SCREENING
UNLOCKING THE BODY'S POTENTIAL

WHY SCREEN?

PHYSICAL CAUSES OF PITCHING ERRORS:

Coaches all too often encourage players to move their bodies into positions that their students are physically incapable of achieving. Often, the reason why players cannot achieve a certain pitch velocity is because they have limited mobility, poor stability, or even a prior injury that limits their range of motion. Yet, if coaches are unaware or untrained to assess such physical limitations, they will likely proceed with pulling out the video camera, drawing a few lines on a screen, and demonstrating that they don't know what they don't know.

OnBase University coaches are educated and knowledgeable in the area of movement screening as it relates to baseball and softball. If the underlying cause of poor technique is poor movement quality, then a coach must be able to identify this and explain it to the player. The training recommendation could then include a combination of technical advice and exercises to improve the student's level of fitness or even to develop a swing style that accommodates the student's physical limitations.

ONBASE UNIVERSITY'S PHILOSOPHY OF THE HUMAN BODY

"The body works in an alternating pattern of stable segments connected by mobile joints. If this pattern is altered - dysfunction and compensation will occur."

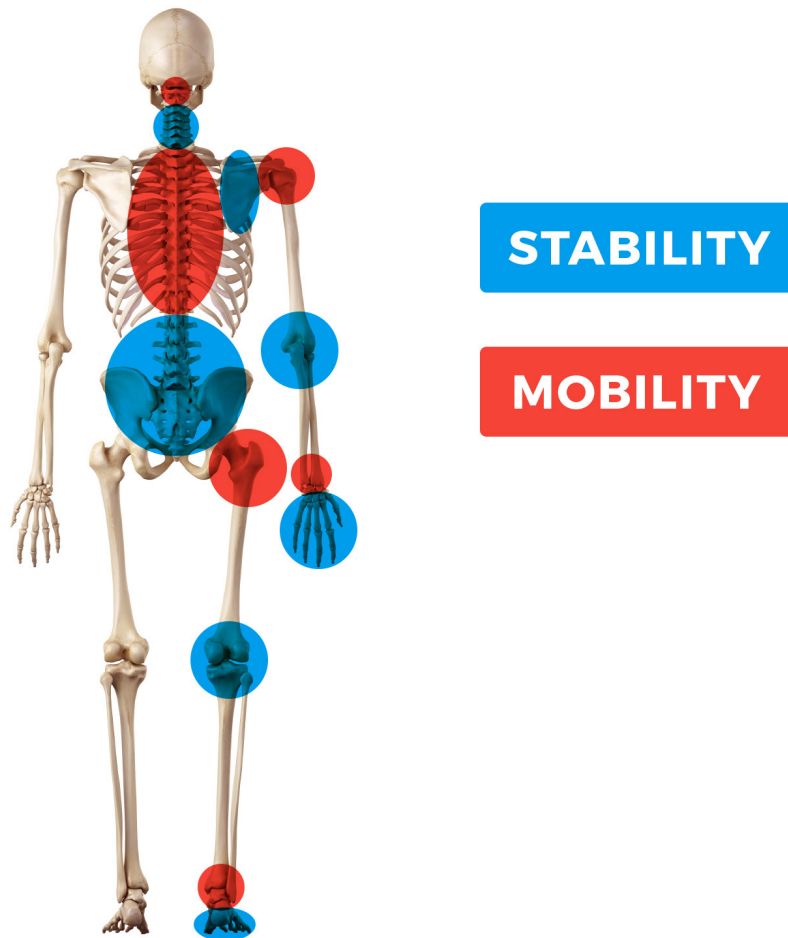
- First noted by Mike Boyle and Gray Cook.

NORMAL PATTERN

| | |
|----------------------------|--------|
| Foot | Stable |
| Ankle | Mobile |
| Knee | Stable |
| Hip | Mobile |
| Pelvis/Sacrum/Lumbar Spine | Stable |
| Thoracic Spine | Mobile |
| Scapulo-Thoracic | Stable |
| Gleno-humeral/Shoulder | Mobile |
| Elbow | Stable |
| Wrist | Mobile |
| Cervical Spine | Stable |

You can see how this observation of an alternating pattern of mobility and stability can help describe how injuries occur. If you take the lower back as an example, you will often find that the hip joints and thoracic spine are limited in mobility. Therefore, the lumbar spine will sacrifice stability to obtain more motion. This abnormal motion in the lumbar spine can be one of the primary reasons for disc and facet injuries in the lower back. Unfortunately, limited thoracic spine and hip mobility are two of the most common findings in male players. This may be why lower back injuries are so common in baseball.

SCREENING - THE FOUNDATION MOBILITY/STABILITY



LIMITATIONS IN MOBILITY CAN PREDICT INSTABILITY

Poor mobility leads to muscle imbalances:

- **Reciprocal Inhibition** - The neuro-muscular phenomenon that occurs when a tight muscle decreases the neural drive to its' functional antagonist. This leads to compensation patterns and predictable injury patterns.
- **Synergistic Dominance** - The neuro-muscular phenomenon that occurs when synergists, stabilizers, and neutralizers take over for a weak or inhibited prime mover.
- **Arthrokinetic Inhibition** - The neuro-muscular phenomenon that occurs when a muscle is inhibited by joint dysfunction or the capsule that crosses the joint.

SCREENING - THE FOUNDATION OF MOBILITY/STABILITY

MOBILITY

Mobility is the combination of normal joint range of motion and proper tissue flexibility. This is a must for proper mechanics and for injury prevention. Mobility allows the body to move in all six degrees of freedom, therefore giving the ability to perform any motion - without having to sacrifice stability!

Mobility allows the generation of ELASTIC ENERGY between muscles, and therefore establishes a base for efficient power production.

Mobile Joints refer to joints that move great in all three planes of motion.

Stretch-Shorten Cycle

“A common pattern of muscle activation, particularly during high performance tasks, is to use an eccentric-concentric sequence in which the active muscle is first lengthened and then shortened. The advantage of this pattern is that a muscle can perform more positive work if it is actively stretched before being allowed to shorten.”

- Neuromechanical Basis of Kinesiology, Roger Enoka

STABILITY

Stability is the ability of any system to remain unchanged or aligned in the presence of change or outside forces. That is a good summary of what many areas in our body that are defined as stabilizers (such as the lumbar spine) are asked to do.

If you want to keep the bow of a bow and arrow stable as you pull the string back, you must have good motor control, balance, strength, and endurance. This is the same principle involved in creating a powerful pitching motion. The ability to keep one part of the body secure while stretching and contracting adjacent segments, allows us to generate speed and maintain a consistent posture throughout the pitching motion. That is Stability!

Stable Joints refer to joints that only like to move in one plane of motion

SCREENING - THE FOUNDATION MOBILITY/STABILITY

MUSCLE IMBALANCES

Muscle imbalances are caused by a sedentary lifestyle; a lack of variable movements or prolonged static postural stress due to sitting, standing, walking in a straight line. Overuse leads to shortening/tightening (not spasm) of postural muscles. Disuse leads to weakening/inhibition of phasic muscles. Neurological reflex-tightening of one muscle (illio-psoas), leads to neurological inhibition of it's antagonist (gluteus maximus).

LOWER CROSSED SYNDROME

The lower crossed syndrome is a grouping of weak muscles combined with overactive or tight muscles, that create a predictable movement pattern in the lower back that can lead to injury. Dr. Vladimir Janda, a physician from the Czech Republic, was really the first person to document this type of muscle imbalance. Dr. Janda noticed that many people developed a distinct pattern of muscle imbalances due to prolonged static postures, such as sitting at a desk all day.

Dr. Janda noted that when a muscle is subjected to a short or contracted state for an extended period, it causes a reflex inhibition or weakening of the muscles on the opposite side of the body - reciprocal inhibition. For example, if you sit in a chair for eight hours a day, in time, your hip flexors will become shortened or tight. Your brain will automatically start to shut down or inhibit your glute muscles (butt) which are on the opposite side. Since your glute muscles are not working properly, your body will recruit synergistic muscles such as the hamstrings and lower back muscles to assist the glutes in performing hip extension. In other words, you start to recruit muscles that were not intended to be used for specific actions such as walking.

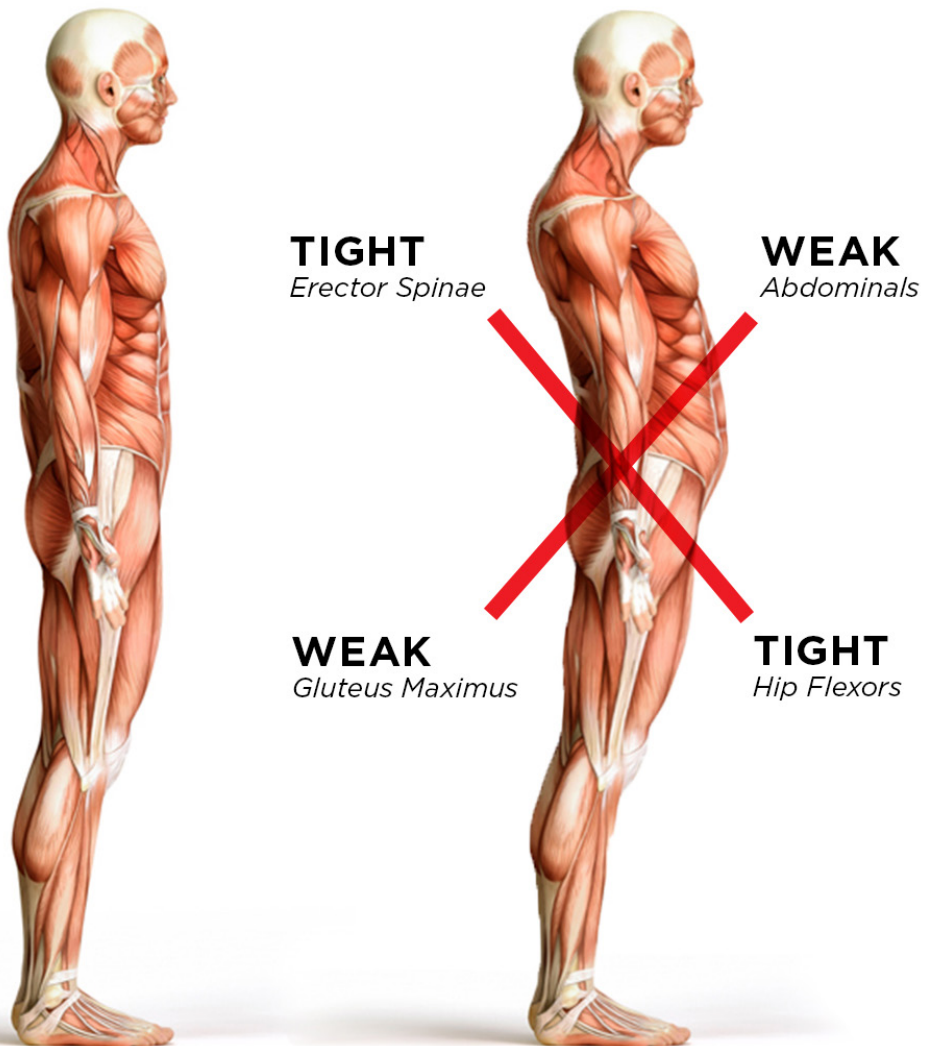
The most common pattern of imbalance that Dr. Janda observed he named the Lower Crossed Syndrome. It is primarily the combination of tight hip flexors and a tight lower back, paired with weak abdominals and weak glutes. This combination leads to an excessive arching or rounding of the lower back, a flabby or protruding abdomen, and a flat butt due to weakness in the glutes. This is a very dangerous combination of muscle imbalances due to the excessive stress that it places on the structures of the lower back. See the illustration on the following page.

UPPER CROSSED SYNDROME

The muscle imbalances on the following illustrations are collectively called an Upper Crossed Syndrome. The term, Upper Crossed, was also coined by Dr. Vladimir Janda. Dr. Janda noticed the same pattern of muscle imbalances on so many people that he started calling the pattern an Upper Crossed Syndrome.

The most significant joint restriction seen in Upper Crossed Syndrome is the lack of thoracic spine extension (limited backward bend or arching of the upper back). This can make it almost impossible to maintain stable posture. Lack of T-Spine extension can lead to a severe loss of spinal rotation, which in turn, will limit the ability to create a good load turn.

LOWER CROSSED SYNDROME



SHORTENED

Iliopsoas (Hip flexors)

Erector Spinae (Back)

Tensor Fascia Lata (TFL)
Quadratus Lumborum (QL)

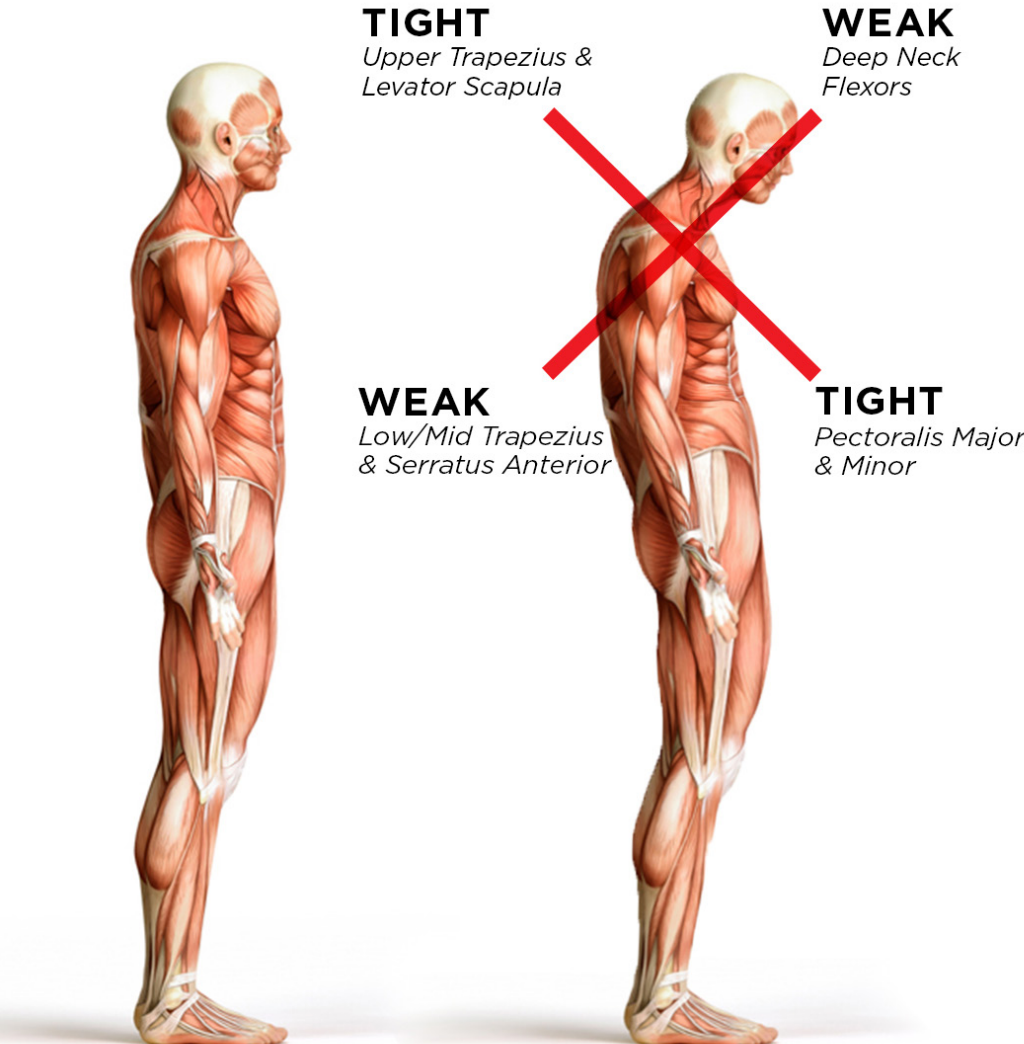
WEAK

Gluteus Maximus

Rectus Abdominis

Gluteus Medius

UPPER CROSSED SYNDROME



SHORTENED

| | |
|-------------------------------------|-----------------------|
| Upper Trapezius & Levator Scapulae | Lower & Mid Trapezius |
| Suboccipitals & Sternocleidomastoid | Deep Neck Flexors |
| Pectoralis Major & Minor | Serratus Anterior |

WEAK



NOTES





ONBASE UNIVERSITY

PITCHING SCREEN

IDENTIFYING THE PITCHER'S LIMITATIONS

THE ONBASEU PITCHING SCREEN

STANDING TESTS

1. Pelvic Tilt Test
2. Pelvic Rotation Test
3. Toe Tap Test
4. Hip 45 Test
5. Half-Kneeling Narrow Base Test
6. Lunge with Extension Test
7. Wide Squat Test
8. Side Step Walkout Test
9. Push-Off Test
10. Heel Lift Test
11. Shoulder 90/90 Test
12. Shoulder Windshield Wiper Test
13. Forearm 80/80 Test

SEATED TESTS

14. Ankle Rocking Test
15. Foot Windshield Wiper Test
16. Seated Trunk Rotation

THE RULES OF SCREENING

There are several rules that must be followed to perform the physical screens correctly. Let's go through each one:

No warm-up. This is critical for consistency from screen to screen. Plus, we are trying to evaluate basic movement. The body should be moving properly even before a warm-up.

If it looks like a dog, smells like a dog, it's a dog! Remember this when you are grading a screen and you're unsure if it's a pass or fail. Your grading accuracy will get better with each screen you perform. If the pattern of movement looks bad in anyway, it is probably really bad - so score it as dysfunctional.

Be picky! This is similar to rule #2. We think the biggest mistake you can make is to pass someone that should have really failed. Ask yourself: "Can I make the player's screen any better with exercise?" If the answer is yes, then they are failing the test.

Shoes on for most of the testing. There are only two times when shoes will be removed. Other than that, please keep your client's shoes on for all screens.

Monkey see - Monkey do. This applies to the speed of testing. You will learn with experience that demonstrating the screen to the client is much faster than a verbal explanation. If possible, perform the screens with your client.

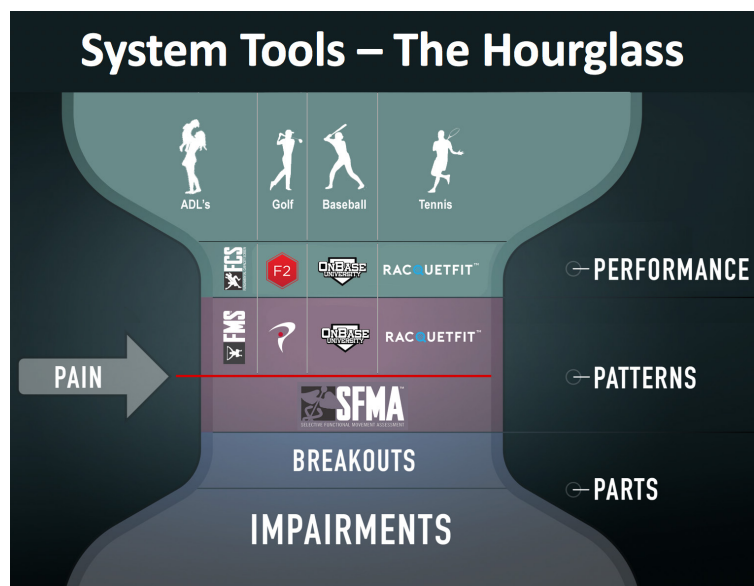
No pain is allowed. This is the most important rule of all. If there is pain at any point during the screen, stop and refer them to a medical professional.

ONBASEU SCREENING OVERVIEW

When to Perform the OnBaseU Screen:

It is important to understand where the OnBaseU Screen fits in with the overall assessment of the player. Many times, you will be asked to evaluate a player to see if you can improve their overall performance. They have no complaint of pain, they just want to either prevent problems from occurring or improve their overall performance. The evaluation of this player should begin with the appropriate screen. The OnBaseU screen was designed to evaluate baseball specific patterns of movement to identify or highlight altered patterns in pain free players, so the observer can predict the player's pitching mechanics. *It does not make any fitness or medical diagnosis*, it just helps predict if and how a player's body is altering their pitching mechanics.

If the OnBaseU screen produces pain or the player is complaining of pain from the start, then the screen needs to be progressed to a thorough medical assessment - that is the SFMA. The SFMA will help identify the cause of the pain and direct the treatment of the individual. Once the pain has been resolved, the OnBaseU screen can be used to re-evaluate the pitching movement patterns of the player. If the OnBaseU screen is dysfunctional, it is highly likely that the player's body is affecting their pitching mechanics.



To learn what is wrong (make a diagnosis) with the player's body, further functional testing should be performed. In conjunction with the OnBaseU screen, we recommend checking the player's basic functional movements (non-baseball specific) that are associated with activities of daily living (ADL's). For that we use the FMS (Functional Movement Screen). Many times the player's primary dysfunction is related to poor sleeping posture, over-training, training errors, playing with their kids, travel activities or other non-baseball specific activities. The FMS is great at identifying altered basic human movement and helping the fitness and health professional determine where to start the player's corrective program.

If the OnBaseU screen was normal and no altered patterns were detected, then the next level of evaluation should include the FCS (Fundamental Capacity Screen). Before we learn and acquire occupational, recreational or sport specific skills, we express energy through elemental capacities that can, and should, be measured. Fundamental Capacity testing allows us to identify "leaks" in an individual's ability to express energy.

The next step in the progression is to assess skill and/or specific characteristics needed for an activity. This will allow the evaluator to see how the player or patient performs in their specific sport or activity. This is where 3D motion capture, 2D video, statistics, trackman and other skill based evaluations come into the equation. Deficiencies in performance should be addressed at that time.

ONBASEU SCREENING OVERVIEW

Murder Mystery

A great analogy to help understand what should be tested on each player is to think of yourself as a police detective. There has been a murder and you need to investigate the crime. Somebody murdered this player's pitching mechanics. The good news is, there are only 15 suspects. And even better news is, all fifteen suspects are part of 5 gangs. So all we have to do is interview each of the gangs and get statements from each of the members.

The gangs are as follows:

- **Core Control Gang (2 Members)**
 - » Pelvic Tilt Test
 - » Pelvic Rotation Test
- **Rotation Gang (3 Members)**
 - » Toe Tap Test
 - » Hip 45 Test
 - » Seated Trunk Rotation Test
- **The Stride Gang (3 Members)**
 - » Side Step Walkout Test
 - » Push-Off Test
 - » Heel Lift Test
 - » Ankle Rock and Roll Test
- **Maintain Upright Posture Gang (3 Members)**
 - » Half-Kneeling Narrow Base Test
 - » Lunge with Extension Test
 - » Wide Squat Test
- **The Arms Gang (3 Members)**
 - » Shoulder 90/90 Test
 - » Shoulder Windshield Wiper Test
 - » Forearm 80/80 Test

This is a great way to remember and group your tests. This line of thinking will also help determine what the player's swing might look like.

Core Rotary Screens

There are three core screens that we use in all the rotary sports that we test. For example these screens are used in TPI's Golf Screen and Racquetfit's Tennis Screen. These screens can help shed some light on a player's Body-Pitching Connections. Those include:

- **Pelvic Tilt Test** - This allows us to examine the player's ability to control their core and pelvic orientation.
- **Pelvic Rotation** - This allows us to examine the player's ability to disassociate the lower body from the upper body.
- **Seated Trunk Rotation** - This allows us to examine the player's mobility in the thorax. This is critical in all rotary sports.

PELVIC TILT TEST

TEST OBJECTIVE FOR THE PELVIC TILT TEST

The Pelvic Tilt Test is a great test for overall mobility of the hips and the lumbar spine and their ability to control the position of the pelvic posture. The ability to move and control the position of the pelvis is critical for optimal power transfer from the lower body to the upper body during the pitching motion.

HOW TO PERFORM THE PELVIC TILT TEST

Begin by having your player assume a normal athletic posture and then place their arms across their chest (hands resting on shoulders). Observe their starting posture. Notice if the lower back has an accentuated arch (S-posture), if it is flat (N-posture), or if it is rounded into a slouched position (C-posture). Once the starting position has been established, ask the client to tilt the pelvis anteriorly or forward, increasing the arch in the lumbar spine.

Once this move is accomplished, ask the client to tilt the pelvis posterior, or backward, removing the arch from the lower back. Proper execution of this test will yield a forward and backward tilting of the pelvis with minimal leg/knee movement and limited upper body forward and backward movement. Observe the smoothness or “shake and bake” nature of the movement, when the client is tilting the pelvis. This will indicate with what frequency those muscles are being used on a day-to-day basis. They are probably not using those muscles on a regular basis in their pitching motion if there is a lot of shaking with the posterior tilt.

Make sure to observe the amount of motion both in the forward/anterior and backward/posterior directions. There can be limitations found in one direction as compared to the other.

CORRECT TESTING FORM



Neutral
(Flat Back)

Anterior Tilt
(Arched Back)

Posterior Tilt
(Slouched Back)

PELVIC TILT TEST

PHYSICAL CAUSES OF LIMITED PELVIC TILT

When a player presents with limitations in either mobility or coordination during the Pelvic Tilt Test, we will look to some key regions for answers:

- **Lumbar Spine Mobility** - If the backward/posterior tilt is limited, then we can look at the lumbar spine mobility as a possible cause for the limitation. Lumbar spine degenerative disc disease, joint arthritis, or other disc pathologies can all limit lumbar spine mobility.
- **Lower Crossed Syndrome** - The most common reason for limited pelvic tilt in both directions is a Lower Crossed Syndrome. We discussed this earlier in the manual and it is easy to see how this would limit their pelvic tilt. First, the player is already in a maximum anterior tilt position, so we know anterior tilting is going to be limited. Due to the tight hip flexors, tight erector spinae, weakness in the abdominals and weakness in the glutes, the player has a tough time performing a posterior tilt.
- **Poor Coordination** - We classify this test as a coordination issue if the player's range of motion is acceptable, but the quality of the movement is suspect. This usually presents itself as a shaky or choppy movement that we call "shake and bake." If "shake and bake" is present, there is usually a disconnect between the brain and the pelvis, or a lack of training involved. Most people do not train for this motion, so the brain is not used to such a task. You will find players sometimes getting frustrated with this because it seems easy in description, but in application, it is more difficult.

PELVIC TILT TEST PITFALLS

When taking a player through this exam, be aware of the following:

- Players oftentimes will attempt to tilt their pelvis with their knees and legs. This will usually show itself as a thrusting forward and backward with the hips. The pelvis may actually be tilting, but not independent of the rest of the body as we are seeking.
- Players may be embarrassed to perform this test, thinking they look like an idiot. Perform the movement with them at the same time to make them feel at ease. It is much easier to convince someone to do the test if you are actively participating as well.
- Players often times will attempt to tilt their pelvis via their upper body and back. This will usually show itself as a thrusting forward and backward with the torso. Again, the pelvis may be tilting, but not independent of the rest of the body as we are seeking.

PELVIC ROTATION TEST

TEST OBJECTIVE FOR PELVIC ROTATION TEST

The Pelvic Rotation Test checks the player's ability to rotate the lower body independently from the upper body. This is an important skill for properly sequencing the stride and to create a good separation between the upper and lower body. This movement requires good mobility of the spine, hips and pelvis, along with simultaneous stability of the thorax.

HOW TO PERFORM THE PELVIC ROTATION TEST

Begin by having the player assume a normal athletic posture and place their arms crossed over the shoulders. Their feet should be approximately shoulder width apart and their hands should be resting on the front of each shoulder. Once they are in position, tell them to not move the upper body while trying to rotate the lower body (belt and below) back and forth. Look for any movement of their shoulders or excessive lateral motion of the pelvis versus rotation. It should appear as if the player is doing the twist with no shoulder motion. Continue testing in both directions being sure to monitor the fluidity of motion of the pelvis both in the right and left directions because that fluidity is important in determining pitching issues. Be sure to monitor the motion of all body segments above the waist line including the torso, shoulders, arms, and head/neck region. A proper Pelvic Rotation Test will yield no motion above the waist line with only the pelvis rotating. It is acceptable for the legs and knees to be moving slightly along with the pelvis. However, any excessive knee bending and straightening should be noted.

If they have difficulty performing this action, try to differentiate between a stability or mobility problem. Do that by holding their upper body stable for them while having them try to rotate. If they still can't separate, they have a mobility problem. If they can separate, it is a stability problem.

CORRECT TESTING FORM



Square



Left Rotation



Right Rotation

PELVIC ROTATION TEST

WHAT TO LOOK FOR IN THE PELVIC ROTATION TEST

Mobility: Bilateral hip mobility and pelvis-to-thorax separation is needed to properly rotate during this test. We are looking for a smooth turn to the right and to the left with no choppiness or lateral movement. Look carefully for a shifting of the pelvis in a lateral direction to the right or left as compared to a rotary motion with the pelvis. Also, pay close attention to the movement of the legs and knees. Minimal movement is expected with this test; gross movement patterns with the legs straightening and bending should not be present.

Stability: Another key aspect of this test is to see if the player can stabilize their upper body and freely mobilize their pelvis. This will be seen by a torso that remains facing straight forward and arms and hands that are quiet and unmoving on the shoulders. The head and neck should also remain quiet during this screen.

PHYSICAL CAUSES OF A LIMITED PELVIC ROTATION TEST

Look at the following key regions for answers when a player presents with limitations in either mobility or stability during the Pelvic Rotation Test:

FOR MOBILITY RESTRICTIONS

- **Thoracic & Lumbar Spine Mobility** - Any restriction in spinal mobility is going to make this test more difficult to perform. Degenerative joint disease, facet subluxations, or disc pathologies are the usual suspects here. Another possible cause for limited spinal mobility is the amount of pelvic tilt utilized during the test. If the pelvis is too much in an anterior tilt (arched back), their mobility will be greatly reduced since the spinal facets are in a closed, packed position.
- **Muscular & Myofascial Restrictions in the Thorax and Spinal Muscles** - Any tightness or fascial restrictions over the Latissimus Dorsi, Erector Spinae, Multifidus, Deep Spinal Rotators, Quadratus Lumborum, etc., will reduce the player's ability to disassociate the lower body from the upper body.
- **Hip Mobility** - Any restriction in hip rotation can limit the player's ability to mobilize the pelvis. As stated before, hip internal rotation is a key factor.

FOR LOSS OF STABILITY

- **Thorax Stability** - Thorax stability is usually lost when a player has never focused on developing that type of strength. In other words, if they have trained on circuit equipment before, where the machine acts as the stabilizer versus their own muscles, limited stability is usually seen. The key here is to switch the workout programs to a stability dominated regimen, and they will develop this skill over time.

FOR POOR COORDINATION

- **Lateral Shifting Versus Rotary Motion** - Many players have the physical abilities (mobility and stability) to perform this test but still can't master the skill. There is definitely a skill involved. This means they are not used to using their obliques, leg muscles and intrinsic hip rotators to isolate pelvic rotation. This is a pattern that must be learned and retrained in many players.

TOE TAP TEST

TEST OBJECTIVE FOR THE TOE TAP TEST

The Toe Tap Test evaluates hip internal rotation and highlights any limitations that may affect the player's ability to coil and load into the hips.

This is a good way to measure the internal rotational mobility of the lower quarter. Hip and tibial internal rotation and ankle mobility are essential for proper pitching. The hip, tibia and ankle all coil and load in the wind-up and rotate and post in the lead leg from foot plant to finish. There is potential for excessive lateral motion in pitching (Sway, Hanging Back, Collapsing the Front Knee, etc.) anytime a player finds restrictions in internal rotation of the lower quarter.

HOW TO PERFORM THE TOE TAP TEST

Have the player stand with their feet one of their own foot lengths apart. Use a bat to help get into the correct starting position. Now place the handle of a bat directly between the feet (see picture below). Have the player try to rotate the left toe inwards (keeping the heel down) to touch the bat. This forces the player to rotate around the testing leg. The toe should easily reach the bat. Repeat on the other leg and compare. Each lower quarter should be able to rotate enough to touch the bat.

CORRECT SET-UP



TOE TAP TEST

WHAT TO LOOK FOR IN THE TOE TAP TEST

This test measures the amount of hip and tibial internal rotation that the player can perform standing. Our research shows that this physical attribute is paramount for proper loading into the back hip during the wind-up or to firm up into the front hip after foot plant.

Many players present with less than 40 degrees of internal rotation, where the average is over 40 degrees both directions. Pain may also be present with this test, so perform the test slowly and stop if there is any discomfort. Also make sure to note any big discrepancies between left and right.

PHYSICAL CAUSES OF LIMITED TOE TAP TEST

When a player presents with limitations in their Toe Tap Test we look at the following:

FOR MOBILITY ISSUES

- **Hip Joint Mobility** - Hip joint restrictions are extremely common.
- **Muscular, Capsular, & Myofascial Restrictions in the Hip and Pelvic Musculature** - Any tightness or fascial restrictions of the intrinsic hip rotators, joint capsule, Glutes, Piriformis, TFL, IT Band, and hip flexors can limit mobility.

TOE TAP TEST PITFALLS

When taking a player through this exam, be aware of the following:

- Don't let the heel come off the ground.
- Make sure the pelvis stays aligned.

HIP 45 TEST

TEST OBJECTIVE FOR HIP 45 TEST

This is a good way to measure the external rotational mobility of the lower quarter. Hip and tibial external rotation and ankle mobility are essential for proper pitching. There is potential for excessive or limited lateral motion or loss of posture in pitching anytime a player finds restrictions in the lower quarter.

HOW TO PERFORM THE HIP 45 TEST

Have the player get into a 45 degree angle between their feet (you can use home plate for a guide if needed). Place their hands on their hips and all their weight on the right leg. Have the player try to rotate their pelvis as far as possible towards the unloaded foot (to the left), which is angled at 45 degrees away from the right foot. Make sure the player keeps the right foot planted firmly on the ground and all of the weight on the right leg. This forces the player to rotate only around the right leg. They should be able to rotate their pelvis past the 45 degree mark (the left foot). Repeat on the left leg and compare.

CORRECT TESTING FORM



Testing Right External Hip Rotation

HIP 45 TEST

WHAT TO LOOK FOR IN THE HIP 45 TEST

This test measures the amount of hip and tibial external rotation that the player can perform standing. Our research shows that this physical attribute is paramount for good pitching mechanics.

Many players present with less than 45 degrees of external rotation, where the average is over 50 degrees both directions. Pain may also be present with this test, so perform the test slowly and stop if there is any discomfort. Also make sure to note any big discrepancies between left and right.

PHYSICAL CAUSES OF LIMITED HIP 45 TEST

When a player presents with limitations in their Hip 45 Test we look at the following:

FOR MOBILITY ISSUES

- **Hip Joint Mobility** - Hip joint restrictions are extremely common.
- **Muscular, Capsular, & Myofascial Restrictions in the Hip and Pelvic Musculature** - Any tightness or fascial restrictions of the intrinsic hip rotators, joint capsule, Glutes, Piriformis, TFL, IT Band, and hip flexors can limit mobility.

HIP 45 TEST PITFALLS

When taking a player through this exam, be aware of the following:

- Don't let the testing foot move from the starting position.
- Make sure the weight stays on the limb being tested.

SEATED TRUNK ROTATION TEST (WITH CERVICAL SPINE)

TEST OBJECTIVE FOR SEATED TRUNK ROTATION TEST

The Seated Trunk Rotation Test with the Cervical Spine is designed to identify how much rotational mobility is present in the cervic-thoraco-lumbar spine. Good separation between the upper and lower body is important for proper sequencing, to help generate speed and maintain a stable posture during pitching.

Many players lack true thoracic or cervical spine rotation. The lack of rotation may cause them to create excessive lumbar spine rotational forces or over use the shoulder joint to compensate for limited thoracic spine mobility.

HOW TO PERFORM THE SEATED TRUNK ROTATION TEST

Begin by asking the client to get into a seated position with knees and feet together, body in an upright and erect posture and arms extended out in the “W” position supporting a bat across the shoulders. Use two bats placed perpendicular to each other or home plate on the ground to see a 45 degree angle to measure the players rotation. First, if you are going to evaluate right rotation, have the player cross their right foot in front of their left leg and place the foot flat on the ground. This helps eliminate pelvic rotation during the test.

Next, ask the client to rotate the thorax to the right as far as possible, keeping the knees together and the feet on the ground. See if they can rotate past the 45 degree mark. If they clear the 45 degree mark, next ask them to rotate their head in the opposite direction, to the left. They should be able to get their chin over their clavicle (collarbone). In order to pass right rotation, they must clear both the shoulder turn and the head turn. Repeat in opposite direction for left rotation. Make sure you switch the legs as well (left on top of right).

Many players just rotate their shoulder blades and it looks like they are making a good shoulder turn, but they lack true thoracic spine rotation. This test assesses their true thoracic rotation with their shoulder blades locked to get a real picture of their spinal mobility.

CORRECT TESTING FORM



SEATED TRUNK ROTATION TEST

WHAT TO LOOK FOR IN THE SEATED TRUNK ROTATION TEST

They should be able to rotate past the 45 degree mark. Typical measurements range from 45-60 degrees in both directions.

Watch the player's knees and hips. It is imperative that the knees and pelvis stay still and pointing forward during the test.

PHYSICAL CAUSES FOR LIMITATIONS IN THE SEATED TRUNK ROTATION TEST

When a player presents with a limitation in thorax rotation:

- **Thoracic Spine Mobility** - Any restriction in thoracic spinal mobility is going to make this test difficult to perform. Degenerative joint disease, facet subluxations or rib cage restrictions are the usual suspects! If the thoracic spine has too much kyphosis ("C" Posture), the mobility will be greatly reduced since the spine is poor at flexion combined with rotation.
- **Muscular & Myofascial Restrictions in the Thorax and Spinal Muscles** - Any tightness or fascial restrictions of the latissimus dorsi, erector spinae, multifidus, deep spinal rotators, quadratus lumborum, etc., will reduce the player's ability to disassociate the lower body from the upper body.
- **Cervical Spine Mobility** - Any restriction in rotation in the cervical spine can limit the player's ability to rotate the thorax. The cervical spine goes through 70 degrees of rotation in the average player.

SIDE-STEP WALKOUT TEST

TEST OBJECTIVE FOR THE SIDE STEP WALKOUT TEST

The purpose of the Side Step Walkout Test is to evaluate hip joint mobility and groin flexibility. This will show whether the pitcher has the ability to stride and separate the feet effortlessly.

HOW TO PERFORM THE SIDE STEP WALKOUT TEST

Have the player lay supine on the ground. Place one baseball outside their heel and another baseball outside their shoulder (AC Joint). Without moving the baseballs, have the player stand up. Now, start with their left foot directly in-line with one of the baseballs. Next, instruct the player to walk out to the right (towards the other baseball) as far as they can go without moving the left foot. Once the player has walked out as far as they can go, compare their right foot position to the other baseball. There are three possible outcomes:

1. The right foot ends up outside the other baseball (great range).
2. The right foot ends up in line with the other baseball (normal range).
3. The right foot ends up short of the other baseball (limited range).

CORRECT TESTING FORM



SIDE STEP WALKOUT

WHAT TO LOOK FOR IN THE SIDE STEP WALKOUT TEST

Look for the athlete to be able to walk out past the other baseball. This should be equal to roughly 85% of the athletes height. This will give the athlete an advantage of maintaining posture with a large stride.

PHYSICAL CAUSES OF LIMITED SIDE STEP WALKOUT TEST

When an athlete presents with limitations in their walkout distance we look at the following:

FOR MOBILITY ISSUES

- **Limited Ankle Mobility** - poor mobility of the ankle, especially into inversion/eversion will limit their side step walkout.
- **Hip Joint Mobility** - Hip Joint restrictions are extremely common amongst baseball players.
- **Muscular, Capsular, & Myofascial Restrictions in the Hip and Pelvis Musculature** - Any tightness or fascial restrictions of the intrinsic hip rotators, joint capsule, glutes, piriformis, TFL, IT band, and hip flexors can limit mobility.

SIDE STEP WALKOUT TEST PITFALLS

When taking an athlete through this exam, be aware of the following:

- Don't let the feet flare out.
- Make sure the starting foot remains planted on the ground and doesn't shift

PUSH-OFF TEST - PART I

TEST OBJECTIVE FOR PART I OF THE PUSH-OFF TEST

Part I of the Push-Off Test is a great test for hip joint and groin mobility, combined with lower body motor control and stability. This is extremely important for a pitcher to be able to make a large stride.

HOW TO PERFORM PART I OF THE PUSH-OFF TEST

Have the player stand with their right foot next to the rubber or some mark on the ground. Make sure the right foot is perpendicular to the rubber. Have the player try to stride out directly sideways as far as they can go, keeping the right foot parallel to the rubber and on the ground. Mark the distance they stepped (place the object next to the toe of the striding foot). Measure the distance they stepped (front of the rubber to the toe - see red line below) using their own foot lengths. They should be able to stride at least 5 foot lengths.

CORRECT TESTING FORM



PUSH-OFF TEST - PART II

TEST OBJECTIVE FOR PART II OF THE PUSH-OFF TEST

Part II of the Push-Off Test is a great test for hip joint mobility, ankle plantarflexion and groin flexibility. This is extremely important for a pitcher to be able to make a larger stride.

HOW TO PERFORM PART II OF THE PUSH-OFF TEST

Repeat Part I of the test, but this time, allow the player to drive off the back foot as they would with a normal pitch - allowing the back foot to drag. Measure the gain in distance between the two strides. This should be at least 1/2 a foot length gain.

CORRECT TESTING FORM



HEEL LIFT TEST

TEST OBJECTIVE FOR HEEL LIFT TEST

The Tandem Heel Lift Test is a great test for ankle plantarflexion. This is a key movement that helps a pitcher gain distance and drive in their stride. Many times plantarflexion dysfunctions go undiagnosed for years.

HOW TO PERFORM HEEL LIFT TEST

Have the player stand with their left foot perpendicular to a wall, with their toes touching the wall. Place the right foot directly behind the left foot with the toes of the right foot touching the heel of the left foot. Both feet should be perpendicular to the wall. Now have the player lift their left foot off the ground and place it next to the right foot, but still in the air. Maintaining balance only on the right foot, have the player try to lift their right heel up off the ground.

CORRECT TESTING FORM



HEEL LIFT TEST

WHAT TO LOOK FOR IN THE HEEL LIFT TEST

They should be able to get at least 40 degree off the ground (approximately one baseball should fit completely under the player's heel).

PHYSICAL CAUSES OF LIMITED HEEL LIFT TEST

- **Ankle Joint Mobility** - Ankle plantarflexion joint restrictions, specially with a history of ankle sprains or Achilles tendon injuries.
- **Fascial Restrictions** - Any restriction in the anterior or posterior chain fascial chain can lead to ankle or tibial rotation limitations.

ANKLE ROCK AND ROLL TEST

TEST OBJECTIVE FOR THE ANKLE ROCK AND ROLL TEST

The Ankle Rock and Roll test is great for checking ankle mobility and stability. This will show whether the player has the ability to invert and evert the ankles and rotate the tibia which are all critical when loading and weight shifting.

HOW TO PERFORM THE ANKLE ROCK AND ROLL TEST

Having the player sit on a chair, keep their knees at 90 degrees and their legs separated. Instruct the player to evert both ankles (roll in) then invert both ankles (roll out) without moving their knees. If they are unable to perform this without accessory motion, hold their knees to help stabilize and repeat the test. This added support should prevent accessory knee or hip movements during this test and help improve stability dysfunctions.

Next, instruct the player to externally (turn out) and internally (turn in) rotate their feet keeping the knee still and flexed.

CORRECT TESTING FORM



INVERSION

EVERSION

ANKLE ROCK AND ROLL TEST

WHAT TO LOOK FOR IN THE ANKLE ROCK AND ROLL TEST

The Rocking portion of the test is qualitative not quantitative (pass or fail), but the correct range of motion for the ankle is 30 degrees inversion and 20 degrees of eversion. The Rolling portion of the test is quantitative and the correct range of motion for the ankle is 20 degrees of internal rotation and 40 degrees of external rotation.

If the player's knees continue to move or they now can not move their ankles when holding the knees, assume they must have mobility limitations in the ankles.

If they can't do the motion without external stability, but they can when someone holds their knees, assume they have a stability problem.

PHYSICAL CAUSES OF LIMITED ANKLE ROCK AND ROLL TEST

- **Ankle Joint Mobility** - Ankle joint restrictions are very common, specially with a history of ankle sprains.
- **Fascial Restrictions** - Any restriction in the anterior or posterior chain fascial chain can lead to ankle or tibial rotation limitations.



EXTERNAL

INTERNAL

HALF-KNEELING NARROW BASE TEST

TEST OBJECTIVE FOR THE HALF-KNEELING NARROW BASE TEST

The Half-Kneeling Narrow Base Test is great for checking balance and stability with one hip flexed and the other extended (the lunge pattern).

HOW TO PERFORM THE HALF-KNEELING NARROW BASE TEST

Having the player get into a half-kneeling position such that both the feet and the knees are in a straight line and the back foot is a plantar-felxed postion (laces down). Using the first or third base line is perfect for true alignment. The player has 3 seconds to gain balance and then must hold the position solidly for 3 seconds while maintaining tall posture. Make sure they are not using their back foot for balance.



HALF-KNEELING NARROW BASE TEST

WHAT TO LOOK FOR IN THE HALF-KNEELING NARROW BASE TEST

Any loss of posture or loss of balance shows the player's inability to maintain upright posture in a lunge pattern. They should look very stable with no movement at all.

PHYSICAL CAUSES OF LIMITED HALF-KNEELING NARROW BASE TEST

- **Hip/Core Stability** - Limitations in weight bearing hip and core stability can make this test difficult.
- **Trunk Stability** - The ability to maintain an upright stable trunk can be difficult for some players. This is due to postural stabilizers and deep spine stabilizers not functioning properly.

LUNGE WITH EXTENSION TEST

TEST OBJECTIVE FOR THE LUNGE WITH EXTENSION TEST

The Lunge with Extension tests for normal extension of hips and spine while maintaining full shoulder flexion.

HOW TO PERFORM THE LUNGE WITH EXTENSION TEST

Have the player lay supine on the ground. Place one baseball outside their heel and another baseball outside their shoulder (AC Joint). Without moving the baseballs, have the player stand up. Now have the player get into a wide lunge (stride stance) with their front foot inside the top ball, their back heel inside the bottom ball and their front knee directly over the back of their front heel. Next, have the player raise their arms into a full shoulder flexion position, with their elbows fully extended. Ask the player to bend backward as far as possible, making sure the front knee position remains unchanged. Direct the player to look up towards hands during the movement.

Special Note: If the arms do not start in a full shoulder flexion position, the test is already dysfunctional. Proceed through the motion to only check for pain.



LUNGE WITH EXTENSION TEST

WHAT TO LOOK FOR IN THE LUNGE WITH EXTENSION TEST

Any limitation in full extension (either shoulder, spine or hip) highlights the player's inability to maintain upright posture in a lunge pattern. The player should be able to achieve the following positions:

- Maintain full shoulder flexion throughout test (humerus covers ear)
- Shoulders cross the back mid-thigh line (the line that bisects the back hamstring)

PHYSICAL CAUSES OF LIMITED LUNGE WITH EXTENSION TEST

When a player presents with limitations we look at the following:

- Potential Mobility Limitations
 - » Hip Joint Restrictions
 - » Muscular, Capsular, & Myofascial Restrictions in the Hip and Pelvic Musculature
 - » Thoracic Spine Mobility
 - » Muscular & Myofascial Restrictions in the Thorax and Spinal Muscles
 - » Shoulder Girdle Mobility
 - » Muscular & Myofascial Restrictions in the Shoulder Girdle Muscles
- Potential Stability Limitations
 - » Weight Bearing Hip Extension Dysfunction
 - » Weight Bearing Thorax Extension Dysfunction
 - » Weight Bearing Shoulder Flexion Dysfunction
 - » Postural Stability Problem

WIDE SQUAT TEST

TEST OBJECTIVE FOR THE WIDE SQUAT STEP

The wide squat assessment tests for bilateral symmetrical mobility of the hips, knees and ankles.

HOW TO PERFORM THE WIDE SQUAT STEP

The player assumes the starting position by placing their feet shoulder width apart and arms out in front of their body. The feet should be in the sagittal plane - toes pointing straight ahead. Have them slowly descend as deeply as possible into a squat position, allowing their arms to remain out front. The squat position should be maintained with the heels on the floor and head and chest facing forward. If the player breaks parallel (hips below knees) at the bottom of the squat, now have them try to lower their arms to touch their fists on floor within their footprint. They should be able to remain stable at the bottom of the squat throughout movement.



WIDE SQUAT TEST

WHAT TO LOOK FOR IN THE WIDE SQUAT TEST

During this test you are looking for the player to achieve a full deep squat with stability and no loss of control:

- Thighs break parallel
- Touches fists to floor within footprint
- Maintains Sagittal plane
- Without excessive effort and/or motor control

Any loss of stability or control can make it difficult for the player to maintain posture and space during their swing.

PHYSICAL CAUSES OF LIMITED WIDE SQUAT TEST:

When a player presents with limitations in their Wide Squat Test we look at the following:

- Potential Mobility Limitations
 - » Hip Flexion Joint Restrictions
 - » Ankle Mobility Restrictions
 - » Knee Flexion Mobility Restrictions
 - » Muscular, Capsular, & Myofascial Restrictions in the Hip and Pelvic Musculature
- Potential Stability Limitations
 - » Weight Bearing Hip Stability Dysfunction
 - » Weight Bearing Knee Stability Dysfunction
 - » Weight Bearing Ankle Stability Dysfunction

SHOULDER 90/90 TEST

TEST OBJECTIVE FOR 90/90 TEST

This test is designed to highlight any limitations in mobility of the gleno-humeral joint and/or stability of the scapulo-thoracic junction. More specifically, the 90/90 Test measures the player's range of external rotation in the shoulder and their ability to maintain scapular stability in an athletic posture versus a full stride posture. We look at the amount of external rotation in each shoulder from a standing position and then compare that range to how the shoulder rotates in their stride posture. Many players will lose range of motion in their stride posture due to a lack of scapular stability. If the shoulder blade elevates or flares due to muscular imbalances or poor posture in their baseball stance, it will change the orientation of the glenoid fossa (shoulder joint). This in turn, will greatly reduce the amount of external rotation in their shoulder joint.

HOW TO PERFORM THE 90/90 TEST

Have the player stand tall and hold their right arm out to their side with 90 degrees of flexion in their elbow and 90 degrees of side abduction at the shoulder joint. Now, without letting them bend their thorax backward, have the player try to externally rotate (rotating the hand up and back) their right hand as far as possible. Only continue rotating as far as the body will allow with no compromises in the posture (no arching of the back!). Never perform this test to the point of pain or discomfort.

Once the client is in a fully externally rotated position, it is time to grade the degrees of rotation. We are going to place them into one of three categories (see picture on opposite page):

- **Less than Spine Angle** - their forearm does not externally rotate past the angle of their spine angle (usually less than 90 degrees)
- **Equal to Spine Angle** - their forearm is parallel to their spine angle (usually 90 degrees)
- **More than Spine Angle** - their forearm externally rotates past their spine angle (usually greater than 90 degrees)
- **Repeat on the opposite side.**



SHOULDER 90/90 TEST

During the test make sure they are only rotating their shoulders and not arching their spine by making sure they don't bend their torso backward. Like always, if there is any pain or discomfort, stop the test.

WHAT TO LOOK FOR IN THE SHOULDER 90/90 TEST

In this test you have three possible problems that may be highlighted:

- The player has limited external rotation in the glenohumeral joint.
- The player has limited stability in the shoulder girdle.
- The player has both limited external rotation and limited stability in the shoulder girdle.

All three outcomes can create pitching compensations or lead to shoulder injuries based on the player's biomechanics.

PHYSICAL CAUSES OF LIMITED SHOULDER 90/90 TEST

For glenohumeral mobility limitations

- **Shoulder Instability** - In a normal functioning shoulder the humerus will stay centered in the glenoid fossa throughout all ranges of movement. Sometimes due to imbalances in the rotator cuff muscles the humerus will shift or slide around the glenoid fossa. If that happens, mobility will usually be reduced.
- **Overdevelopment of the Internal Rotators** - If there is an imbalance in the muscle length tension between the internal and external rotators of the shoulder, mobility can be reduced. The two major internal rotators that can become over-developed, especially in a player, are the Lats and the Subscapularis.
- **Capsular Tightness** - The shoulder is surrounded by a capsule that aids in keeping all anatomy soundly in place. In some cases this capsule is too tight in certain areas and will thereby limit certain ranges of motion.
- **External Rotator Injury or Weakness** - The Teres Minor and/or Infraspinatus muscle may present with injury or weakness and the inability to mobilize the shoulder through the proper external ranges of motion.

FOR SCAPULAR STABILITY LIMITATIONS

- **Mid-Scapular Muscular Weakness** - Any weaknesses in the Rhomboids, Mid to Lower Trapezius, or Serratus Anterior muscles can lead to scapular instability.
- **C-Posture** - When a player presents with an Upper Crossed Syndrome, the shoulder blades tend to pull apart from one another and thereby alter the position of the glenoid fossa. This can dramatically reduce the shoulder's ability to externally rotate.

SHOULDER WINDSHIELD WIPER TEST

TEST OBJECTIVE FOR THE SHOULDER WINDSHIELD WIPER TEST

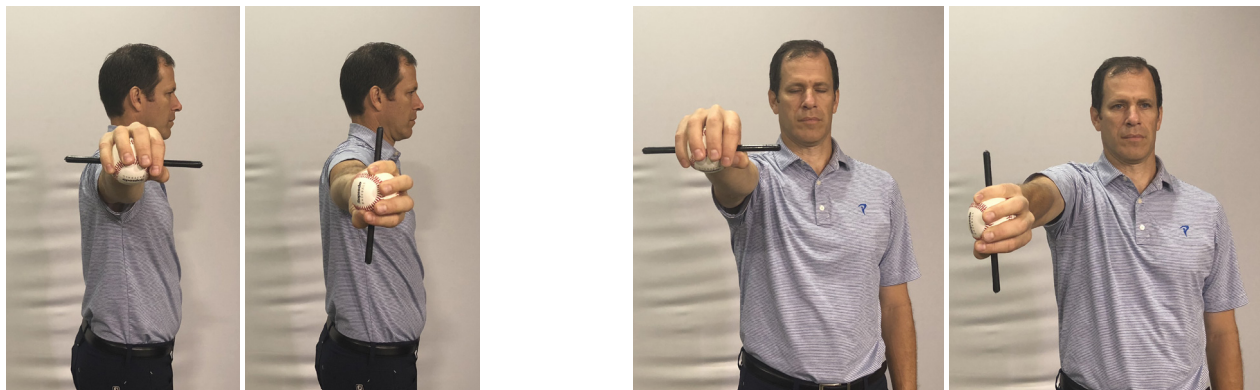
The Shoulder Windshield Wiper Test checks the player's ability to internally rotate the shoulder (turn the thumb down). This is an important skill for properly releasing the ball during the pitching motion. This movement requires good mobility of the shoulder girdle, forearm and thoracic spine.

HOW TO PERFORM THE SHOULDER WINDSHIELD WIPER TEST

To test the left shoulder, begin by having the player grab a baseball in their left hand and stand tall with their feet pelvic width apart and their left arm extended directly out to their side. Have the player start with their palm facing the ground. Now, **keeping the shoulder 90 degrees and the hand in-line with the trunk**, have them rotate the thumb down as far as possible. They should be able to rotate to 90 degrees (thumb goes vertical) Repeat in the opposite direction for the right shoulder.

Next, check the same range of motion with the shoulder flexed directly out in front of the player. Have the player start with their palm facing the ground. Now, **keeping the shoulder 90 degrees**, have them rotate the thumb down as far as possible. They should be able to rotate to 90 degrees (thumb goes vertical) Repeat in the opposite direction for the right shoulder.

SHOULDER WINDSHIELD WIPER TESTING FORM



SHOULDER WINDSHIELD WIPER TEST

WHAT TO LOOK FOR IN THE SHOULDER WINDSHIELD WIPER TEST

During this exam you are looking for adequate ranges of motion in the internal rotation of the shoulder.

The results will be scored as one of the following findings:

- = or > 90 degrees (front)
- < 90 degrees (front)
- = or > 90 degrees (at side)
- < 90 degrees (at side)

PHYSICAL CAUSES OF THE SHOULDER WINDSHIELD WIPER TEST

If the athlete cannot perform the Shoulder Windshield Wiper test to equal or past 90 degrees, potential reasons are typically focused in two areas.

FOR MOBILITY RESTRICTIONS

- **Glenohumeral Joint Mobility** - Any gross limitation in the glenohumeral joint can show as a positive test. If there is an imbalance in the muscle length tension between the internal and external rotators of the shoulder, internal rotation mobility can be reduced. The two major external rotators that can become over-developed, especially in a pitchers, are Teres Minor and Infraspinatus.
- **Forearm Rotation Joint Mobility**- Restrictions between the ulna and the radius in the forearm. Any gross limitation in the forearm can show as a positive test. This can be due to joint or soft tissue restrictions.

FOREARM 80/80 TEST

TEST OBJECTIVE FOR THE FOREARM 90/90 TEST

The Forearm 80/80 Test is an important test to determine the mobility of the wrist and forearm in two specific movement patterns; Pronation and Supination. The ability to both Pronate and Supinate the wrist is imperative for proper throwing mechanics, as well as power production in pitching.

HOW TO PERFORM THE FOREARM 80/80 TEST

In a standing position, begin the test by having the player holding a ball with the shoulder at 90 degrees, the elbow at 90 degrees and the ball and palm facing forward. Next, have the player try to fully pronate the forearm and turn the ball facing away from their head. They should be able to turn a full 80 degrees. Now try to supinate a full 80 degrees by having them turn the ball and palm so they face their head. Again, they should be able to complete a full 80 degree turn. Repeat on both sides to check for symmetry.

CORRECT TESTING FORM



PRONATION

SUPINATION

FOREARM 80/80 TEST

WHAT TO LOOK FOR IN THE FOREARM 80/80 TEST

During this exam you are looking for the forearm to travel a minimum of:

- 80 degrees counter clockwise (facing the head - curve ball - supination)
- 80 degrees clockwise (facing away - change-up - pronation)

If the player has restricted forearm range of motion, but has good shoulder range of motion, this may put excessive stress on the shoulder.

If the player has restricted shoulder range of motion, but has good forearm range of motion, this may put excessive stress on the elbow.

PHYSICAL CAUSES FOR POOR FOREARM 80/80 TEST

When a client presents with limitations in either Pronation or Supination in either forearm, during the Forearm 80/80 Test, we will look to some key regions for answers.

- **Joint Mechanics** - A limitation may be present if there is a disturbance in the forearm's Radio-Ulnar Joint Axis. This axis is an oblique line that connects the superior and inferior Radio-Ulnar joints. It is around this axis that the Radius/Ulna/Wrist can both Pronate and Supinate.

Disruptions in this joint axis can stem from traumatic events such as bone fractures or surgeries. Many other issues may also be present if this axis is not setup correctly.

- **Muscular Mechanics** - During Pronation of the forearm and wrist, the muscles that account for the ranges of motion are as follows; Pronator Quadratus, Pronator Teres, and the Flexor Carpi Radialis. Strength or mobility issues present in any of these muscles can lead to limitations in the ability of the client to forward Pronate the wrist and forearm. During Supination of the forearm and wrist, the muscles that account for the ranges of motion are as follows; Supinator, Extensor Pollicis Longus, and Extensor Indices. Strength or mobility issues present in any of these muscles can lead to limitations in the ability of the client to forward Supinate the wrist and forearm.

FOREARM 80/80 TEST PITFALLS

- Make sure the shoulder and elbow remain in the 90/90 position throughout the test.

| | | | | | |
|--------------------------------------|---|--------------------------------|---|--|---|
| Name: | | Age: | | Date: | |
| Hits: RT LT | | Throws: RT LT | | Weight: | |
| | | | | Height: | |
| Pelvic Tilt | | Toe Tap Test | | Side Step Walkout Test | |
| Athletic Posture (Subjective) | | L One Foot Length Apart | R | Top of Shoulder to Foot | |
| Neutral Tilt | | Touches | | On Base Line | |
| S-Posture | | Short | | Equal to Ball | |
| C-Posture | | L Holding Pelvis | R | Unable to Complete | |
| Amount of Motion | | Improves | | Push-Off Test | |
| Normal Motion | | No Change | | Lunge w/ Extension Test | |
| Hard Time Arching Back | | Hip 45 Test | | Part I - Keeping Back Foot Down | |
| Hard Time Flattening Back | | L 45 Degree Angle | R | 5-6 Foot Lengths | |
| Both Limited | | Greater than 45 degrees | | < 5 Foot Lengths | |
| Quality of Movement | | Equal to 45 Degrees | | Part II - Normal Throw | |
| Smooth Movement | | Less than 45 degrees | | > 1 Foot Length Increase | |
| Shake and Bake Movement | | Seated Trunk Rotation | | .5 - 1 Foot Length Increase | |
| Did Not Test | | L Bat Behind Back | R | < .5 Foot Length Increase | |
| Pelvic Rotation | | Greater than 45 degrees | | Heel Lift Test | |
| L Without Holding Shoulders | R | Equal to 45 degrees | | Arms In Front | |
| Good | | Less than 45 degrees | | Good Squat | |
| Limited | | Turning Head | | Limited Squat | |
| L Holding Shoulders | R | Good - Over Clavicle | | Arms Down | |
| Improves | | Limited - Short of Clavicle | | Stable | |
| Doesn't Improve | | | | Unstable | |
| L Coordination | | | | Rolls Outside | |
| Good Rotary Movement | | | | Ankle Rock and Roll Test | |
| More Lateral Movement | | | | Ankle Rolling Test | |
| | | L Seated w/o Holding | R | L Seated Turning In | R |
| | | Good Inversion | | 20 degrees or more | |
| | | Good Eversion | | Limited (<20 degrees) | |
| | | Limited Eversion (Roll In) | | L Seated Holding Turn In | R |
| | | Limited Inversion (Roll Out) | | 20 degrees or more | |
| | | L Seated Holding | R | Limited (<20 degrees) | |
| | | Improves Eversion | | L Seated Turning Out | R |
| | | Improves Inversion | | 20 degrees or more | |
| | | Limited Eversion (Roll In) | | Limited (<20 degrees) | |
| | | Limited Inversion (Roll Out) | | L Seated Holding Turn Out | R |
| | | | | 20 degrees or more | |
| | | | | Limited (<20 degrees) | |

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| Core Control Gang |
| Rotation Gang |
| Stride Gang |
| Upright Posture Gang |
| Arm Gang |
| Normal |



| | | | | | |
|--------------------------------------|----------------------------------|------------------------------|--------------------------------|-------------------------------|--|
| Name: | | Age: | | Date: | |
| Hits: RT LT | | Throws: RT LT | | Weight: | |
| Hits: RT LT | | Throws: RT LT | | Height: | |
| Pelvic Tilt | | Toe Tap Test | | Side Step Walkout Test | |
| Athletic Posture (Subjective) | | L | One Foot Length Apart | R | Top of Shoulder to Foot |
| Neutral Tilt | | | Touches | | On Base Line |
| S-Posture | | | Short | | Equal to Ball |
| C-Posture | | L | Holding Pelvis | R | Less than Ball |
| Amount of Motion | | | Improves | | Push-Off Test |
| Normal Motion | | | No Change | | Part I - Keeping Back Foot Down |
| Hard Time Arching Back | | Hip 45 Test | | | > 6 Foot Lengths |
| Hard Time Flattening Back | | L | 45 Degree Angle | R | 5-6 Foot Lengths |
| Both Limited | | | Greater than 45 degrees | | < 5 Foot Lengths |
| Quality of Movement | | | Equal to 45 Degrees | | Part II - Normal Throw |
| Smooth Movement | | | Less than 45 degrees | | > 1 Foot Length Increase |
| Shake and Bake Movement | | Seated Trunk Rotation | | | .5 - 1 Foot Length Increase |
| Did Not Test | | L | Bat Behind Back | R | < .5 Foot Length Increase |
| Pelvic Rotation | | | Greater than 45 degrees | | Heel Lift Test |
| L | Without Holding Shoulders | R | Equal to 45 degrees | L | Height of Lift |
| | Good | | Less than 45 degrees | | Good Lift |
| | Limited | R | Turning Head | L | Limited Lift |
| L | Holding Shoulders | R | Good - Over Clavicle | L | Quality of Lift |
| | Improves | | Limited - Short of Clavicle | | Raises Straight Up |
| | Doesn't Improve | | | | Rolls Outside |
| L | Coordination | R | | | Ankle Rock and Roll Test |
| | Good Rotary Movement | | | | Seated w/o Holding |
| | More Lateral Movement | | | | Good Inversion |
| | | | | | Good Eversion |
| | | | | | Limited Eversion (Roll In) |
| | | | | | Limited Inversion (Roll Out) |
| | | | | | L Seated Holding R |
| | | | | | Improves Eversion |
| | | | | | Improves Inversion |
| | | | | | Limited Eversion (Roll In) |
| | | | | | Limited Inversion (Roll Out) |
| | | | | | L Seated Holding Turn In R |
| | | | | | 20 degrees or more |
| | | | | | Limited (<20 degrees) |
| | | | | | L Seated Holding Turn Out R |
| | | | | | 20 degrees or more |
| | | | | | Limited (<20 degrees) |

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| S-Posture | | Short | | Equal to Ball | |
| C-Posture | | L Holding Pelvis | R | Less than Ball | |
| Amount of Motion | | Improves | | Push-Off Test | |
| Normal Motion | | No Change | | Lunge w/ Extension Test | |
| Hard Time Arching Back | | Hip 45 Test | | Part I - Keeping Back Foot Down | |
| Hard Time Flattening Back | | L 45 Degree Angle | R | > 6 Foot Lengths | |
| Both Limited | | Greater than 45 degrees | | < 5 Foot Lengths | |
| Quality of Movement | | Equal to 45 Degrees | | Part II - Normal Throw | |
| Smooth Movement | | Less than 45 degrees | | > 1 Foot Length Increase | |
| Shake and Bake Movement | | Seated Trunk Rotation | | .5 - 1 Foot Length Increase | |
| Did Not Test | | L Bat Behind Back | R | < .5 Foot Length Increase | |
| Pelvic Rotation | | Greater than 45 degrees | | Heel Lift Test | |
| L Without Holding Shoulders | R | Equal to 45 degrees | | L Height of Lift | |
| Good | | Less than 45 degrees | | R Good Lift | |
| Limited | | R Turning Head | L | L Quality of Lift | |
| L Holding Shoulders | R | Good - Over Clavicle | | R Stable | |
| Improves | | Limited - Short of Clavicle | | Raisers Straight Up | |
| Doesn't Improve | | | | Rolls Outside | |
| L Coordination | R | | | Ankle Rock and Roll Test | |
| Good Rotary Movement | | | | Ankle Rolling Test | |
| More Lateral Movement | | | | L Seated w/o Holding | R |
| | | | | L Seated Turning In | |
| | | | | R Seated Turning In | |
| | | | | 20 degrees or more | |
| | | | | Good Inversion | |
| | | | | Good Eversion | |
| | | | | Limited (<20 degrees) | |
| | | | | L Seated Holding Turn In | R |
| | | | | Limited Eversion (Roll In) | |
| | | | | 20 degrees or more | |
| | | L Seated Holding | R | Limited (<20 degrees) | |
| | | | | L Seated Turning Out | R |
| | | | | Improves Eversion | |
| | | | | 20 degrees or more | |
| | | | | Improves Inversion | |
| | | | | Limited Eversion (Roll In) | |
| | | | | Limited (<20 degrees) | |
| | | L Seated Holding Turn Out | R | 20 degrees or more | |
| | | | | Limited (<20 degrees) | |

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| Shake and Bake Movement | | Seated Trunk Rotation | | .5 - 1 Foot Length Increase | |
| Did Not Test | | L Bat Behind Back | R | < .5 Foot Length Increase | |
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| L Without Holding Shoulders | R | Equal to 45 degrees | | L Height of Lift | R |
| Good | | Less than 45 degrees | | Good Lift | |
| Limited | | R Turning Head | L | Limited Lift | |
| L Holding Shoulders | R | Good - Over Clavicle | | L Quality of Lift | R |
| Improves | | Limited - Short of Clavicle | | Raises Straight Up | |
| Doesn't Improve | | | | Rolls Outside | |
| L Coordination | R | | | Ankle Rock and Roll Test | |
| Good Rotary Movement | | | | L Seated w/o Holding | R |
| More Lateral Movement | | | | Good Inversion | |
| | | | | Good Eversion | |
| | | | | L Limited Eversion (Roll In) | R |
| | | | | Limited Inversion (Roll Out) | |
| | | L Seated Holding | R | Limited (<20 degrees) | |
| | | Improves Eversion | | L Seated Turning Out | R |
| | | Improves Inversion | | 20 degrees or more | |
| | | Limited Eversion (Roll In) | | Limited (<20 degrees) | |
| | | Limited Inversion (Roll Out) | | L Seated Holding Turn Out | R |
| | | | | 20 degrees or more | |
| | | | | Limited (<20 degrees) | |

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