

ONBASE UNIVERSITY

LEVEL 1

HITTING

SPONSOR



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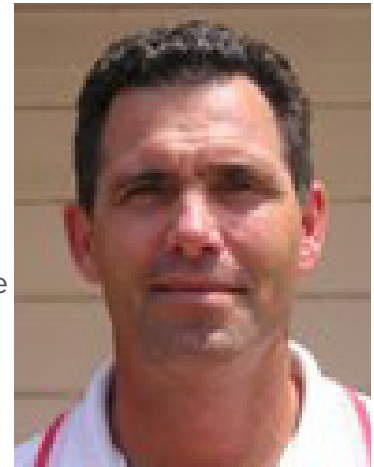
DR. GREG ROSE, DC

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).



DON SLAUGHT

When it comes to baseball, Don Slaughter 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.



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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”.



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

THE BIG 13
13 COMMON INHIBITORS
TO AN EFFICIENT SWING

KEYS TO HITTING

THE THREE MEASURES OF HITTING:

Power comes from the speed of each body part (the gears) and how well they work together in a synchronized chain (Kinematic Sequence). This is known in both baseball and softball as “**Addition**”. In other words, this is how the body adds or transitions the forces together to ultimately accelerate the bat.

Contact is a function of timing and bat path. Correct timing and a good bat path create a larger acceptable margin for error, therefore, allowing a player to make better or more consistent contact each time.

Efficiency is the player’s ability to adjust to speeds and locations of the pitch. By eliminating any extra moves that costs the hitter time and effort, it allows them to adapt to each pitch more successfully. There is a position that enables players to adjust efficiently to different speeds and locations of the pitch.

11 KEY POSITIONS AND/OR MOVEMENTS

THE 11 KEY POSITIONS AND/OR MOVEMENTS :

One can divide the hitting motion into eleven distinct phases. Those phases include:

PREPARATION PHASE

1. **Stance** - The starting position of the hitter prior to any movement by the pitcher.
2. **Negative Move** - Any movement away from the pitcher and the furthest point back prior to moving forward.
3. **Positive Move** - This is the movement towards the pitcher and ends at Toe Touch/ Ready Position. This is also where we see separation of the hands from the body.
4. **Toe Touch/Ready Position** - The position the hitter can efficiently start their swing. Most hitters reach this point at Toe Touch. Others get their foot down early and then have a Positive Move to their Ready Position.

SWING PHASE

5. **Heel Plant** - When the front foot heel gets firmly planted.
6. **First Move** - The First Move is the first 3 or 4 inches the hands move forward in the swing.
7. **Connection** - Position when the hands pass in front of the back shoulder.
8. **Bat lag** - Point when the barrel of the bat enters the strike zone.
9. **Contact** - closest frame to when the bat hits the ball.
10. **Extension** - Position where both arms get fully extended.
11. **Finish** - When the bat stops rotating around the body.

THE BIG 13

13 COMMON INHIBITORS TO AN EFFICIENT SWING:

1. **Sway** - Knee over or outside back foot
2. **Loss of Posture** - loss of attacking posture before Ready Position or not reversing posture at Heel Plant
3. **Loss of Space** - Lose your spacing, straightening up, hips move closer to home plate, DP Stride, swinging around body
4. **Dead Hands** - No or early separation
5. **Loss of Base** - No pressure between knees and feet, they lose ability to store energy and adjust to different speeds and locations
6. **Hanging Back** - No positive/linear move/no weight shift - Not enough weight into front foot - prior to starting your swing.
7. **Gate Swing** - Body doesn't disassociate, turns as one unit, swinging around body
8. **Casting the Hands** - Hands going outside front elbow too soon. Not adjusting from inside to outside.
9. **Flying Elbow** - Elbow sticking out behind hands at Toe Touch
10. **Dumping the Barrel** - Loose angles in bat early - contact past 90-degree angle
11. **Drifting** - Lack of a firm front side after front foot contact.
12. **Small Zone** - Swinging down or across the plane of the pitch creates a small zone and a small margin for error
13. **Push** - Hands go in front of back elbow. One arm pushing one pulling bat.

DESCRIPTION

A Sway is any excessive lower body lateral movement away from the pitcher during the Negative Move that forces the weight to the outside of the back foot. This hitting characteristic makes it very difficult to develop a consistent and repeatable stride or Positive Move. We want the players timing from stance to Toe Touch/Ready Position to be consistent so the only variable is the speed of the pitch. Creating a stable platform allows them to load into their back foot and drive their weight from their back leg into their front leg in a very efficient manner.

VIDEO ANALYSIS

Sway is seen using the face-on camera view. Start by drawing a vertical line up from the middle of back foot at the Stance. Advance the video to the end of the Negative Move. If the middle of the back knee moves outside of back foot line any time during the Negative Move that is considered a sway. Be picky when it comes to assessing excessive motions; if the knee moves what appears to be only one inch past the line, it is still considered a sway.



NORMAL

SWAY

PHYSICAL CAUSES

Several physical limitations may cause a Sway:

- **Limited Back Hip Mobility** - Foremost, back hip internal rotation is paramount for full rotation into the back hip without any lateral Sway during the Negative Move. If the body is unable to rotate around the back hip due to joint or muscular restrictions, lateral movements will dominate the pattern.
- **Limited Back Ankle Mobility** - back side ankle mobility (eversion) is extremely important for proper loading and ground force reactions during the Negative Move. 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 Negative Move. 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** - Finally, the ability to laterally stabilize the back leg during the Negative Move is directly proportional to the strength and proper motor control of the musculature of the lower extremity, gluteal and other core muscles.

DESCRIPTION

Creating and maintaining a correct posture is essential to getting the most out of the swing. From Negative Move to the Toe Touch\Ready Position the hitter normally has an Attacking Posture (a slight forward lean towards the pitcher with their upper body) and then at Heel Plant they should have a Backward Posture (a slight backward lean away from the pitcher with their upper body) so they can fully transition into rotation. This shift in posture allows the hitter to control the speed and timing of the Positive Move and the weight shift throughout the swing. A Loss of Posture is the reverse of any of these normal postures and can have many causes. Many times this is also referred to as collapsing the back side or dipping the back shoulder. A Loss of Posture at Heel Plant can be caused by excessive upper body lean. This hitting characteristic makes it difficult for players to stop their linear move and transition fully into rotation. This affects the hitter's ability to generate and transition energy and adjust to speeds of the pitch. It also tends to disconnect the lower body from the upper body.

VIDEO ANALYSIS

The easiest way to diagnose Loss of Posture is to draw a line from the inside eye (right eye for right-handed batter) to the middle of the pelvis (belt buckle) at the Negative Move (red line), Toe Touch\Ready Position (yellow line), and Heel Plant (green line). At the Negative Move the line starting from the inside eye should slant down towards the hitters back foot. That line is called the Attacking Posture line. At Toe Touch\Ready Position the hitter should still have an Attacking Posture but the angle of the line may decrease. At Heel Plant the slope or angle of the line should be reversed (Backward Posture) enabling the hitter to stop his head and transition fully into rotation. If any of these lines are leaning the wrong direction the hitter has a Loss of Posture. Another way to describe it is to say the head (eyes/nose/chin) are slightly ahead of belly button or belt buckle in the Negative Move and Toe Touch and the belt Buckle is slightly ahead of the inside eye at Heel Plant.



PHYSICAL CAUSES

Several physical limitations may cause a Loss of Posture:

- **Limited Thorax Mobility** - Usually, there is a coupled motion of thorax rotation, extension and lateral bend during the Negative Move. If thorax mobility is reduced, then altered movements (compensations) of the thorax can occur. Thorax mobility can be reduced by abdominal fascial restrictions, rib cage mobility limitations, reduced spinal mobility and even poor shoulder (Latissimus) flexibility.
- **Limited Spine Disassociation** - The ability to separate the upper body from the lower body (disassociation) allows the shoulders to rotate correctly around the spine with good posture. 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 Core Stability** - This is the inability of the core (pelvis, hips and lumbar spine) to properly engage and create a stable base for the thorax to rotate around. Abdominal and gluteal weakness or inhibition can lead to poor core stabilization in hitting.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the thorax to become over active and have a Loss of Posture. Overall leg strength and power is essential for maintaining a proper sequence during hitting.
- **Limited Shoulder Mobility & Stability** - Glenohumeral restrictions or any gross limitation in the glenohumeral joint can alter a player's trunk motion. Any lack of shoulder stability in the shoulder girdle can also create the same problems.
- **Limited Front Hip Mobility and Stability** - The player should firm up the front side after Heel Plant, which helps create a normal trunk spine angle. Limitations in front hip mobility and stability can force them to have a Loss of Posture.

DESCRIPTION

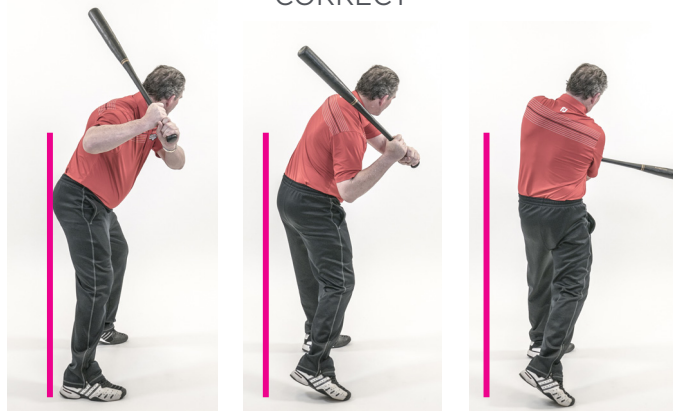
A hitter needs to create and maintain room for his arms to swing down the line of the pitch. There are several ways of losing the spacing needed to hit in a big zone or have the sweet spot of the bat traveling down the line of the pitch. The most prevalent is not having enough bend in the knees and the waist to create space for the back elbow to swing past the hips. The second most common is for the player to load his back elbow behind his back where there is no direct path back down the line of the pitch. Others are standing up out of the legs, straightening the back, or the pelvis moving closer to the plate. All of these take away the room needed to swing the bat efficiently down the line of the pitch. These problems also restrict the ability to transition the energy up through the body and into the arms and bat. Often they describe Loss of Space as a feeling of being stuck or tied up on inside pitches.

VIDEO ANALYSIS

The easiest way to diagnose this characteristic is from the down-the-line camera view. Move the video to the start of the Positive Move and draw a vertical line directly behind the pelvis. If they player has enough forward bend and has maintained a good posture, there should be plenty of room for the back elbow to swing freely past the back hip and down the line of the pitch. Move the video forward slowly to contact and pay attention to the relationship between the pelvis and that vertical line. If a player is staying in their posture and moving properly, there will be no daylight between the line and the player's pelvis (assume the pitch is over the plate). If there is forward movement towards the plate, forcing the player to stand up and reduce the area for the back elbow, it is called Loss of Space.



CORRECT



LOSS OF SPACE

PHYSICAL CAUSES

Several physical limitations may cause Loss of Space:

- **Limited Spine and Hip Mobility** - Foremost, spine and hip mobility are paramount for a full and complete turn of the body. If the hips or spine are unable to rotate due to joint or muscular restrictions, then it is easier for the player to just shift forward towards home plate.
- **Limited Spine Disassociation** - The ability to separate the upper body from the lower body (disassociation) allows the shoulders to rotate around the spine for a complete load. 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 Hip and Core Stability** - The ability to stabilize the hips and core while hitting, directly impacts the body's ability to rotate and coil. Stability during the swing is directly proportional to the neurological control and strength of the core musculature (the thorax and glutes). When it comes to spinal stabilization, the core is the king.
- **Limited Ankle Mobility** - The player's ability to squat can directly effect their ability to sit into the lower body during the Positive Move. Players with limited ankle mobility or poor squatting mechanics tend to stand up and throw the arms outside, instead of sitting down and back and maintaining a good stable posture.
- **Limited Shoulder Mobility** - Limitations in shoulder mobility can cause the lower body to compensate to get the bat on plane. If the shoulder has limitations in horizontal adduction (bringing the arm across the body) or external rotation, this may force the player to move their lower body towards the plate to shallow out the bat path.

DESCRIPTION

Dead Hands refer to the inability to create live and independent hands in the hitter's Positive Move. The distance of the hands from the nose should grow as you move forward in the Positive Move to create a stretch reflex acting as a spring or stretch-shorten cycle to increase overall arm power. This can happen for two reasons. First, the hands do not separate from nose at all during the Positive Move. Second, the hands separate early in the Negative Move and become stale as the hitter moves into Toe Touch/Ready Position. If the hands stay the same distance from the nose or becomes shorter that is called Dead Hands.

VIDEO ANALYSIS

Seen using Face on Camera This occurs between the Negative Move and the Toe Touch position. Measure the distance between the nose and the hands at the end of the Negative Move. The distance should increase by the time they get to Toe Touch. If it stays the same or gets smaller, that's called Dead Hands.



NORMAL - LIVE & INDEPENDENT HANDS

DEAD HANDS

PHYSICAL CAUSES

Several physical limitations may cause a Dead Hands:

- **Limited Front Shoulder Mobility** - Limitations in front shoulder mobility can cause Dead Hands. If the front side shoulder has limitations in horizontal adduction (bringing the arm across the body), this may prevent a player from creating a good separation of the hands from the body during the First Move. This is specially true if they also have thoracic restrictions which will require more shoulder adduction to complete the separation.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can cause Dead Hands. If the back scapula has limitations in retraction (bringing the shoulder blades together), this may prevent a player from creating a good separation of the hands from the body during the First Move. This is specially true if they also have thoracic restrictions which will require more scapular retraction to complete the separation.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the hands to remain back while the lower body initiates the First Move. 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 Leg Strength and Power** - Any severe power reduction from the lower body can cause the hands to become over active during the First Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.

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.

LOSS OF BASE

TOE TOUCH/READY POSITION

DESCRIPTION

Loss of Base (often called No Pressure) is when a hitter does not maintain pressure between the knees and feet or loses a stable base of support with both feet at the Toe Touch\Ready Position. They have lost their athletic position in the lower half. This happens when the weight in the back heel comes off too early or the front knee cap points out over the front foot towards the pitcher at Toe Touch (instead of inward). The hitter loses the ability to adjust to speeds and locations of the pitch. The hitter essentially has to swing now or never. The hitter loses resistance or ground force reaction and is unable to store energy to adjust to off-speed pitches. The ability to store energy and swing when you want to swing is imperative to adjusting to off-speed pitches.

VIDEO ANALYSIS

The easiest way to diagnose this characteristic is from the face-on camera view. When the player gets into the Toe Touch/Ready Position stop the video. At this point, if the player's back heel is raised or their front knee cap is pointing directly over their front foot that is considered a Loss of Base.



NORMAL



FRONT KNEE CAP



BACK HEEL UP

LOSS OF BASE

PHYSICAL CAUSES

Several physical limitations may cause a Loss of Base:

- **Limited Ankle Mobility** - Ankle mobility (dorsiflexion and eversion) is extremely important for maintaining a stable base and proper ground force reactions during the Positive Move. If ankle mobility is limited, it is difficult for players to maintain a solid base foundation with the feet.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the player to maintain a stable posture during the Positive Move. 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 Front Shoulder Mobility** - Limitations in front shoulder mobility can causing a Loss of Base. If the front side shoulder has limitations in horizontal adduction (bringing the arm across the body), this may prevent a player from keeping the lower body firmly planted during the Positive Move.
- **Limited Core Stability** - This is the inability of the core (pelvis, hips and lumbar spine) to properly engage and create a stable base for the thorax to rotate around. Abdominal and gluteal weakness or inhibition can lead to poor core stabilization in hitting.
- **Limited Lower Body Stability** - Limitations in balance or lower body stability can cause a Loss of Base. If the lower body has a hard time stabilizing on one leg, striding or keeping the pelvis stable, this may prevent a player from keeping the lower body firmly planted during the Positive Move.

HANGING BACK

NEGATIVE MOVE TO CONTACT

DESCRIPTION

Hanging Back (or Squishing the Bug) is a term we use to describe two common faults in the swing. The first is leaving weight on the back leg or not having a good weight transfer to the front side. This can leave power on the table and reduce exit velocity. The second is rotating around the back hip (like spinning) rather than the front hip which causes the hitter to hit in a small zone.

VIDEO ANALYSIS

Diagnose Hanging Back from the face-on camera view. Draw a vertical line up from the outside of the back foot at stance. If at anytime between stance and contact the players heel goes behind this line we call it Hanging Back. In addition, if the player has weight on their back foot at contact then their weight transfer was incomplete.



NORMAL



HANGING BACK

PHYSICAL CAUSES

Several physical limitations may cause Hanging Back:

- **Limited Front Hip Mobility** - Foremost, front hip internal rotation is paramount for full rotation into the front hip during the Positive Move. If the body is unable to rotate around the front hip due to joint or muscular restrictions, Hanging Back may dominate the pattern.
- **Limited Front Ankle Mobility** - Front side ankle mobility (inversion/eversion) is extremely important for proper loading and ground force reactions during the Positive Move. If ankle mobility is limited, it is difficult for players to shift weight onto the front leg.
- **Limited Lower Body Stability** - The ability to stabilize the front side during the Positive Move is directly proportional to the strength and stability of the lower extremity, hip, gluteal and other core muscles.
- **Limited Leg Strength and Power** - Finally, any severe power reduction from the lower body can cause the player to not shift weight during the Positive Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.

GATE SWING

TOE TOUCH TO EXTENSION

DESCRIPTION

A Gate Swing describes a swing that is missing part of the kinematic sequence. The gears are not adding together to create more speed or power. The hips and shoulders are rotating at the same time or the arms are rotating at the same speed and sequence as the shoulders. Normally, hips rotate first then the torso starts adding to the speed of the hips and then the arms swing past the torso increasing the speed and then finally the release of the angle of the bat into the ball. The back elbow initiates the swing and tells the hips to start rotating. The elbow should then steadily catch up to the hips and move past the hip as they approach contact. At Connection the hands, elbow and the stripe of the pants should all line up and then the elbow continues past hips all the way through extension. If the player pins the back elbow against the back hip and leaves it there as they rotate the body as one unit into contact, it is a Gate Swing.

VIDEO ANALYSIS

Using the face on camera view, observe the trail elbow from Toe Touch to Extension. If the back elbow stops or pauses at the hip and continues to rotate connected to the hip it is a Gate Swing.



NORMAL



GATE SWING

PHYSICAL CAUSES

Several physical limitations may cause a Gate Swing:

- **Limited Spine Disassociation** - Foremost, the ability to separate the upper body from the lower body (disassociation) allows the shoulders to rotate around the lower body for a complete release and finish. 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 Hip and Core Stability** - The ability to stabilize the hips and core while hitting, directly impacts the body's ability to rotate and coil. Stability during the swing is directly proportional to the neurological control and strength of the core musculature (the thorax and glutes). When it comes to spinal stabilization, the core is the king.
- **Limited Shoulder Mobility** - Limitations in shoulder mobility can cause the arms to stop moving across the body after Connection.
- **Limited Upper Body Power** - Weakness in the upper body can force the player to just turn the body together, causing the Gate Swing.

DESCRIPTION

Casting the hands describes the relationship between the hands and the lead elbow as you start your forward swing. Ideally the hands should remain inside the elbow or closer to the body than the front elbow for about a third of the swing. This enables the hitter to maintain the ability to adjust from the inside to the outside pitch further into the swing. It takes the average MLB hitter about ten to twelve 60ths of a second to swing the bat from their Toe Touch/Ready position to Contact. Looking from the catchers view, we would like to see your hands remain even or inside your front elbow for three or four 60ths of a second. If your hands move outside your elbow early, which causes the front elbow to start moving across your body, it causes the hands and the bat to swing across the plane of the pitch resulting in hitting in a small zone. Casting the Hands can also cause the barrel to release early reducing the speed of the bat at contact.

VIDEO ANALYSIS

Casting the Hands is best seen using either the centerfield view or from behind home plate view. Pause the hitter at the Toe Touch/Ready Position. Look at the relationship of the lead hand and the lead elbow (which is closer to home plate). Normally, the elbow is closer to home plate at this time. Slowly advance the video to the Heel Plant position. Again, look at the relationship between the lead hand and lead elbow. If the hands have moved closer to home plate, they are Casting the Hands.



NORMAL



CASTING THE HANDS

PHYSICAL CAUSES

Several physical limitations may cause a Casting the Hands:

- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the hands to remain back while the lower body initiates the First Move. 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 Front Shoulder Mobility** - Limitations in front shoulder mobility can causing Casting the Hands. If the front side shoulder has limitations in horizontal adduction (bringing the arm across the body), this may prevent a player from creating a good separation of the hands from the body during the First Move. This is specially true if they also have thoracic restrictions which will require more shoulder adduction to complete the separation.
- **Limited Wrist Mobility** - The player's ability to radially deviate (set the bat) in the wrists is important to allow the bat to set and release properly. If radial deviation is limited, the player may compensate by Casting the Hands.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can cause Casting the Hands. If the back scapula has limitations in retraction (bringing the shoulder blades together), this may prevent a player from creating a good separation of the hands from the body during the First Move. 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 hands to become over active during the First Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.
- **Limited Ankle Mobility** - The player's ability to squat can directly effect their ability to sit into the lower body during the Positive Move. Players with limited ankle mobility or poor squatting mechanics tend to stand up and throw the arms outside, instead of sitting down and back and maintaining a good stable posture.

DESCRIPTION

A Flying Elbow is when a hitter's elbow is sticking out behind the hitter's hands at Toe Touch/Ready Position. Normally, a hitter's hands are even or behind the back elbow in a position to pull or whip with both hands. If the hitter has a flying elbow he has 2 options one is to collapse the back elbow and then whip the bat or he can pull with the front arm and push with the back arm. The first option is better but still inefficient because of the extra move and the second option causes a push which will greatly reduce the velocity of the bat. Ideally the hitter wants to whip the bat with both hands.

VIDEO ANALYSIS

A Flying Elbow is best seen using Face on Camera. Advance the player on the video to the Toe Touch\Ready Position. If the trail elbow (yellow dot) is still farther away from the pitcher than the mid-hands (pink dot) at the Toe Touch/Ready Position, it is called a Flying Elbow.



NORMAL



FLYING ELBOW

PHYSICAL CAUSES

Several physical limitations may cause a Flying Elbow:

- **Limited Back Shoulder Mobility** - Foremost, any reduction in back shoulder external rotation can limit a player's ability to drop the elbow and set the bat properly. Many players who struggle with shoulder mobility problems have a Flying Elbow.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the back elbow and bat time to drop down as the player starts their Positive Move.
- **Limited Front Shoulder Mobility** - Limitations in front shoulder mobility can cause Dead Hands and therefore make it difficult to get the back elbow in the proper position.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can also cause Dead Hands and therefore make it difficult to get the back elbow in the proper position.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the hands to become over active during the First Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.

DUMPING THE BARREL

STANCE TO READY POSITION

DESCRIPTION

Dumping the Barrel refers to the top hand getting outside the bottom hand prior to toe touch. The position of the bat in relationship to the front forearm combined with the lateral move of the hands creates the power or whip in the bat. Any early loss of position can reduce the player's ability to whip the bat. The bat should retain lag (hands leading the bat) to help to create more power.

VIDEO ANALYSIS

Dumping the Barrel is best seen using face-on camera view. Pause the video at the Ready Position / Toe Touch. If the top hand is outside the bottom hand (farther away from the pitcher) then the hitter is Dumping the Barrel and is losing significant power.



NORMAL



DUMPING THE BARREL

PHYSICAL CAUSES

Several physical limitations may cause a Dumping the Barrel:

- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the hands to remain back while the lower body initiates the First Move. 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 Front Shoulder Mobility** - Limitations in front shoulder mobility can cause the bat to release early. If the front side shoulder has limitations in horizontal adduction (bringing the arm across the body), this may prevent a player from creating a good separation of the hands from the body during the First Move. This is especially true if they also have thoracic restrictions which will require more shoulder adduction to complete the separation.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the hands to become over active during the First Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.
- **Limited Wrist Mobility** - The player's ability to radially deviate (set the bat) in the wrists is important to allow the bat to set and release properly. If radial deviation is limited, the player may compensate by Dumping the Barrel.
- **Upper Extremity Strength** - Many young player's have bats that are too long or too heavy and don't have enough upper body strength to fully extend and release through contact. Wrist and grip strength combined with shoulder and forearm strength are all critically important.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can cause Dumping the Barrel. If the back scapula has limitations in retraction (bringing the shoulder blades together), this may prevent a player from creating a good separation of the hands from the body during the First Move. This is especially true if they also have thoracic restrictions which will require more scapular retraction to complete the separation.

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DESCRIPTION

Drifting is a common characteristic affecting the hitter's front side stability and their ability to rotate through contact. If the hitter's front leg/front side does not firm up after the First Move, but instead the pelvis continues to drift or slide forward towards the pitcher as they swing, it is called Drifting. In other words, there is no full transition from the Positive Move (Linear) into rotation. After the First Move we should see the maximum amount of knee flex in the front knee, even though the degrees of this angle can vary dramatically. Some players have a lot 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 Heel Plant. Players that Drift reduce their lower body stability and can dramatically reduce power into the upper body.

VIDEO ANALYSIS

The easiest way to diagnose Drifting is from face-on camera. Advance the hitter to the end of the First Move and draw a vertical line up directly in front of the lead hip. Now, slowly advance the player into contact. If the front hip or pelvis continues to move forward of the line, the player is Drifting. The best of the best will actually reduce the front knee flex (knee flex angle becomes straighter or more obtuse) as they go into contact and the hip will get farther away from the line.



NORMAL



DRIFTING

PHYSICAL CAUSES

Several physical limitations may cause a Drifting:

- **Limited Front Hip Mobility** - Foremost, front hip internal rotation is paramount for full rotation into the front hip without any lateral Drift from Heel Strike to Finish. If the body is unable to rotate around the front hip due to joint or muscular restrictions, lateral movements will dominate the pattern.
- **Limited Front Ankle Mobility** - Front side ankle mobility (inversion./eversion) is extremely important for proper loading and ground force reactions from Heel Strike to Finish. If ankle mobility is limited, it is difficult for players to maintain a solid base foundation with the front side.
- **Limited Spine Disassociation** - The ability to separate the upper body from the lower body allows the lower body to laterally stabilize while rotating from Heel Strike to Finish. 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** - Finally, the ability to laterally stabilize the front side during from Heel Strike to Finish is directly proportional to the strength and proper motor control of the musculature of the lower extremity, gluteal and other core muscles.

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SMALL ZONE

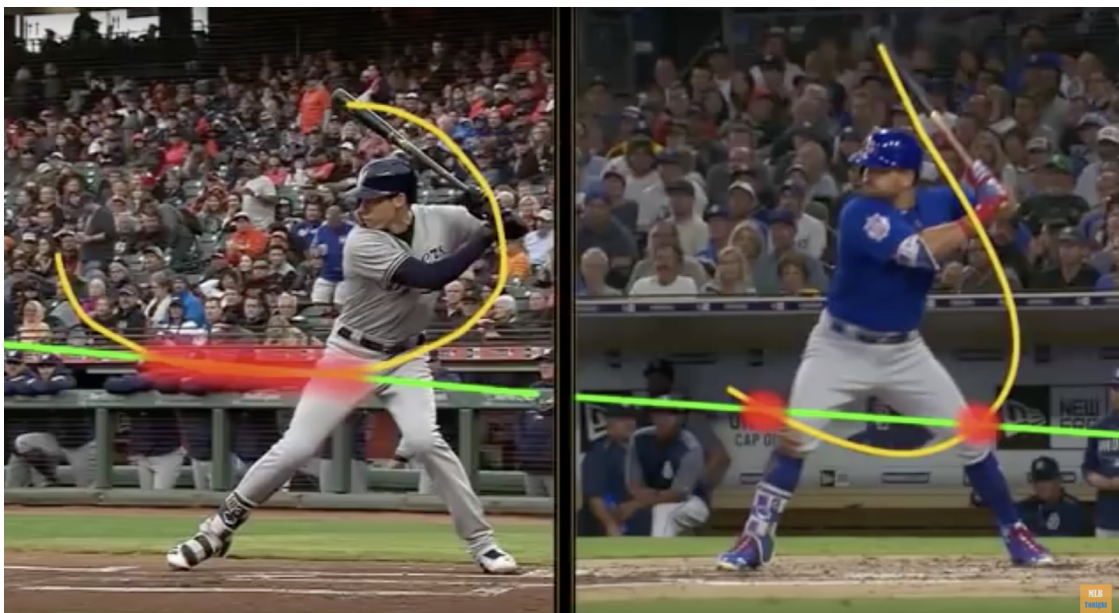
READY POSITION TO CONTACT

DESCRIPTION

Small Zone refers to the path that the bat takes compared to the path of the incoming ball. If the sweet spot of the bat is on plane with the pitch for about 3 or 4 feet, the hitter is hitting in a big zone. If the sweet spot of the bat is only on plane for a short time or is just intersecting with the path of the pitch, we call this hitting in a small zone. Normally, the bat will get on the plane of the ball as soon as possible and stay there as long as possible to maximize the possibility of contact on the sweet spot of the bat. If the bat path starts from above the ball path and continues to drop down below the ball path, it is called a Small Zone. The longer the sweet spot is on plane with the pitch the greater the hitter's margin for error. This is synonymous with hitting the ball to all fields. If the hitter is on plane and a little late the ball goes to the opposite field. If the hitter is a little early the ball will be hit to the pull side of the field. If a hitter is swing down or across the plane of the pitch the hitter will have to have perfect timing in order to hit the ball on the sweet spot of the bat. For the entire time the bat is in the strike zone (Bat Lag and all the way through to extension), the front elbow should always be higher than the hands and the hands should always be higher than the Barrel of the bat. This is the only way to swing the bat down the line of the pitch.

VIDEO ANALYSIS

Small Zone is best seen using face-on camera. Play the swing through, making a dot on two points where you can see the ball as it approaches the batter. Start by drawing a line that connects those two dots all the way to the catcher's glove. This makes a line that matches the path of the ball. Now, move the video to Connection and place a dot on the tip of the bat for each frame as the player swings the bat all the way through Extension. Connect the dots to trace out the path of the bat. Now look at how long the sweet spot is on plane with the pitch. The tip of the bat should be 2 or 3 inches below the path of the ball for about 3 to 4 feet. If the path of the bat starts above the ball and continues to move down and intersects the path of the ball the hitter is hitting in a small zone. Pay attention to what part of the bat is staying on plane with the pitch. The tip of the bat is no good and the label of the bats is no good.



FROM MLB TONIGHT BROADCAST

PHYSICAL CAUSES

Several physical limitations may cause a Small Zone:

- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body allows the lower body to start the Positive Move, but allow the upper body to stay back and drop the bat in the zone earlier . 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 Front Shoulder Mobility** - Limitations in front shoulder mobility can cause Dead Hands which creates a smaller zone.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can also cause Dead Hands which creates a smaller zone.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the hands to become over active during the First Move which creates a smaller zone..



NORMAL

DESCRIPTION

Pushing is when the back arm is pushing the bat through the strike zone rather than both arms pulling or whipping the bat through the strike. The telltale sign of this is when the hands are in front of the back elbow at Connection. This is usually caused by poor coaching cues like “take your hands to the ball” or “take the knob of the bat to the ball” or “keep your hands inside the ball.” Players take these words literally and forget to lead back with their elbow to whip the bat. Pushing makes it really difficult to create bat speed because it is all an upper body swing.

VIDEO ANALYSIS

A Push is best seen using the face-on camera. Stop the batter at Connection. This is the point where we look to see how well the upper body and lower body are working together. Ideally we see the hands elbow and the stripe of the pants (hips) lining up at this point. If the hands go early they are being Pushed into the ball. Place a red dot on the hitter’s lead hand, yellow dot on the hitter’s back elbow and a green dot on their back hip. They should line up. If the red dot is leading (lead hand), we call it a Push.



NORMAL



PUSH

PHYSICAL CAUSES

Several physical limitations may cause a Push (very similar to Flying Elbow):

- **Limited Back Shoulder Mobility** - Foremost, any reduction in back shoulder external rotation can limit a players ability to drop the elbow and set the bat properly. Many players who struggle with shoulder mobility problems have a Push.
- **Limited Spine Disassociation** - The ability to separate the lower body from the upper body (disassociation) allows the back elbow and bat time to drop down as the player starts their Positive Move.
- **Limited Front Shoulder Mobility** - Limitations in front shoulder mobility can cause Dead Hands and therefore make it difficult to prevent the hands from getting too far out in front.
- **Limited Back Scapular Mobility** - Limitations in back shoulder scapular mobility can also cause Dead Hands and therefore make it difficult to prevent the hands from getting too far out in front.
- **Limited Leg Strength and Power** - Any severe power reduction from the lower body can cause the hands to become over active during the First Move. Overall leg strength and power is essential for maintaining a proper sequence during hitting.

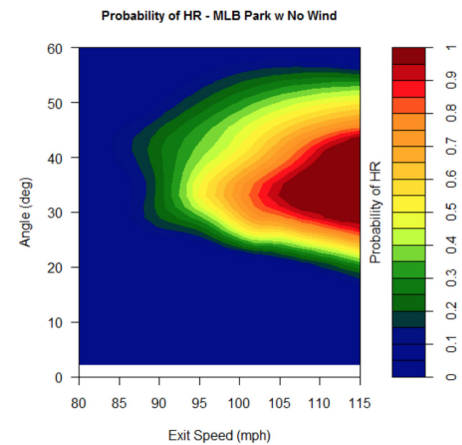
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KEYS TO HITTING

CHARACTERISTICS THAT REDUCE POWER:

1. Hanging Back
2. Dead Hands
3. Push
4. Gate Swing
5. Dumping the Barrel
6. Drifting
7. Loss of Posture

Any poor Connection between upper and lower body can lead to power loss.



CHARACTERISTICS THAT HURT CONTACT:

1. Sway
2. Loss of Posture
3. Loss of Space
4. Loss of Base
5. Casting the Hands
6. Small zone

Anything that causes a player to be inconsistent in their timing or limits the ability to swing the bat on plane with the pitch will create contact problems. If the player is consistent from stance to Toe Touch/Ready Position, there is only one variable left -- the speed of the pitch.



KEYS TO HITTING

CHARACTERISTICS THAT LIMIT EFFICIENCY (STARTS AT TOE TOUCH/ READY POSITION):

1. Loss of Posture
2. Hanging Back
3. Loss of Space
4. Loss of Base
5. Flying Elbow
6. Push

A big key to being efficient is to get to a good Toe Touch\Ready Position. If the Hips are closed or turned in, the shoulders are too steep or the hitter is light on the front foot, these will all lead to efficiency problems which add extra moves that cost the hitter time and effort to swing the bat.

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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.



HITTING CHARACTERISTICS BEST VIEWED FROM FACE ON

1. Sway
2. Loss of Posture
3. Dead Hands
4. Loss of Base
5. Hanging Back
6. Gate Swing
7. Flying Elbow
8. Dumping the Barrel
9. Drifting
10. Small Zone
11. Push

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.



HITTING CHARACTERISTICS BEST VIEWED FROM DOWN-THE-LINE

1. No Spacing
2. Casting the Hands

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.





ONBASE UNIVERSITY

PHYSICAL SCREENING
UNLOCKING THE BODY'S POTENTIAL

WHY SCREEN?

PHYSICAL CAUSES OF HITTING 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 exit ball 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."

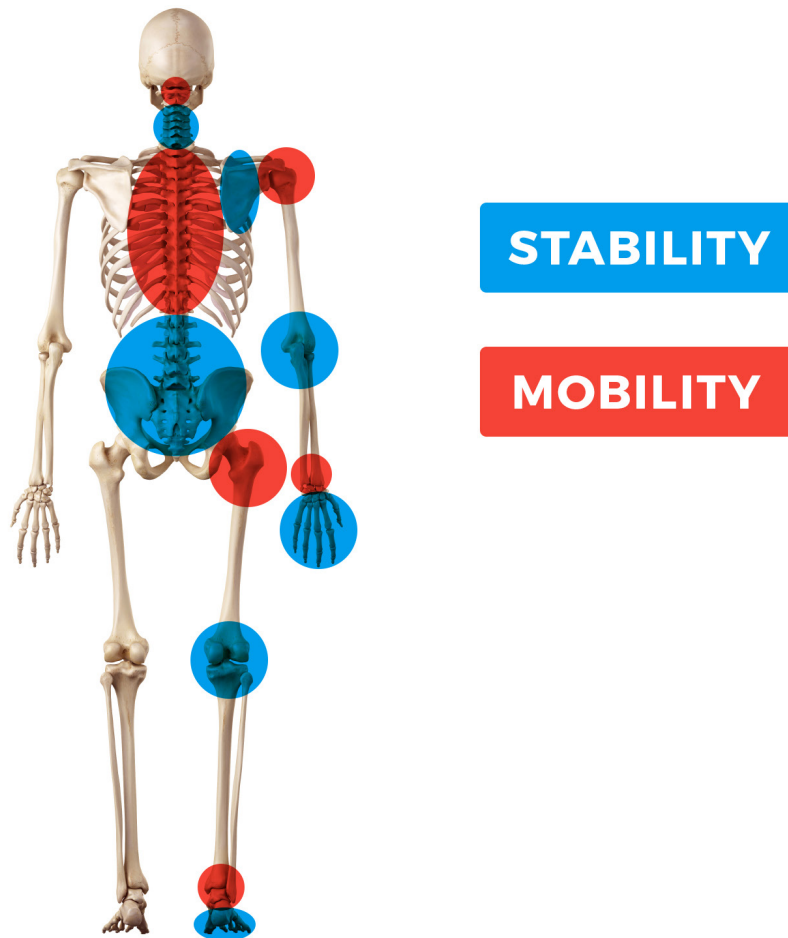
- First noted by Mike Boyle and Gray Cook.

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 hitting 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 hitting 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).

-Liebenson C. Integrating rehabilitation into chiropractic practice (blending active and passive care). In: Liebenson C. ed. Rehabilitation of the spine. Baltimore: Williams & Wilkins; 1996: p. 13-14

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. Vladamir 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.

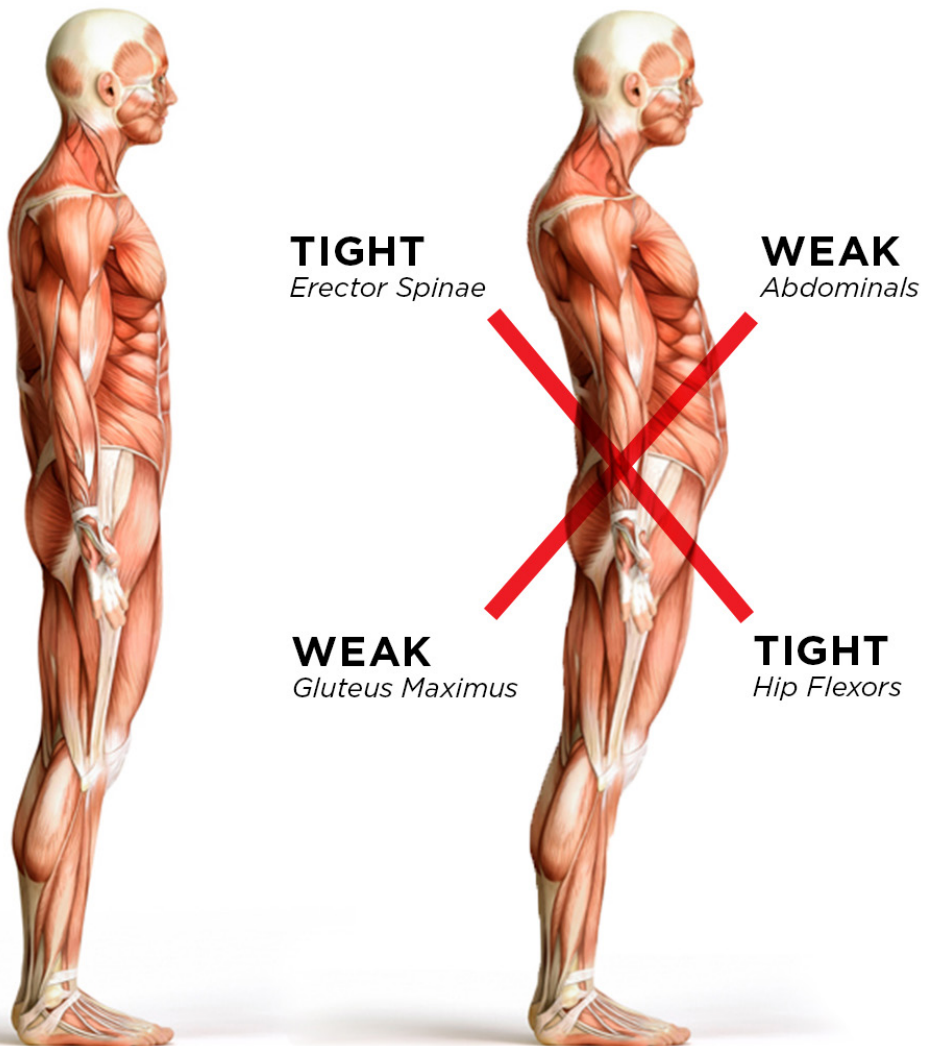
The most common pattern of imbalance that Dr. Janda observed he named the Lower Crossed Syndrome. It is primarily the combination of tight hip flexors and a tight lower back, paired with weak abdominals and weak glutes. This combination leads to an excessive arching or rounding of the lower back, a flabby 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 followingo 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)

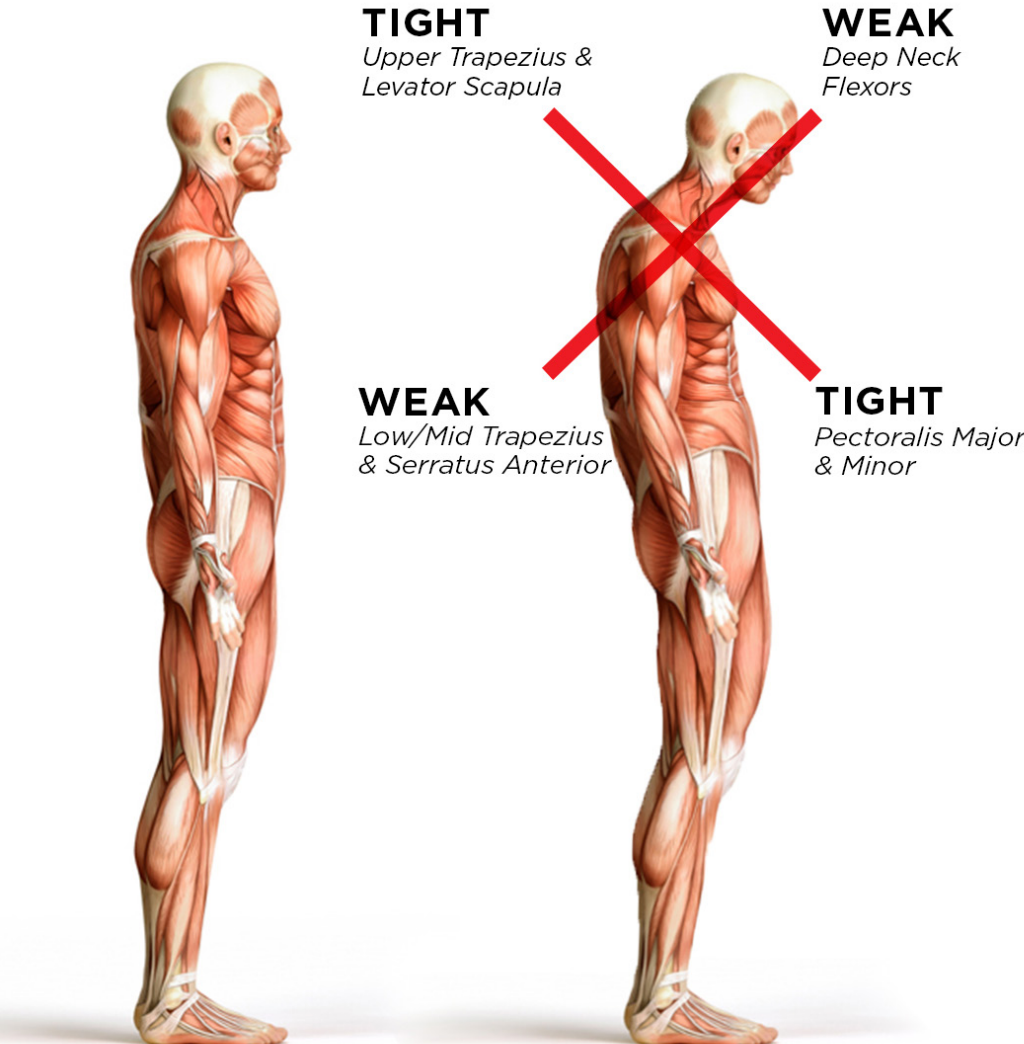
WEAK

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

HITTING SCREEN

IDENTIFYING THE HITTER'S LIMITATIONS

THE ONBASEU HITTING SCREEN

STANDING TESTS

1. Pelvic Tilt Test
2. Pelvic Rotation Test
3. Toe Tap Test
4. Hip 45 Test
5. Lateral Step Test
6. Wide Squat Test
7. Shoulder 46 Test
8. Separation Test
9. Holding Angle Test
10. Hitchhiker Test

SEATED TESTS

11. Ankle Rocking Test
12. Seated Trunk Rotation Test

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.

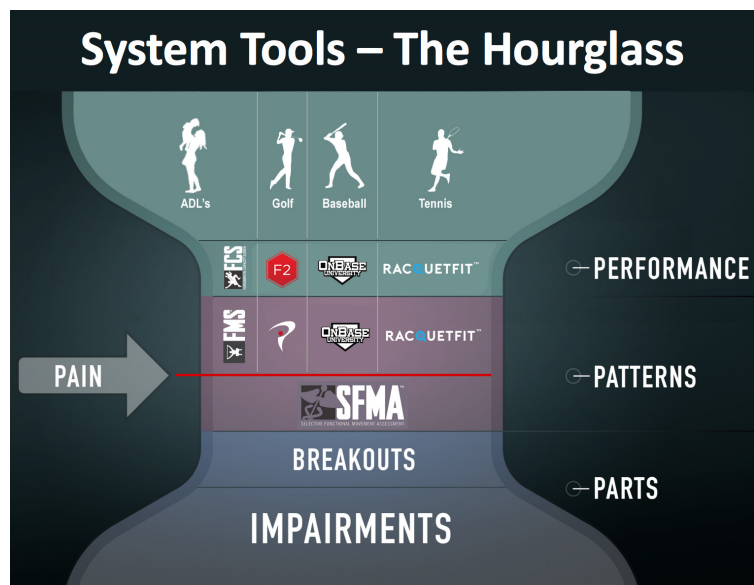
No pain is allowed. This is the most important rule of all. If there is pain at any point during the screen, stop and refer them to a medical professional.

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 hitting mechanics. *It does not make any fitness or medical diagnosis*, it just helps predict if and how a player's body is altering their swing 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 hitting movement patterns of the player. If the OnBaseU screen is dysfunctional, it is highly likely that the player's body is affecting their swing 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, playing with their kids, over-training, training errors, 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 swing mechanics. The good news is, there are only 12 suspects. And even better news is, all twelve suspects are part of 4 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:

- **Rotation Gang (3 Members)**
 - » Toe Tap Test
 - » Hip 45 Test
 - » Seated Trunk Rotation Test
- **Core Control Gang (2 Members)**
 - » Pelvic Tilt Test
 - » Pelvic Rotation Test
- **Stable Posture Gang (3 Members)**
 - » Lateral Step Test
 - » Wide Squat Test
 - » Ankle Rocking Test
- **Live and Independent Hands Gang (4 Members)**
 - » Shoulder 46 Test
 - » Separation Test
 - » Holding Angle Test
 - » Hitch Hiking 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-Hitting Connections. Those include:

- **Pelvic Tilt Test** - This allows us to examine the player's ability to control their abdominals, glutes and pelvic orientation. These are all key for transferring energy from the lower body to the upper body and maintaining a stable posture.
- **Pelvic Rotation** - This allows us to examine the player's ability to disassociate the lower body from the upper body. This is critical for proper sequencing in the Positive Move.
- **Seated Trunk Rotation** - This allows us to examine the player's mobility in the thorax. This is critical in all rotary sports.

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 load 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 hitting. The hip, tibia and ankle all coil and load on the trail leg during the Negative Move and rotate and post in the lead leg from Heel Plant to Finish. There is potential for excessive lateral motion in hitting (Sway, Loss of Posture, Drifting, 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 Negative Move or to post up into the front hip after Heel Plant.

Many players present with less than 40 degrees of internal 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 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 hitting. There is potential for excessive lateral motion or loss of posture in hitting anytime a player finds restrictions in the lower quarter.

HOW TO PERFORM THE HIP 45 TEST

Have the player stand parallel to the right side of home plate with their feet together. 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). 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 1st base line). 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 maintaining pressure and a stable lower body during hitting.

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 hitting.

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.

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 hitting motion.

HOW TO PERFORM THE PELVIC TILT TEST

Begin by having your player assume a normal hitting 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 hitting 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 hitting 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 hitting 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.

LATERAL STEP

TEST OBJECTIVE FOR THE LATERAL STEP

The Lateral Step requires proper coordination and stability between the hips, moving asymmetrically with one bearing the load of the body while the other moves freely in flexion and abduction. The pelvis and core must begin with and maintain stability and alignment throughout the movement pattern.

Excessive upper body movement in basic lateral stepping is viewed as compensation; it is not seen when proper mobility, stability, posture and balance are available and functioning. The Lateral Step challenges bilateral mobility and stability of the hips, knees and ankles. The test also challenges stability and control of the pelvis and core as it offers an opportunity to observe functional symmetry.

HOW TO PERFORM THE LATERAL STEP

Have the client stand tall, feet touching at both heels and toes and touching the right side of home plate. Position the bat across the shoulders, below the neck. Ask the player to raise their left foot up to knee height and laterally reach out and touch the left side of home plate while maintaining a tall spine. Then return the moving leg to the starting position. The Lateral Step is performed slowly and under control. Score the moving leg and repeat the test on both sides



LATERAL STEP

WHAT TO LOOK FOR IN THE LATERAL STEP TEST

During this test you are looking for the player to accomplish the task without loss of stability or control:

- No excessive valgus collapse (knee diving inwards)
- Minimal to no hiking of the pelvis
- Bat remains parallel

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

PHYSICAL CAUSES OF LIMITED LATERAL STEP TEST:

When a player presents with limitations in their Lateral Step we look at the following:

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

ANKLE ROCKING TEST

TEST OBJECTIVE FOR THE ANKLE ROCKING WIPER TEST

The Ankle Rocking test is great for checking ankle mobility and stability. This will show whether the player has the ability to invert and evert which is critical when loading and weight shifting.

HOW TO PERFORM THE ANKLE ROCKING 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 then invert both ankles without moving their knees. If they are unable to perform this without accessory motion, have them place their two fists between their knees to help stabilize. Instruct the player to evert both ankles then invert both ankles without letting the knees and hands separate. The fists should prevent accessory knee or hip movements during this test and help improve stability dysfunctions.

This test is a qualitative not quantitative (pass or fail), but the correct range of motion for the ankle is 30 degrees inversion and 20 degrees of eversion.

CORRECT TESTING FORM



INVERSION

EVERSION

ANKLE ROCKING TEST

WHAT TO LOOK FOR IN THE ANKLE ROCKING TEST

If the player's knees continue to move outward even with their hands between their knees, assume they must have mobility limitations in the ankles.

If they can't do the motion without their hands between their knees, but they can with the hands, assume they have a stability problem.

PHYSICAL CAUSES OF THE ANKLE ROCKING TEST

- **Ankle Joint Mobility** - Ankle joint restrictions are very common, specially with a history of ankle sprains.
- **Muscular, Capsular, & Myofascial Restrictions in the Ankle** - Previous trauma, scar tissue, any tightness or fascial restrictions of the peroneals, anterior tibialis, gastrocs, soleus, flexors and extensors can all limit ankle inversion and eversion.

SHOULDER 46 TEST

TEST OBJECTIVE FOR THE SHOULDER 46 TEST

This test evaluates shoulder external rotation mobility. This position places the scapula approximately in the Connection position.

HOW TO PERFORM THE SHOULDER 46 TEST

Using home plate as a guideline, begin the test by standing tall parallel to the third base line. Have the player place their right elbow by their side with their forearm parallel to the ground, thumb pointing up and fingers extended. Without rotating the body, have the player externally rotate the right shoulder (rotate their arm towards first base) as far as possible. The player should be able to point their fingers past second base towards the 4 position.



Now repeat the test starting parallel to the first base line. This time try to externally rotate the left shoulder as far as possible. The player should be able to point their fingers past second base towards the 6 position.

CORRECT



SHOULDER 46 TEST

WHAT TO LOOK FOR IN THE SHOULDER 46 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 hitting compensations or lead to shoulder injuries based on the player's biomechanics.

PHYSICAL CAUSES OF LIMITED SHOULDER 46 TEST

When a player presents with limitations in their Shoulder 46 Test we look at the following:

- **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.
- **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 46 TEST PITFALLS

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

- Don't let the elbow drift off the body (keep it by their side).
- Make sure the body doesn't rotate, just the shoulder.

SEPARATION TEST

TEST OBJECTIVE FOR THE SEPARATION TEST

The Separation Test checks the player's ability to horizontally adduct the shoulder (move the arm across the chest). This is an important skill for properly loading the lead shoulder and generating good power from the arms. This movement requires good mobility of the shoulder girdle and thoracic spine.

HOW TO PERFORM THE SEPARATION TEST

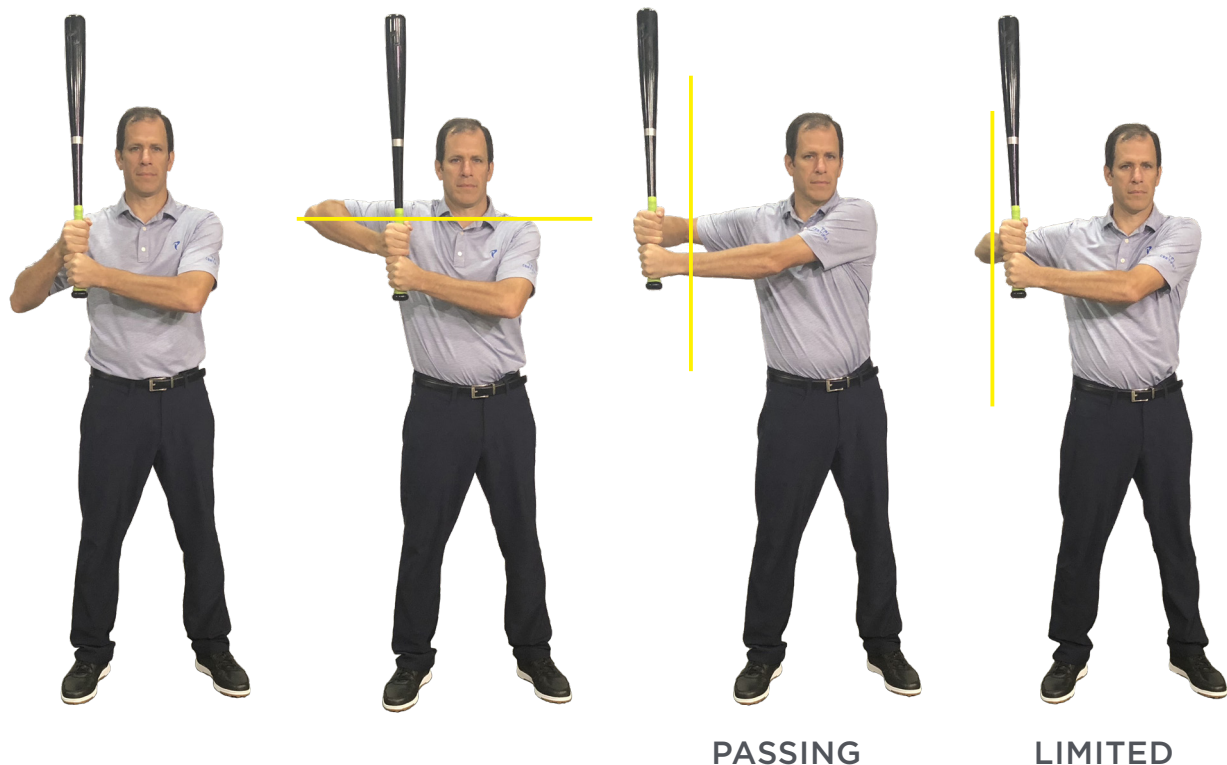
In a standing position, begin the test by holding the bat with their standard grip and position the hands over the right arm pit (with the middle of the handle at nipple height). Make sure the bat is point straight up vertical and maintain this position for the entire test. Have the player try to elevate their right elbow above their shoulder line, without tipping the bat, releasing the grip or tilting the spine. Take note of the elbow position.

Next, regardless of the height of the elbow, keeping the elbow elevated and the bat vertical, have the player try to shift the hands laterally away from the body as far as possible **without rotating the shoulders or hips**. Note the position of the hands:

- Inside the Elbow Joint
- Over the Elbow Joint
- Outside the Elbow Joint

Repeat on the opposite side for symmetry.

CORRECT TESTING FORM



HOLDING ANGLE TEST

TEST OBJECTIVE FOR THE HOLDING ANGLE TEST

The Holding Angle Test is a great test to determine if the wrists have enough mobility to hinge and set. Any limitation in wrist mobility can cause compensations in the set, path and release of the bat, which can ultimately lead to poor mechanics, injuries or both.

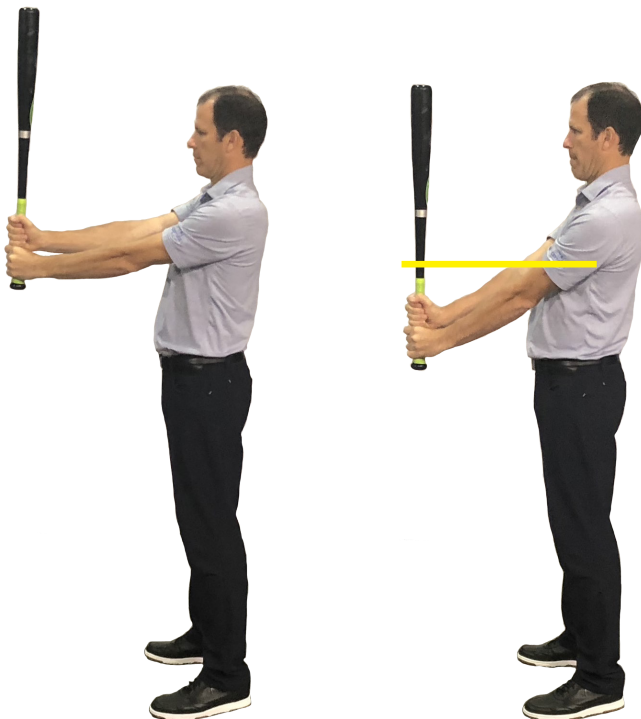
HOW TO PERFORM THE HOLDING ANGLE TEST

Start with the player holding the bat with their standard grip with arms extended straight out in front of them, and the bat held vertical or perpendicular to the ground. Have the player slowly lower their hands as low as possible without letting the bat tip forward (it must stay vertical). Note how low the top of the top hand can go in relationship to the bottom of the sternum:

- Above the Bottom of the Sternum
- In Line with the Bottom of the Sternum
- Below the Bottom of the Sternum

**It is OK to ask the player to place their finger on the bottom of their sternum before they start the test to give you the tester a good visual guideline on where to observe.

CORRECT TESTING FORM



HOLDING ANGLE TEST

WHAT TO LOOK FOR IN THE HOLDING ANGLE TEST

This test measures the amount of wrist hinge (radial deviation) and wrist extension. These are two critically important motions for maintaining lag in the bat and creating fast bat speed.

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

- Limited wrist radial deviation (wrist hinge up).
- Limited wrist extension.

PHYSICAL CAUSES OF LIMITED HOLDING ANGLE TEST

When a player presents with limitations in their Holding Angle Test we look at the following:

FOR MOBILITY ISSUES

- **Carpal Mobility** - any restrictions between the carpal bones of the wrist/hand are extremely common.
- **Muscular, Capsular, & Myofascial Restrictions in the Wrist and Forearm Musculature** - Any tightness or fascial restrictions around the forearm muscles or carpal bone joint capsules can limit mobility.

HOLDING ANGLE TEST PITFALLS

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

- Don't let the player let go or change their grip during the test.
- Make sure the player keeps their elbows extended and the bat vertical.

HITCH HIKING TEST (FOREARM ROTATION)

TEST OBJECTIVE FOR THE HITCH HIKING TEST

The Hitch Hiking Test is an important test to determine the mobility of the wrist, elbow and forearm in two specific movement patterns; Pronation and Supination. The ability to both Pronate and Supinate the wrist is imperative for proper set and release of the bat, as well as power production in the swing.

HOW TO PERFORM THE HITCH HIKING TEST

In a standing position, begin test by having the player bend their elbows to 90 degrees with their arms by their sides and their forearms pointing directly in front of them. Next, set the thumbs to point towards the ceiling, and have both palms directly facing one another. Once in this position, begin the test by trying rotate both hands outwards so that the thumbs roll laterally (Supination). Maintain the setup position with the straight and parallel forearms during the entire Supination portion of the test. Once they gain as much range of motion into the Supination direction, begin the second portion of the test which is exactly opposite of the first. With forearms in the straight and parallel position, slowly bring the thumbs back towards the vertical and continue turning inwards as far as they can go, in a medial direction (Pronation).



SUPINATION

PRONATION

HITCH HIKING TEST (FOREARM ROTATION)

WHAT TO LOOK FOR IN THE HITCH HIKING TEST

During this test you are looking for adequate ranges of motion, both into the Pronation and Supination directions.

- Normal Pronation is 80 degrees
- Normal Supination is 80 degrees

Any rotation limitation in the wrists, elbow or forearm can lead to major problems with bat path, bat angle and bat release.

PHYSICAL CAUSES OF LIMITED HITCH HIKING TEST

When a client presents with limitations in either Pronation or Supination in either wrist, during the Hitch Hiking Test, we will look to some key regions for answers.

- **Boney 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.

REVIEW OF MOST COMMON BODY SWING CONNECTION

These Connections Are Ordered From Most Likely First:

STANDING TESTS

1. **Pelvic Tilt Test** - Loss of Space, Loss of Base, Drifting, Loss of Posture, Sway, Hanging Back, Casting the Hands, Gate Swing, Small Zone
2. **Pelvic Rotation Test** - Casting the Hands, Loss of Base, Loss of Posture, Sway, Hanging Back, Drifting, Dead Hands, Push, Gate Swing, Dumping the Barrel, Small Zone
3. **Toe Tap Test** - Sway, Drifting, Loss of Base, Loss of Space, Loss of Posture, Casting the Hands, Hanging Back, Gate Swing, Small Zone
4. **Hip 45 Test** - Loss of Space, Loss of Base, Gate Swing, Sway, Loss of Posture, Hanging Back, Drifting
5. **Lateral Step Test** - Loss of Posture, Loss of Base, Sway, Drifting, Loss of Space, Hanging Back, Casting the Hands, Small Zone
6. **Wide Squat Test** - Losing Space, Loss of Base, Sway, Drifting, Loss of Posture, Hanging Back, Casting the Hands, Small Zone
7. **Shoulder 46 Test** - Flying Elbow, Push, Gate Swing, Loss of Posture, Casting the Hands, Loss of Space, Dead Hands, Small Zone, Dumping the Barrel
8. **Separation Test** - Dead Hands, Casting the Hands, Loss of Posture, Gate Swing, Loss of Base, Flying Elbow, Push, Dumping the Barrel, Small Zone
9. **Holding Angle Test** - Dumping the Barrel, Casting the Hands, Flying Elbow, Small Zone
10. **Hitchhiker Test** - Flying Elbow, Push, Dumping the Barrel, Casting the Hands, Small Zone

SEATED TESTS

11. **Ankle Rocking Test** - Sway, Drifting, Loss of Base, Loss of Space, Hanging Back, Casting the Hands, Small Zone
12. **Seated Trunk Rotation Test** - Casting the Hands, Loss of Posture, Dead Hands, Loss of Space, Lose of Base, Gate Swing, Flying Elbow, Push, Small Zone, Sway, Drifting

NOTES





ONBASE UNIVERSITY

KINEMATIC SEQUENCE

MAXIMIZING PERFORMANCE IN
BASEBALL & SOFTBALL

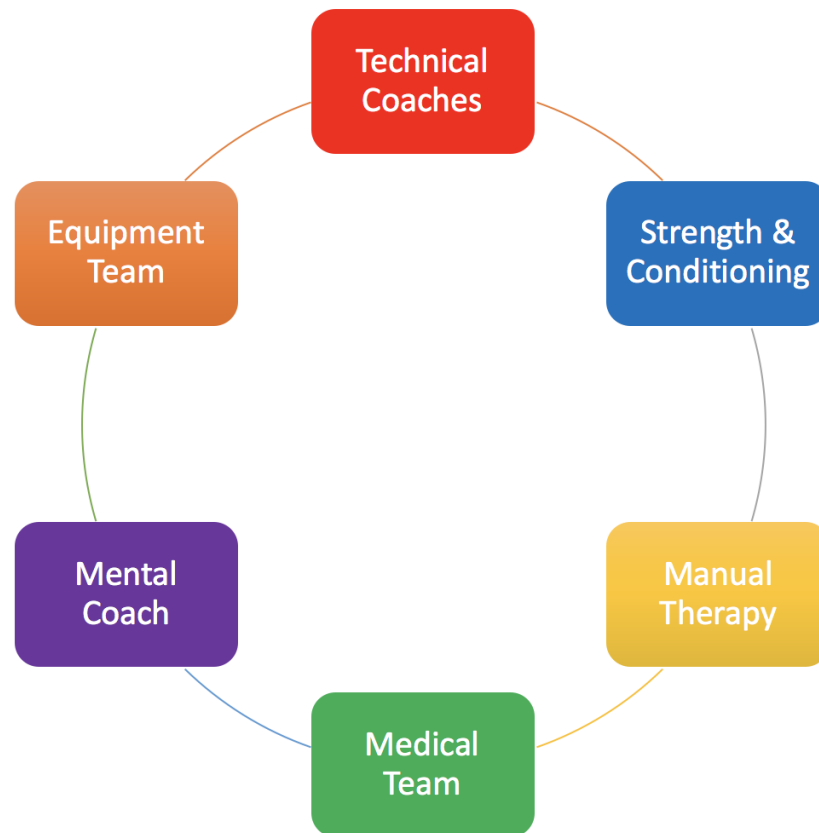
THE TEAM APPROACH TO COACHING

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:** Throwing Coach / Hitting Coach / Fielding 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



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 hit or pitch (style) – not if it works or not!

OnBase UNIVERSITY'S PHILOSOPHY OF HITTING AND THROWING:

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

THE KINEMATIC SEQUENCE

THE KINEMATIC SEQUENCE

Have you ever wondered how players such as Jeff Bagwell or Kevin Youkilis have had successful careers with such unorthodox mechanics? Fortunately, with the aid of 3D motion capture systems, researchers have been able to identify the true measurement of good hitting. The answer is not in how close your hitting resembles Ted Williams or Barry Bonds on a video camera, the answer is in the efficiency of your hitting compared to the best players in the world. In other words, there are a lot of strange styles of hitting in MLB, but they all seem to get the job done. The question you should be asking yourself is “How can I make my hitting 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 bat or ball. We call this the “kinematic sequence.” The amazing thing is that all great hitters have a remarkably similar kinematic sequence of generating speed and transferring speed throughout their bodies. That means if you compare Jeff Bagwell’s kinematic sequence to Kevin Youkilis’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 hitters begin by generating speed from their lower body and transferring that speed through their torso, then into their arms, and then into the bat. But what hitting 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 hitters. The sequence of energy initiation for efficient hitters is: lower body starts, thorax moves next, lead arm goes third and the bat starts last. Then the lower body decelerates first (red line on the graph), thorax second (green line), lead arm third (blue line) and the bat last (yellow line). This occurs during the stride and weight shift.

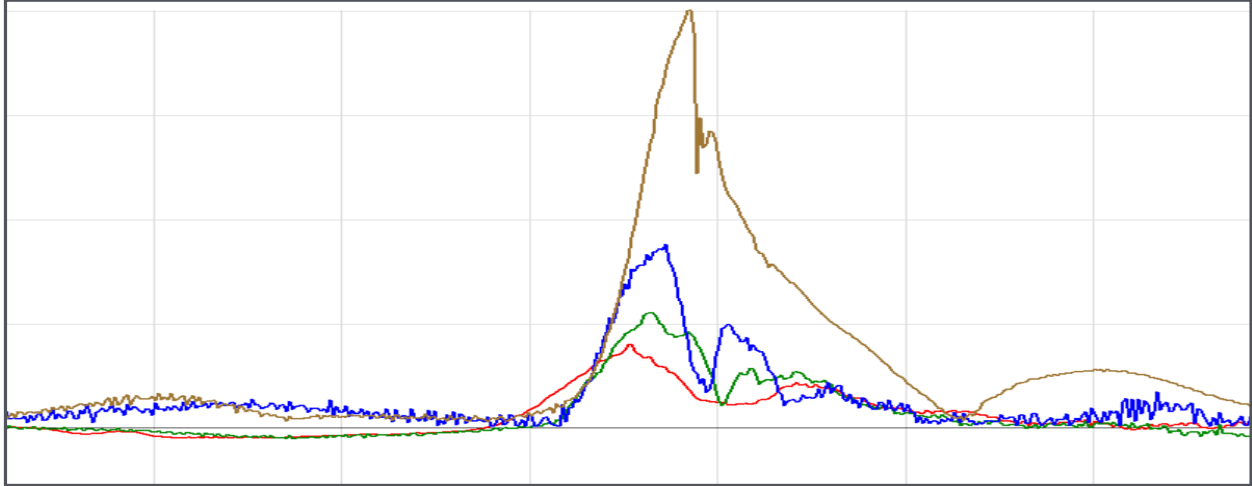
Each segment of the body builds on the previous segment, increasing speed up the chain. (Red is less than green, which is less than blue, which is less than yellow).

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

The sequence is the key to repeatability and consistency (be it accurate or not). Energy transfer or deceleration is the key to power.

THE KINEMATIC SEQUENCE - HITTING

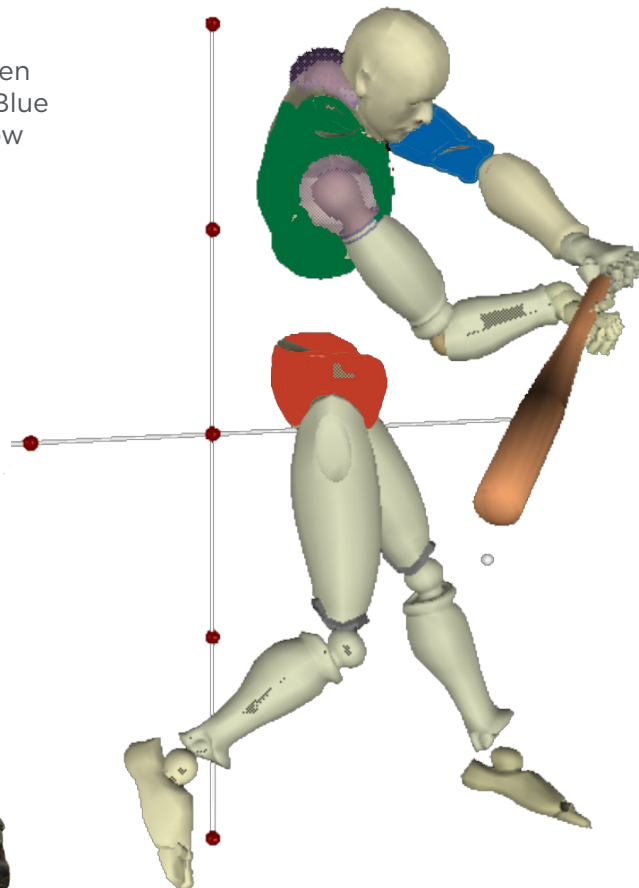
EXAMPLES OF EFFICIENT HITTING



COLORS:



Pelvis = Red
Thorax = Green
Lead Arm = Blue
Barrel = Yellow



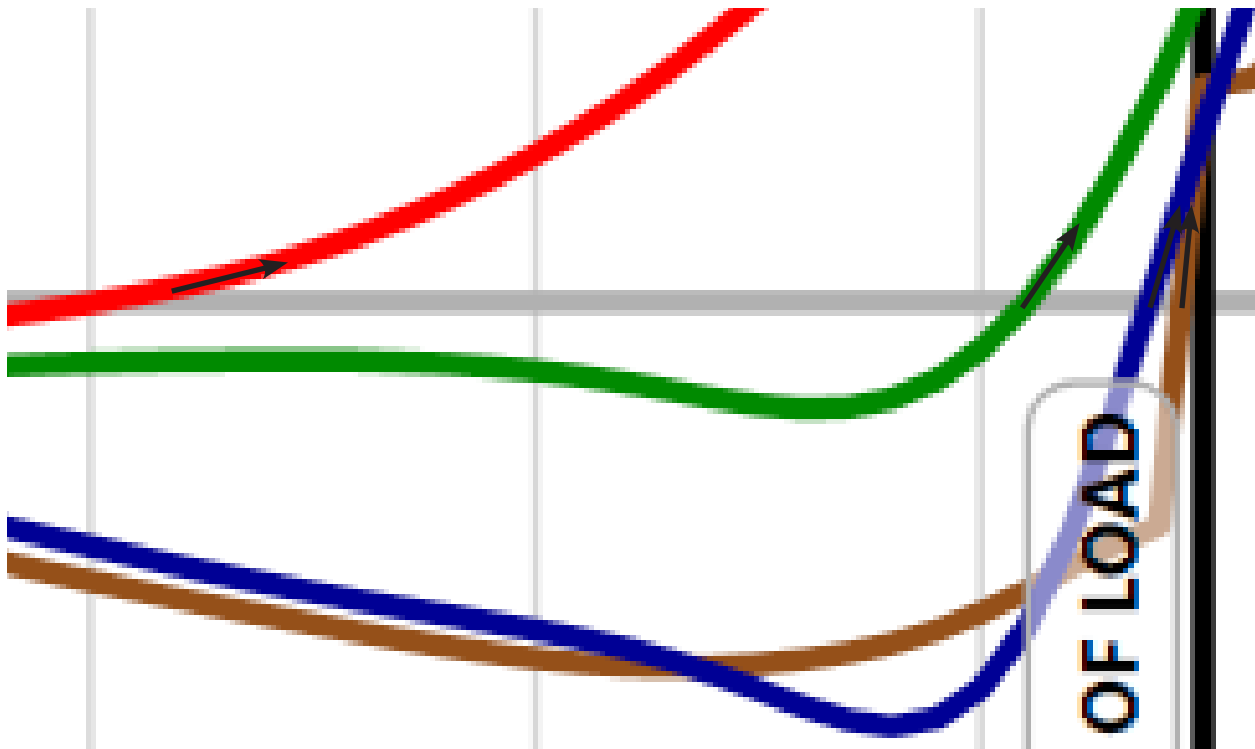
THE KINEMATIC SEQUENCE

THE 100 METER RACE ANALOGY:

To better understand the kinematic sequence, imagine there are four sprinters going for the gold in the 100 meter dash. When the four sprinters are in their set positions and ready to go, let's think of that as the beginning of the Positive Move in hitting. For the most efficient hitters on the planet, you will see the red sprinter come out of the blocks first, the green sprinter come out second, the blue sprinter come out third and the yellow sprinter come out last. What that means is the hips (the red sprinter) usually start first. Then the trunk begins to rotate (the green sprinter). The arm (elbow extension for throwers) starts to fire third (the blue sprinter), and the bat (shoulder internal rotation for throwers) fires last (the yellow sprinter). That is the most common transition, or firing sequence that we see with the best hitters in the world.



As you can see from the graph below (this is a zoomed-in graph of the transition sequence on the kinematic sequence), the pelvis starts to accelerate first in a right-handed player. You can always tell when a segment fires because you will see a sudden increase in the acceleration of that segment.



THE KINEMATIC SEQUENCE

100 METER RACE (CONT.):

Now, just like the 100 meter race, the sequence in which they come out of the blocks, does not always match the sequence in which they cross the finish line. The next thing we need to analyze is what happens during the race. Imagine halfway through the race, the sprinters are still in the same order as they came out of the blocks. The red sprinter is in first, green in second, blue is in third and the yellow sprinter is last.



Then, all of a sudden, the green sprinter takes his left hand and pushes off the red sprinter to take the lead. First of all, this would give the green sprinter a speed boost and would in turn slow down the red sprinter. This is a perfect analogy of what happens when the torso starts to fire in the down hitting. The torso grabs onto the lower body (pelvis) and starts to increase its speed. But the reaction to this force slows down the pelvis.



Then the blue sprinter grabs onto the green sprinter and propels himself into first place. This in turn will slow down the green sprinter. This is exactly what happens when the arms start to fire around the torso. The arms accelerate to their highest speed and the torso reacts by slowing down.



Finally, the yellow sprinter grabs onto the blue sprinter and takes the lead into first place. This in turn will slow down the blue sprinter. This represents the bat releasing off the arms. If they time this properly, the order of sprinters crossing the finish line would be the yellow sprinter winning the race, blue coming in second, green coming in third and red finishing last.



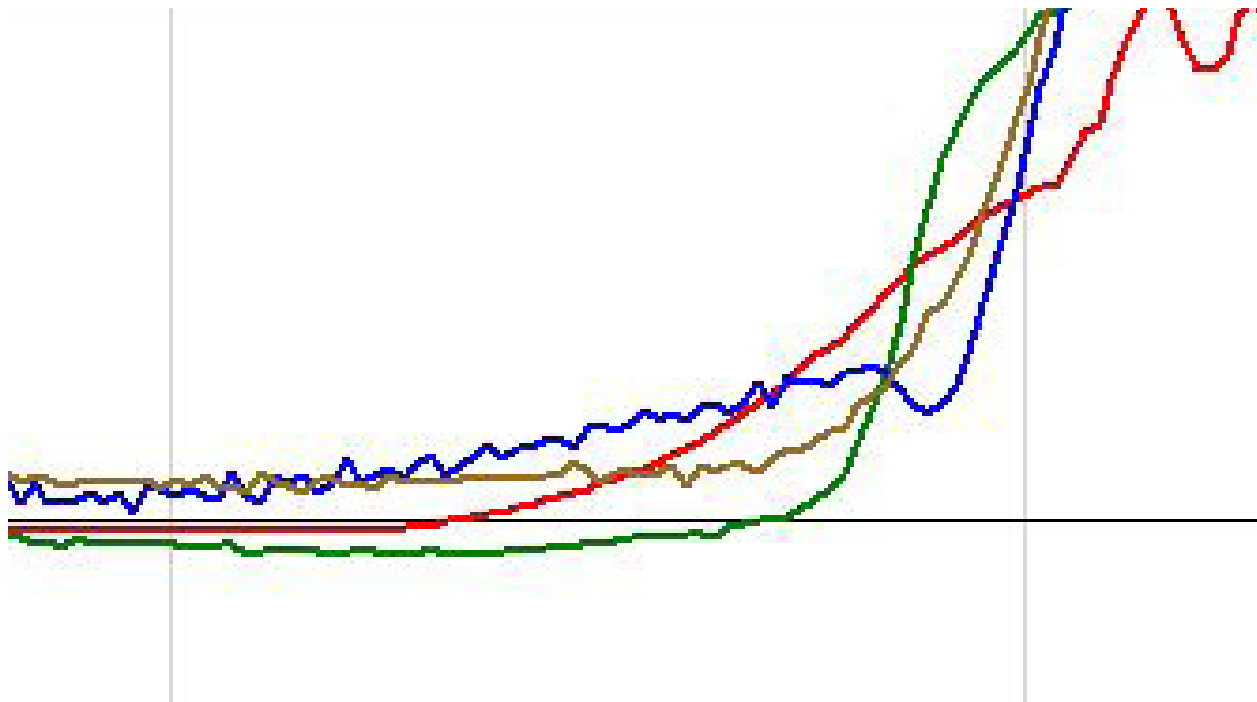
THE KINEMATIC SEQUENCE

100 METER RACE (CONT.):

By looking at the order in which the sprinters slow down, we are able to get a clear picture of who has the best potential to win the race. In other words, if the arm (blue sprinter) slows down first, then we would suspect that the bat (yellow sprinter) must have grabbed onto the arms to accelerate itself too early. Therefore, we would not expect the arms to come in second at the finish line.

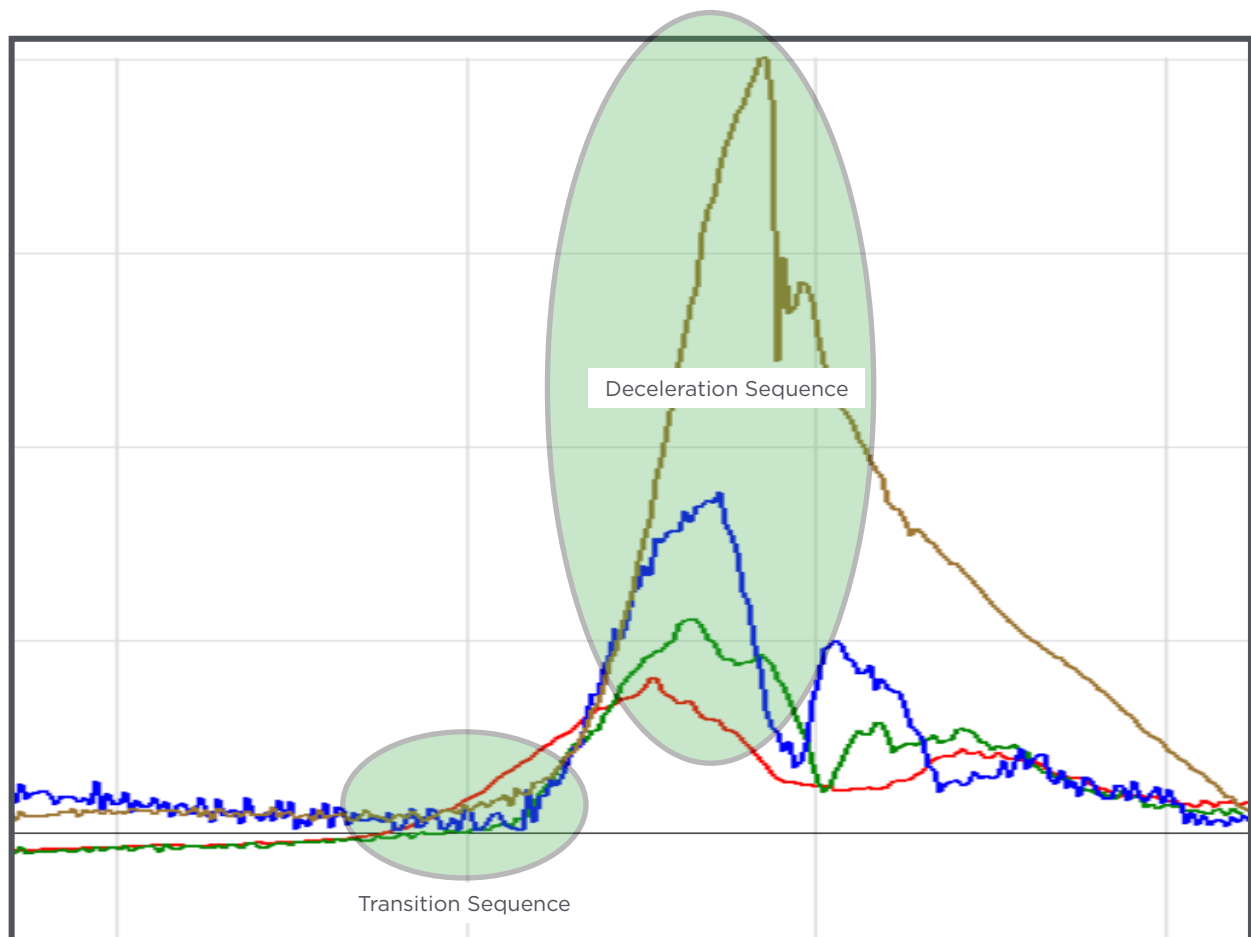
The graph below demonstrates an inefficient transition sequence where the pelvis goes first, but much earlier than the other segments. The thorax fires next and then the bat fires third out of sequence. Finally the arm transitions last.

EXAMPLE OF INEFFICIENT TRANSITION SEQUENCE



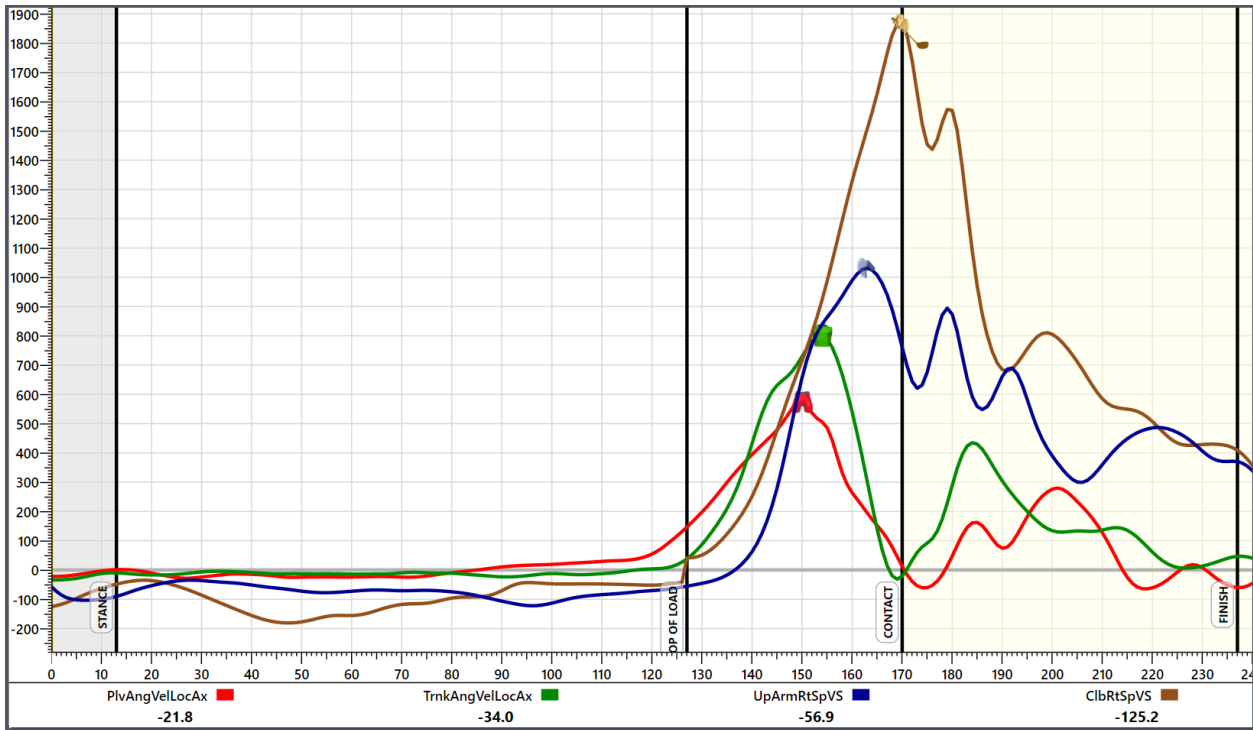
THE KINEMATIC SEQUENCE

If you look a little closer at the Kinematic Sequence graph you will see that there are actually two distinct sequences (or key events) that can be analyzed. There is the Deceleration Sequence (that is the most useful sequence for predicting efficiency) and there is the Transition Sequence that we just reviewed. The image below highlights both areas.

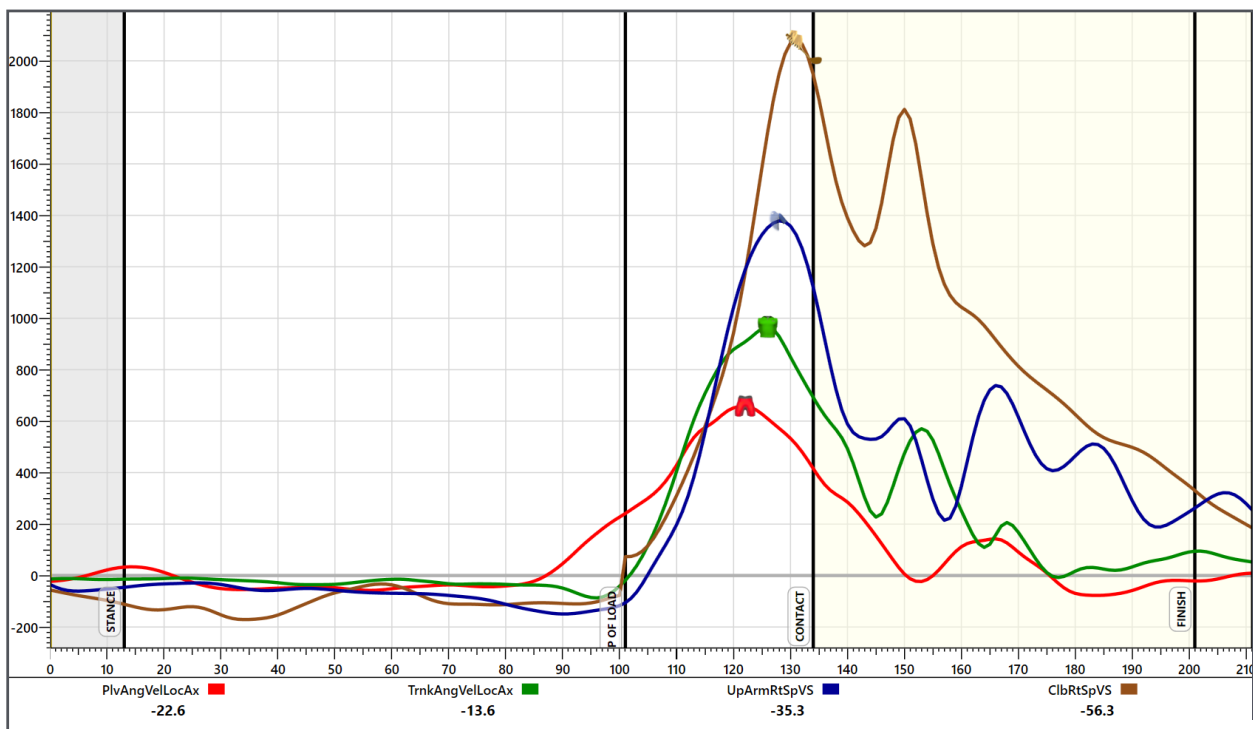


THE KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE A

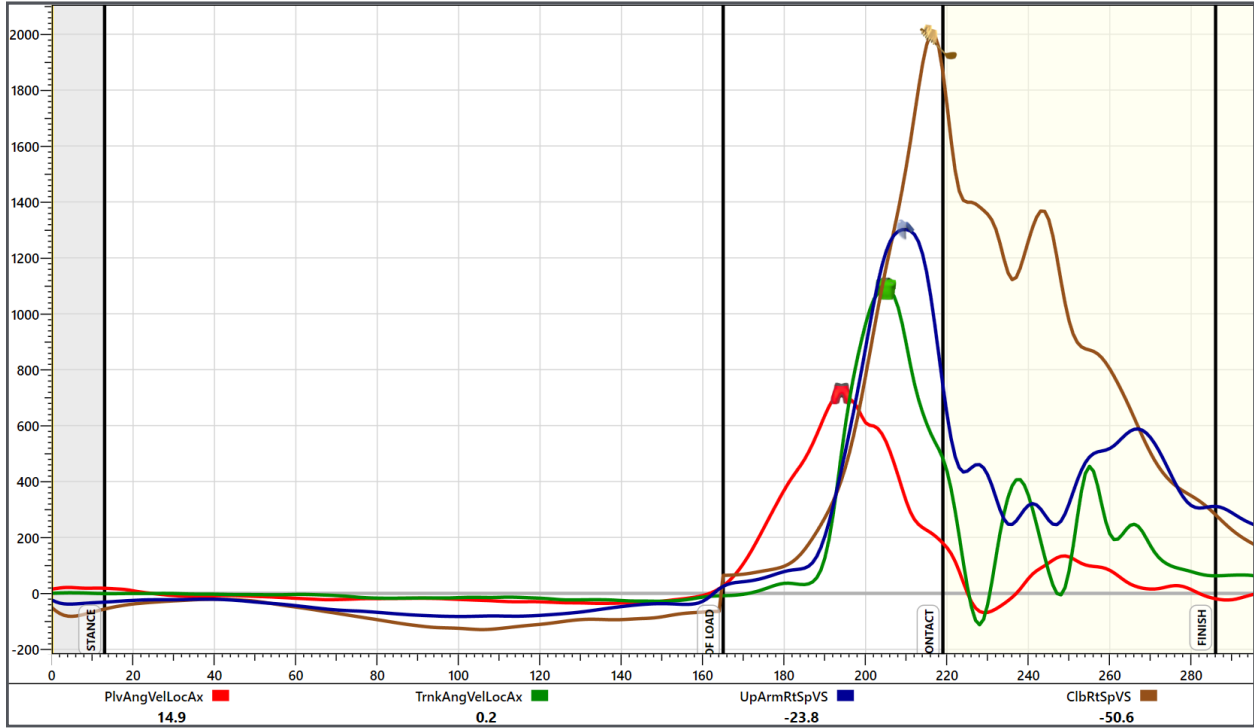


DECELERATION SEQUENCE - EXAMPLE B

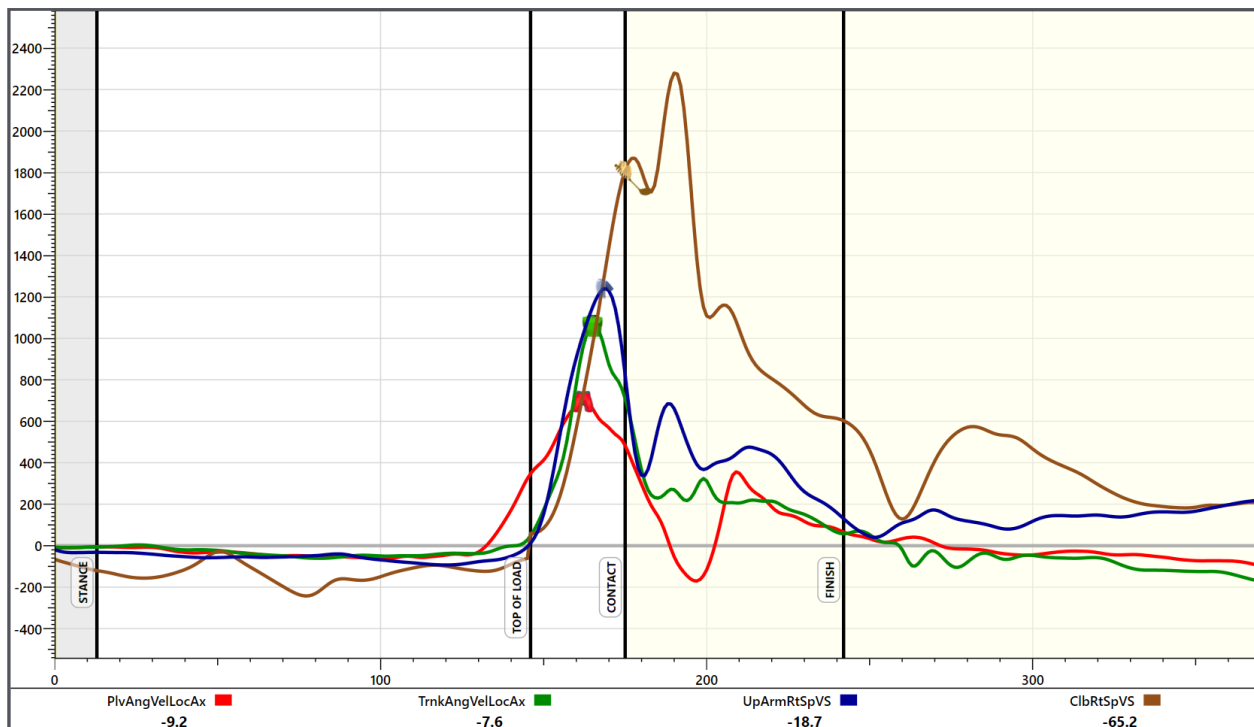


THE KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE C

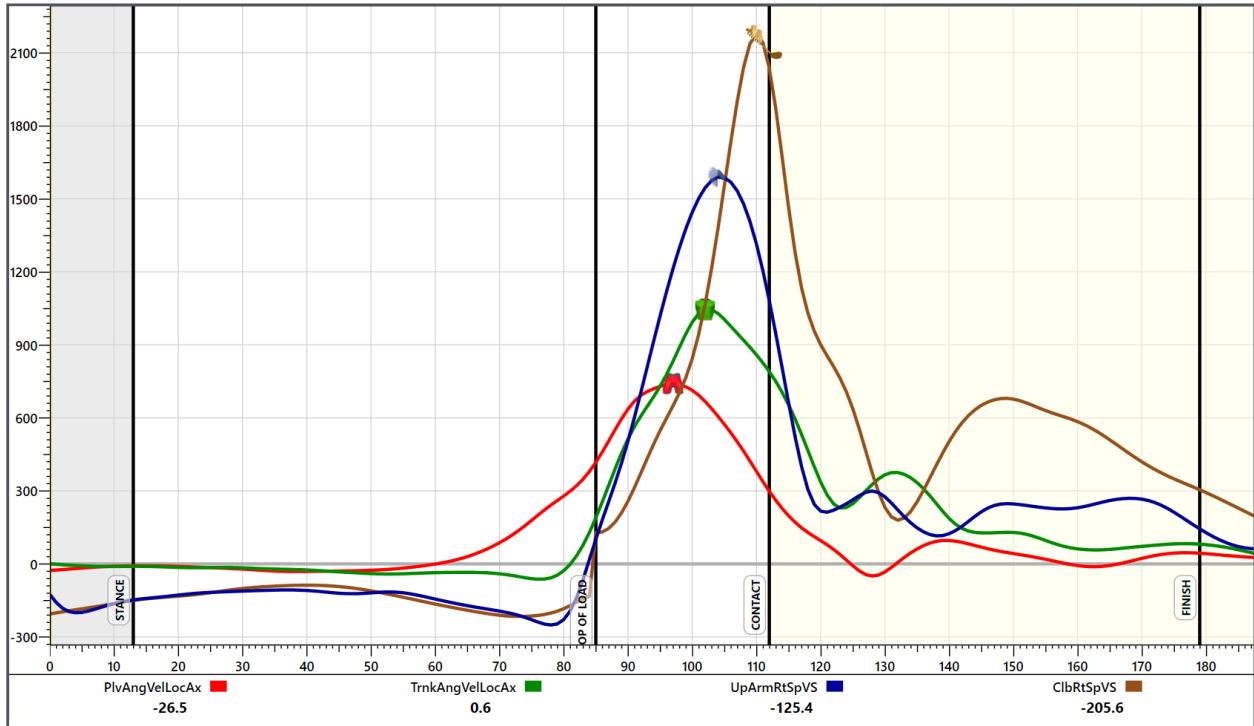


DECELERATION SEQUENCE - EXAMPLE D

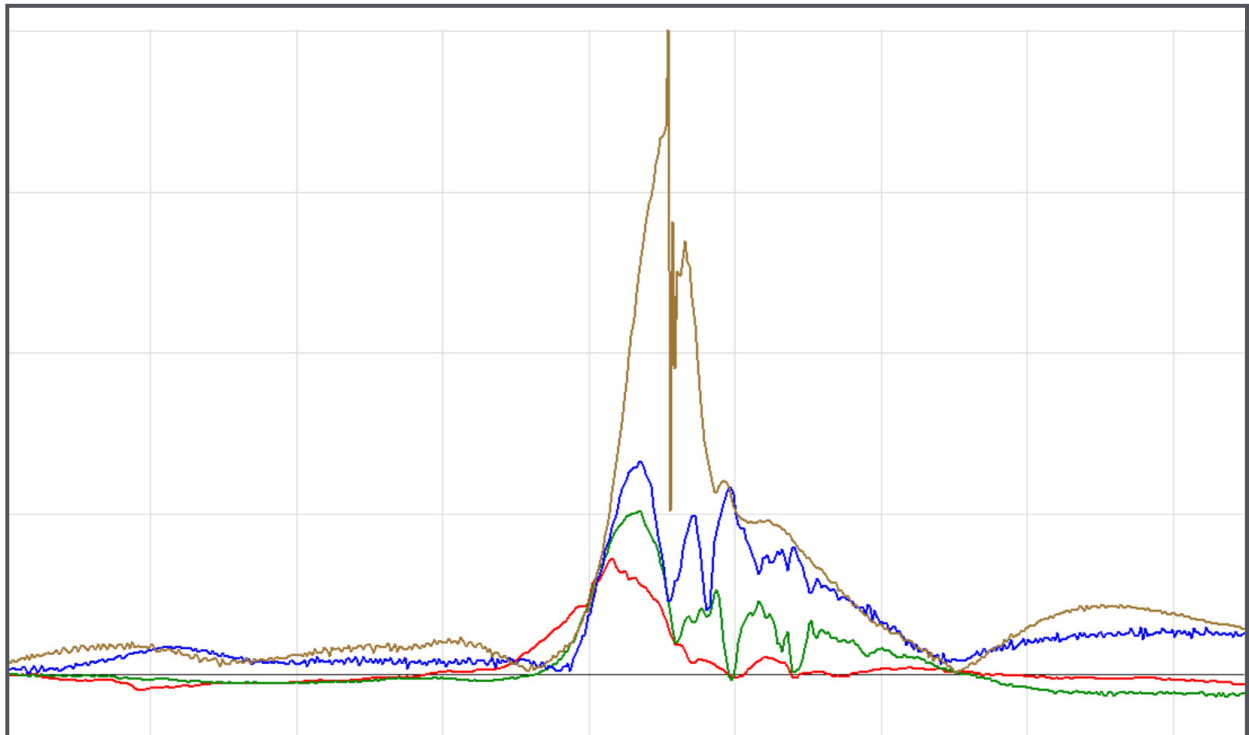


THE KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE E

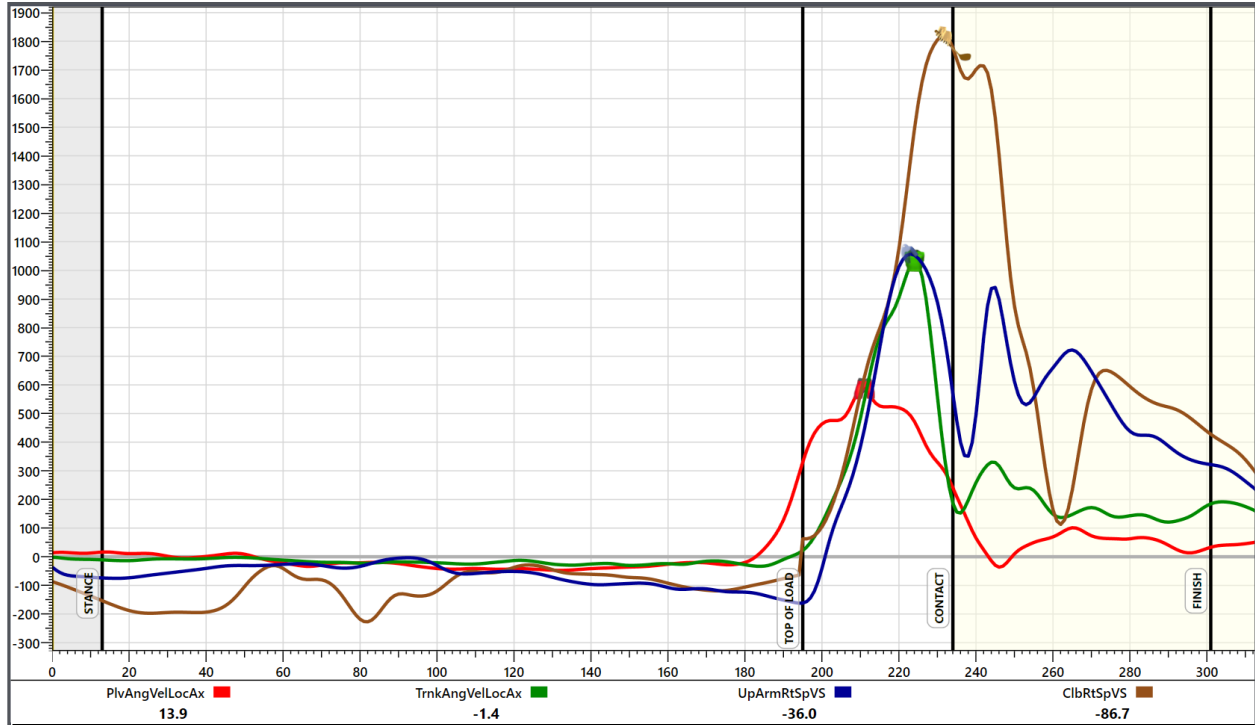


DECELERATION SEQUENCE - EXAMPLE F

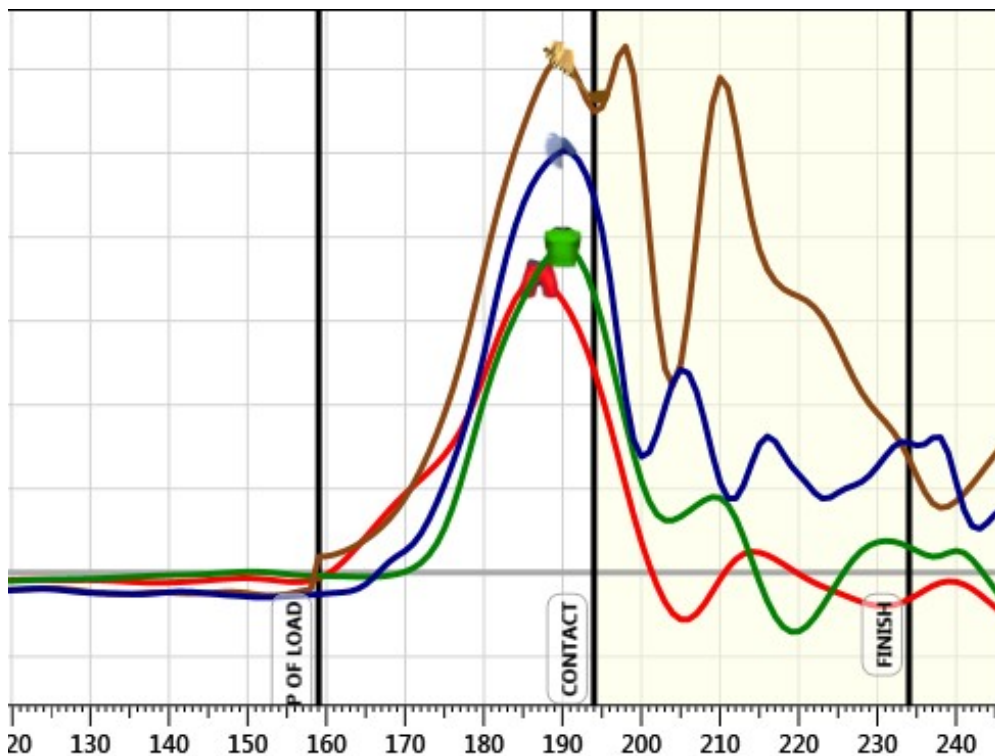


POOR KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE G

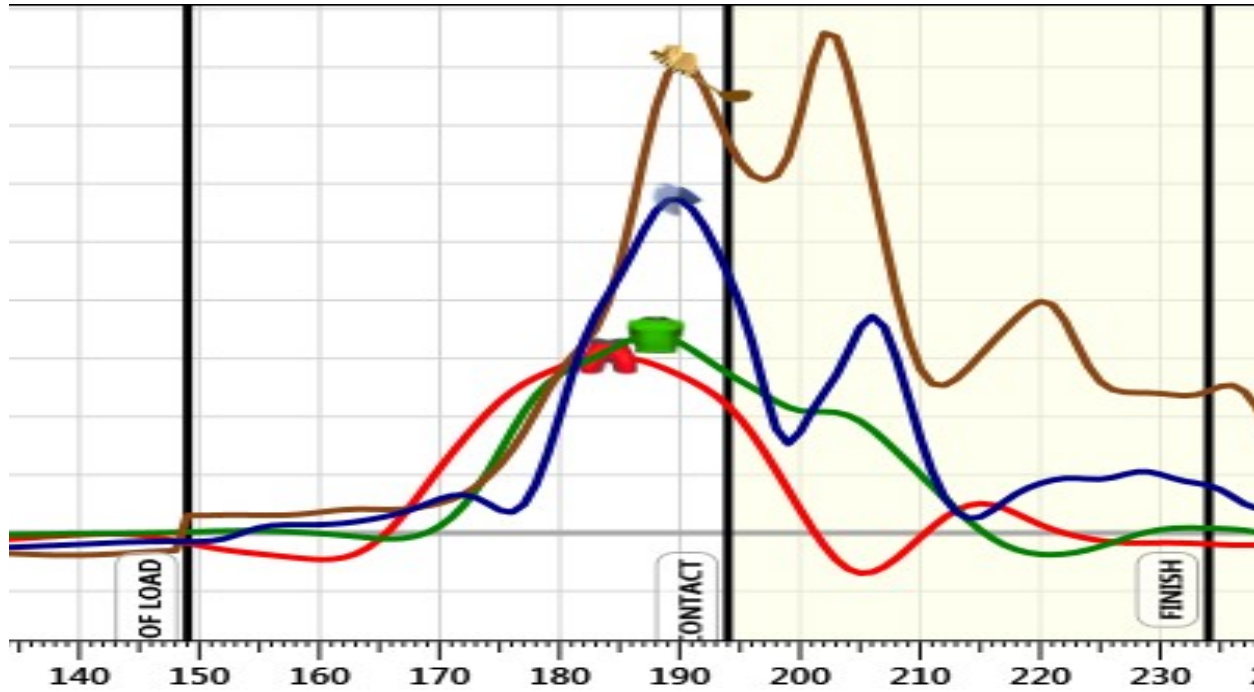


DECELERATION SEQUENCE - EXAMPLE H

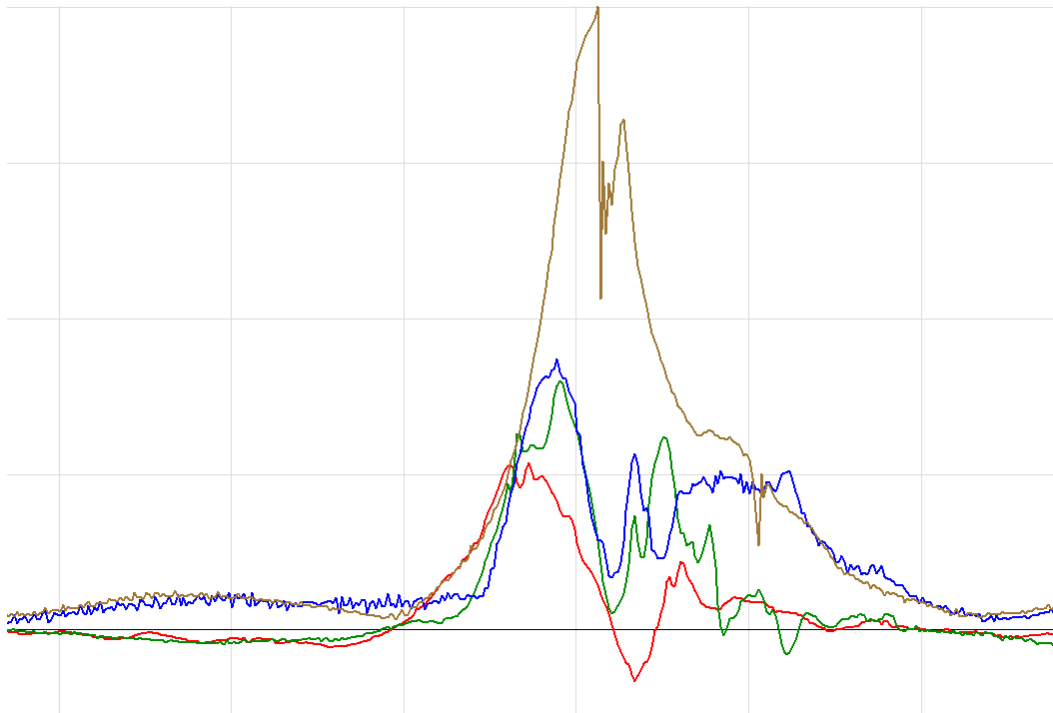


POOR KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE I

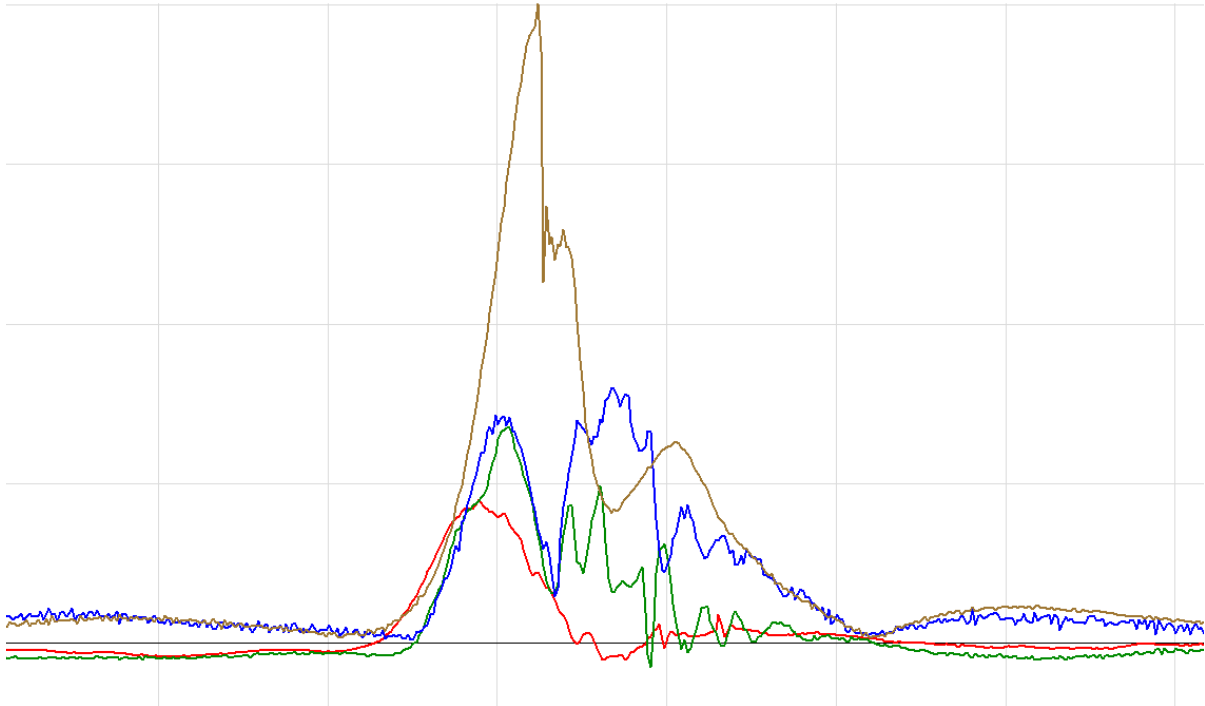


DECELERATION SEQUENCE - EXAMPLE J



POOR KINEMATIC SEQUENCE - HITTING

DECELERATION SEQUENCE - EXAMPLE G



THREE THINGS LEAD TO EFFICIENCY BREAKDOWNS:

- Poor Mechanics - Use 2D video hitting analysis to isolate mechanical breakdowns.
- Poor Conditioning - Use the OnBaseU Hitting screen to isolate any limitations in the body.
- Poor Equipment - Use proper bat fitting techniques to determine the best specifications for the player.

KINEMATIC SEQUENCE

NOTES





ONBASE UNIVERSITY

MOTOR LEARNING
MAKING REAL CHANGES FAST

MOTOR CONTROL AND LEARNING

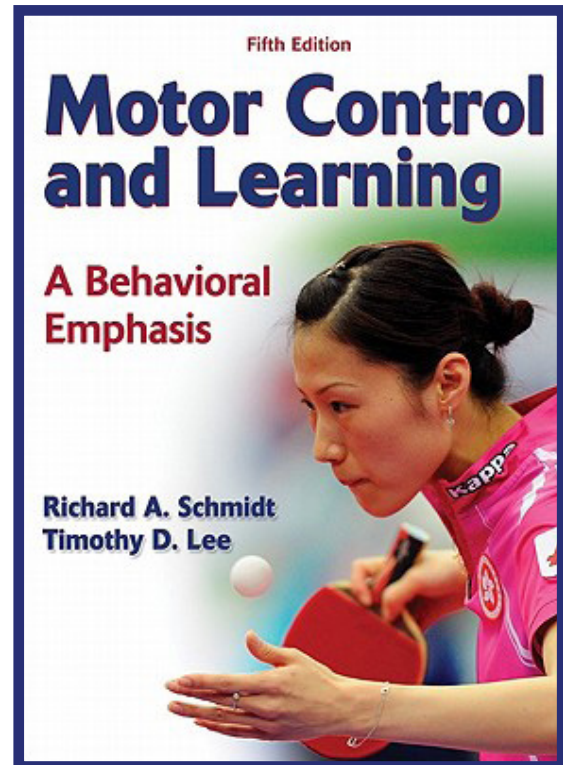
THE SCIENCE OF MOTOR LEARNING:

Special Thanks:

Most of this overview comes from two world-renown researchers: Dr. Richard Schmidt and Dr. Timothy Lee. The late Dr. Schmidt was based out of Southern California and researched and taught motor learning for over 40 years. Dr. Lee still teaches at McMaster University in Ontario, Canada and has published over 80 papers on motor control and learning. We would like to recommend their book, “Motor Control and Learning”, for a complete understanding of how humans learn and to see techniques on how to help implement your reloading exercises. A picture of the cover is included to the right.

WHY IN THIS MANUAL:

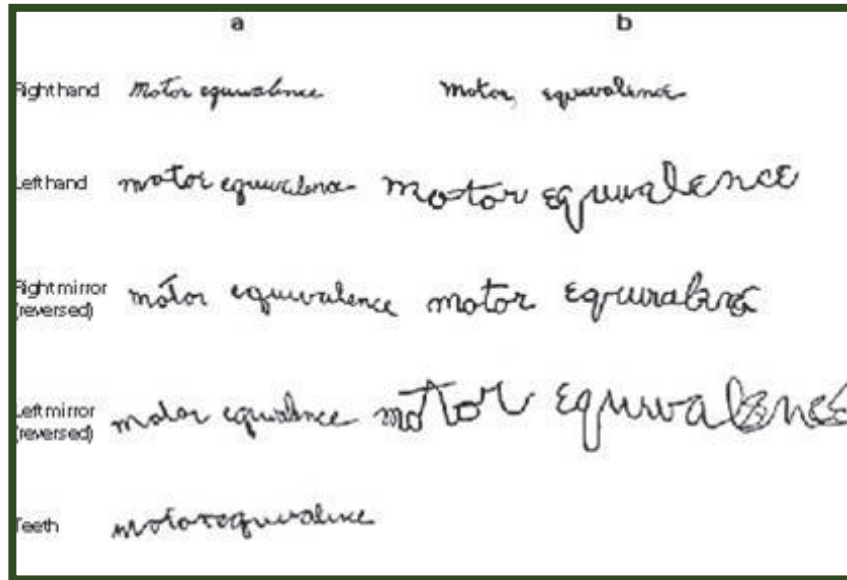
Many of the problems discovered in the OnBaseU Screen have a true motor control dysfunction that is the source of the player’s problem. As coaches, it is our job to help eliminate these deep ingrained motor control dysfunctions. Unfortunately, most of us did not learn the latest research on motor learning during our coaching education. For this reason, we feel it necessary to review the latest motor learning research since this will be one of our primary responsibilities as coaches.



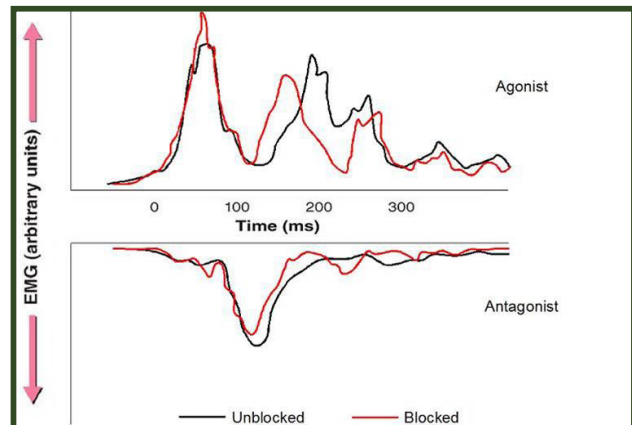
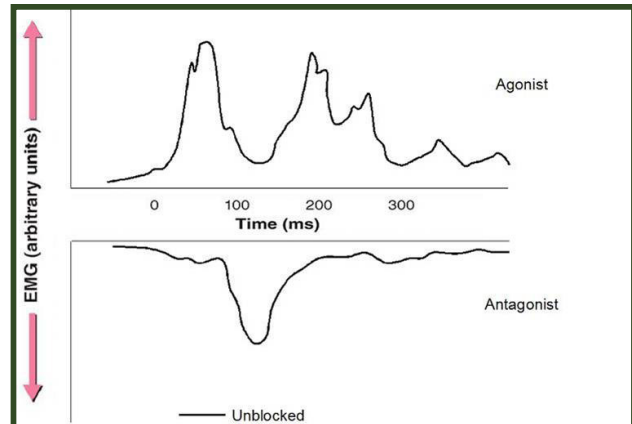
MUSCLE MEMORY

WHAT WE KNOW ABOUT MOTOR PROGRAMS

- Resides in the central nervous system (brain), not muscles



- Planned in advance and executed without many changes when triggered into action (Wadman et al.)

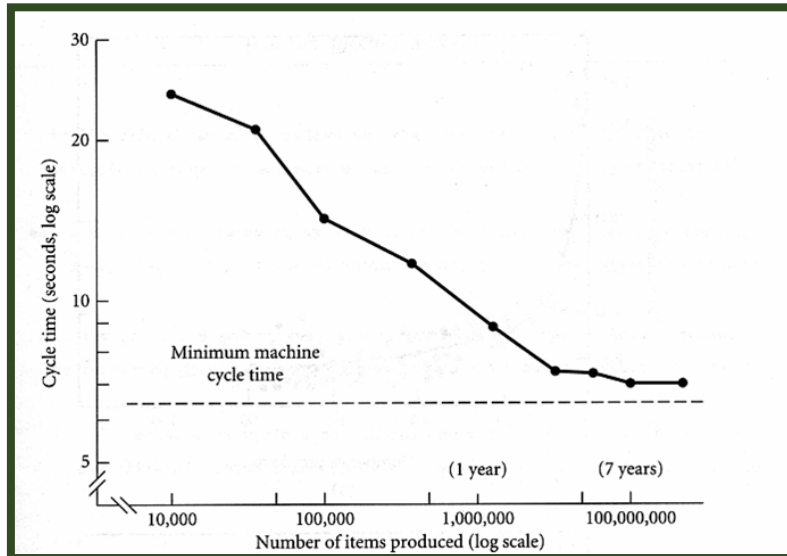


FEATURES OF LEARNING MOTOR PROGRAMS

FEATURES OF LEARNING MOTOR PROGRAMS

Learning motor programs is different than learning other information:

- Factual information -- what did you learn today?
- Motor learning -- a process that never ends



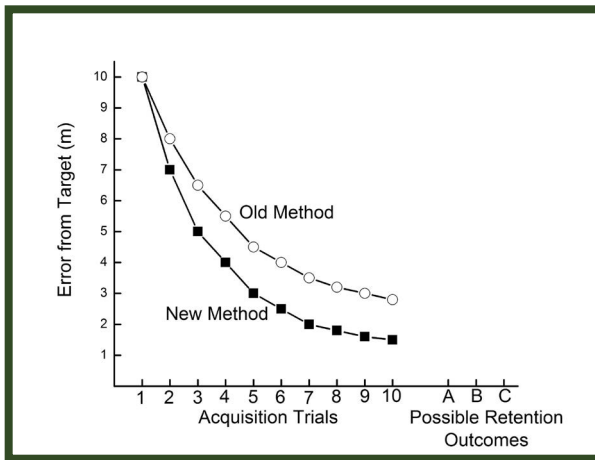
- Retention of motor skills is much better and more enduring than factual information



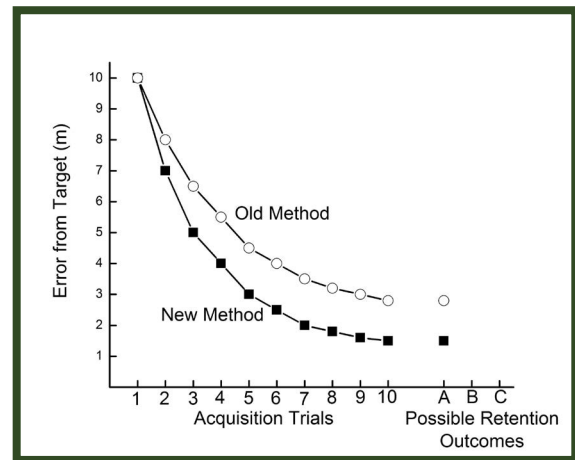
PERFORMANCE VS. LEARNING DISTINCTION

FUNDAMENTALS OF THE PERFORMANCE VS. LEARNING DISTINCTION

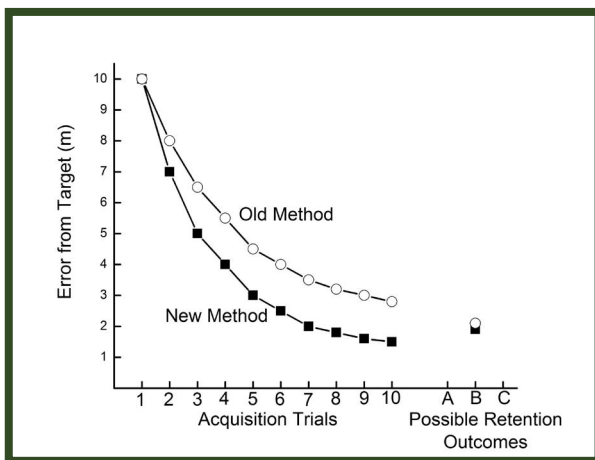
- Fundamental basis for evaluating motor learning research experiments AND teaching effectiveness
- Changes that occur during practice can be temporary or permanent
- Assumptions about learning must be based on permanent changes
- Tests (e.g., exams) are used to assess classroom learning; tests for motor learning are called “retention” tests



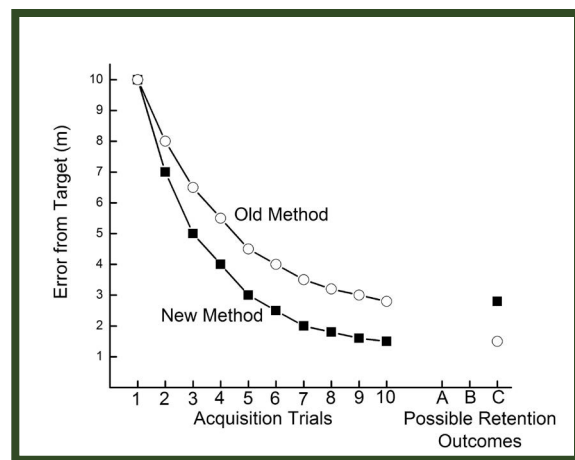
A practice curve - plot of performance scores over attempts, or blocks of attempts.



Retention test resulting in similar results as seen in practice.



Retention test resulting in no difference between practice methods.



Retention test resulting in reversed differences, compared to practice.

PERFORMANCE VS. LEARNING DISTINCTION

FUNDAMENTALS OF THE PERFORMANCE VS. LEARNING DISTINCTION

- Some causes of temporary changes in performance:
 - Fatigue
 - Boredom
- Some causes of permanent changes (learning):
 - Amount of practice (if done effectively)
 - Augmented feedback (if provided effectively)

CONDITIONS OF PRACTICE AND MOTOR LEARNING

OUTDATED ANALOGIES

- “Grooving” the skill, as in digging a deeper groove in a phonograph record
- “Stamping it in”
- “Water running down a mound of dirt digs progressively deeper streams”

These all suggest the notion that repetitiveness is key

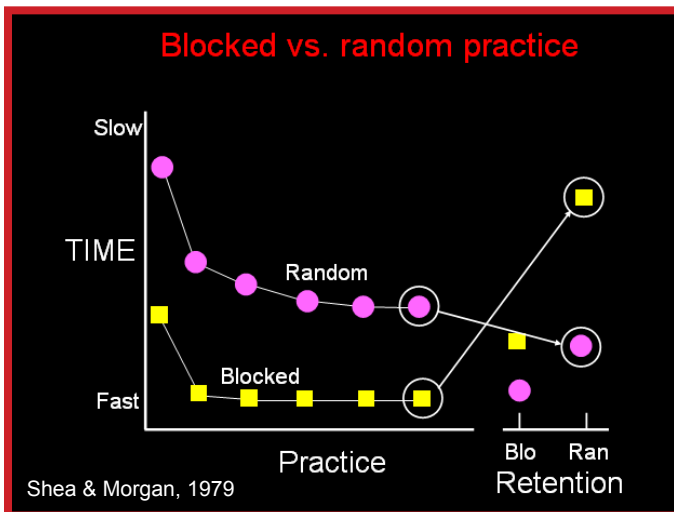
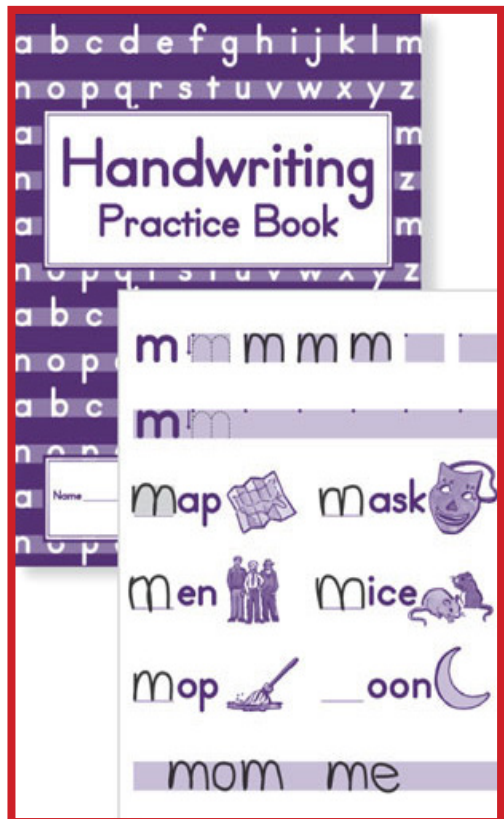
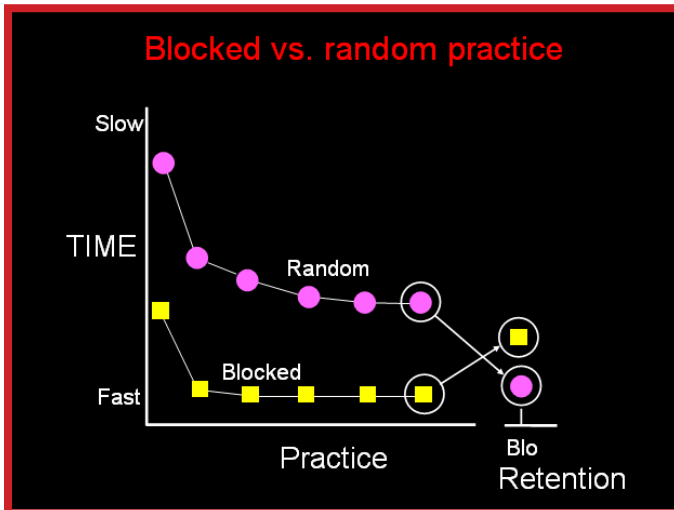
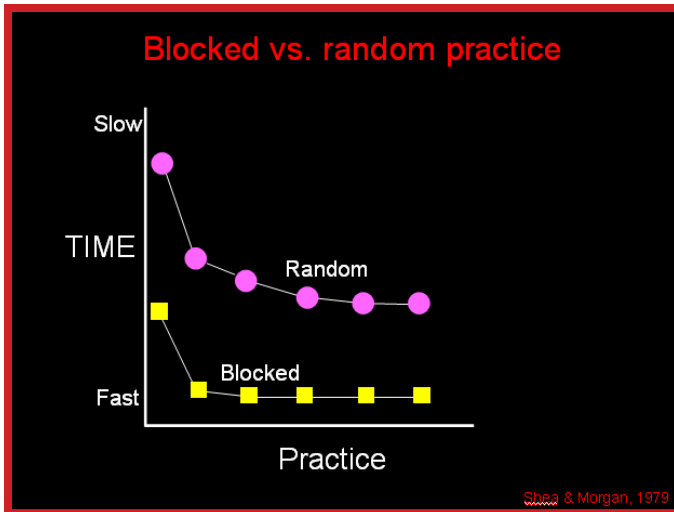
Research suggests something very different!

BLOCKED VS. RANDOM PRACTICE

A breakthrough experiment by John Shea and Robyn Morgan (1978)

- 3 tasks to practice, 18 attempts per task
- blocked practice: AAA...BBB...CCC
- random practice: ACBCBCAAB...
- same “amount” of total practice,
- same retention and transfer tests

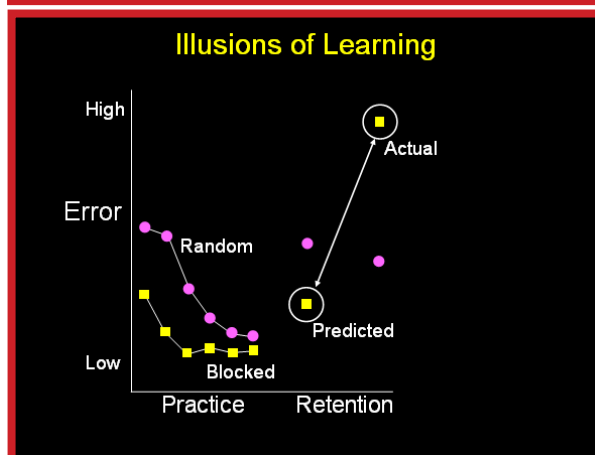
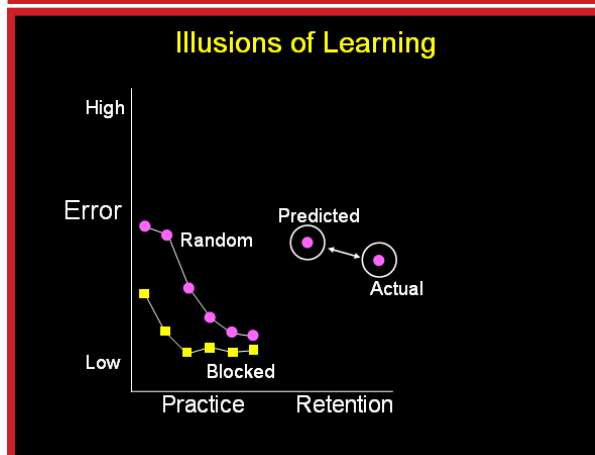
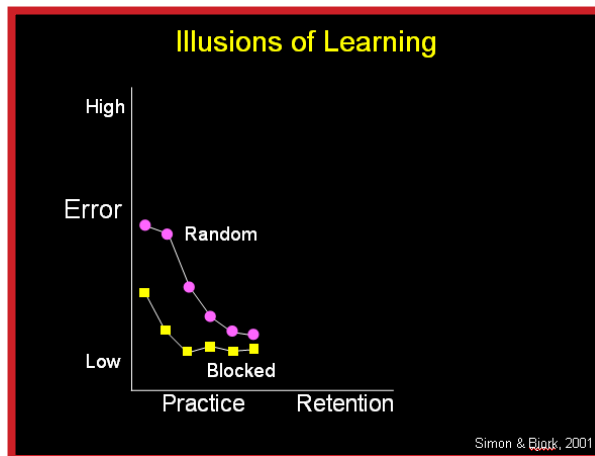
Blocked vs. Random Practice



Illusions of Learning

JUDGMENTS ABOUT LEARNING ARE OFTEN CONFUSED WITH JUDGMENTS ABOUT PERFORMANCE

- How often have you heard something like this? “I don’t understand why I played so bad since my practice was so good?”

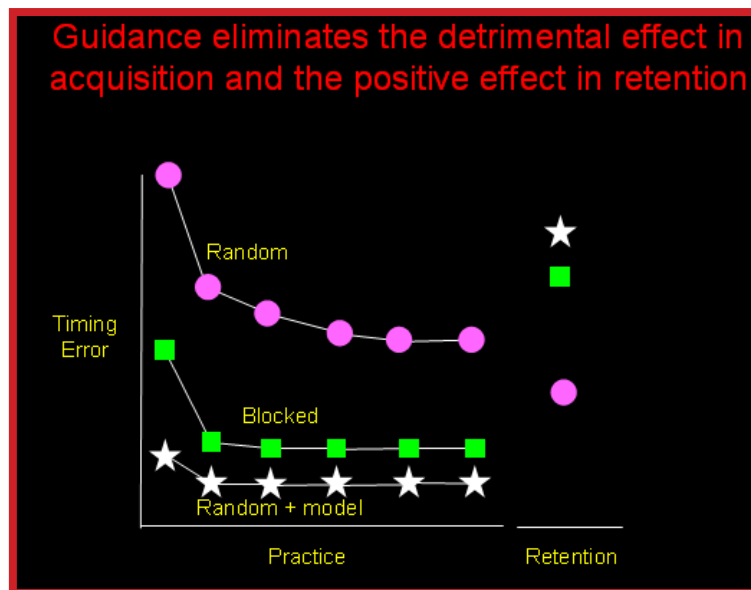


Illusions of Learning

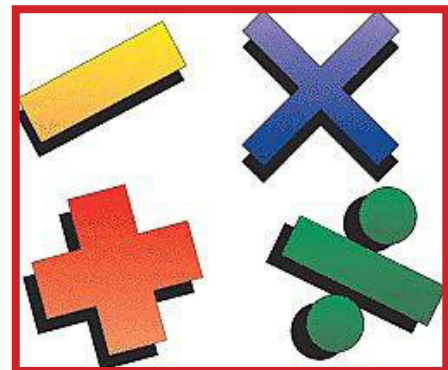
- Simon & Bjork (2001) - blocked group severely overestimated retention performance
- Implications of false metamemory judgments?
 - Overestimate skill level (take risks?)
 - May stop practice to soon
 - More apt to take shortcuts to facilitate performance gains -- shortcuts that benefit practice but not learning
 - Illusions of competence can lead to dangerous situations as well as frustration

CAVEAT: BLOCKED VS. RANDOM PRACTICE IS NOT THE REAL ISSUE

- Random practice benefit can easily be eliminated
- Blocked practice detriment can easily be overcome



- More important issue is understanding why these effects occur and how to avoid or promote them.
- Why do blocked/random differences occur?
- Think of it as solving math problems.
- Remembering the solution eliminates the need to re-solve the problem
- Forgetting the solution requires one to reconstruct a solution to the problem
- Learning is more permanent and also better adaptable to new situations when you need to work harder to solve the problem



FEEDBACK AND INSTRUCTION IN MOTOR LEARNING

FEEDBACK AND INSTRUCTION IN MOTOR LEARNING

INTRINSIC FEEDBACK

- Refers to the information received directly through your senses
- Available during practice and in “test” situations (games, performances, operations, etc.)

AUGMENTED FEEDBACK

- Information that is provided by means of an external source
 - » Instructor comments and suggestions
 - » Video and pictures
 - » Auditory information
 - » Physically-restrictive guidance tools
- Represents an artificial addition to intrinsic feedback -- not normally available in test situations, usually only in practice
- It serves to “augment” the intrinsic information
- Goal for learning is to understand how to use intrinsic feedback in test situations
- Augmented feedback can facilitate that goal, but it can also get in the way of that goal

OUTDATED THINKING

Researchers, teachers, coaches, and everyone else used to think that:

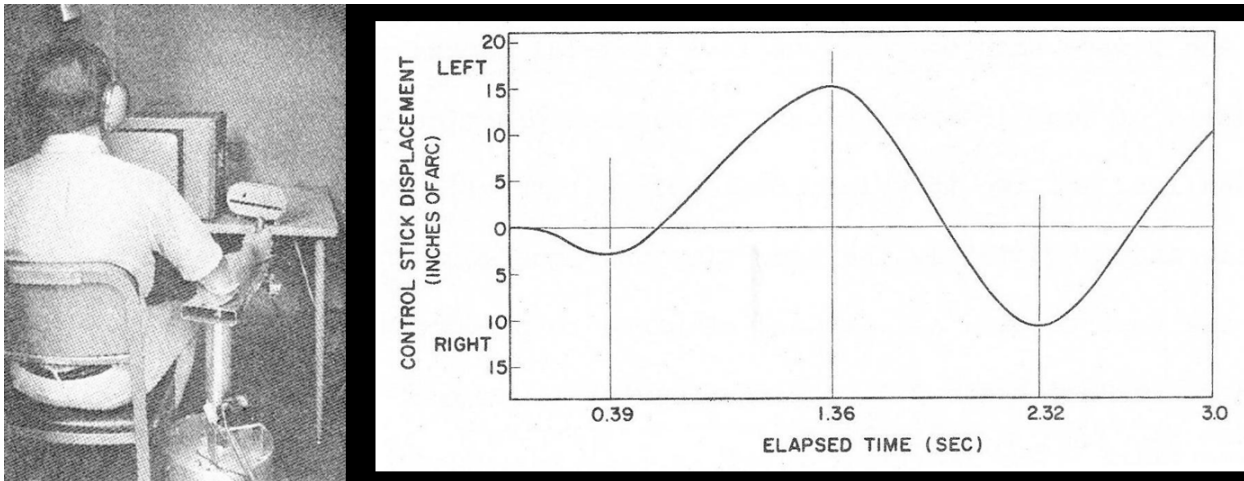
Anything you did with feedback you should make it:

- » as frequent as possible
- » as immediate as possible
- » as informational as possible
- » and generally, as useful for correcting errors as possible...

FEEDBACK AND INSTRUCTION IN MOTOR LEARNING

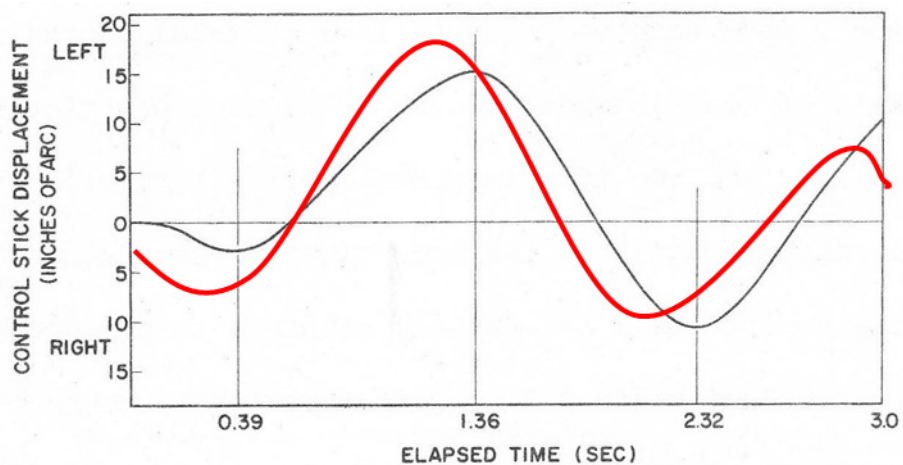
RESEARCH SUGGESTS THAT AUGMENTED FEEDBACK AFFECTS LEARNING DIFFERENTLY

- Armstrong (1970) study
- Subjects learned to make a 3-sec spatial-temporal arm movement



THREE EXPERIMENTAL CONDITIONS

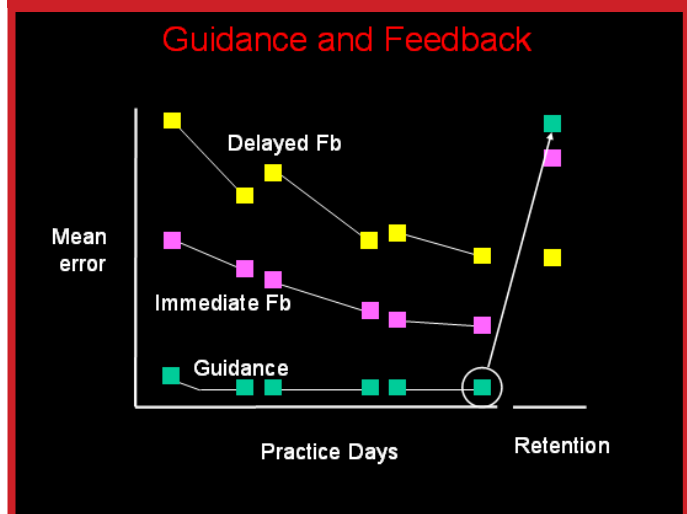
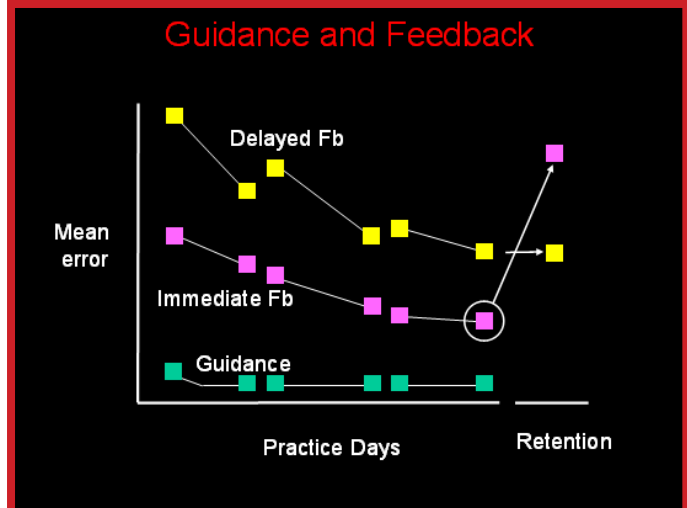
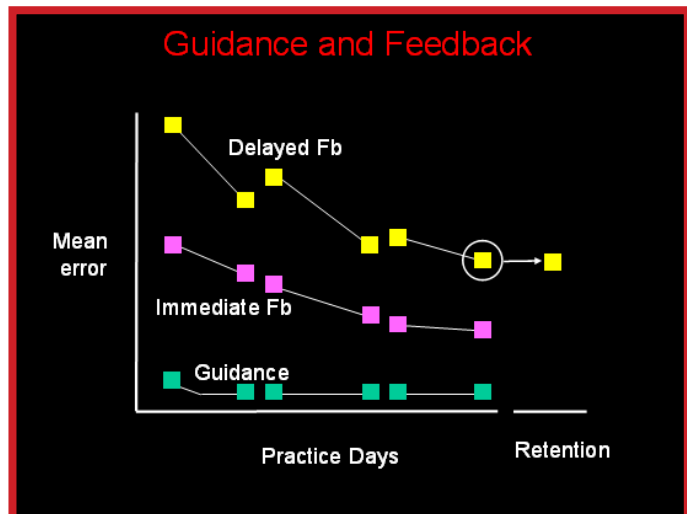
1. Guidance: robotic limbs restricted amount of error that could be made
2. Immediate feedback: precise spatial-temporal feedback provided about ongoing movement
3. Delayed feedback: feedback not presented until several seconds after trial was completed



FEEDBACK AND INSTRUCTION IN MOTOR LEARNING

CONCLUSIONS FROM ARMSTRONG (1970)

- Augmented feedback supports performance while present – dependency on feedback?
- Reduced reliance can benefit learning when augmented feedback is no longer present
- Especially true when interpreting intrinsic feedback (vision, proprioception, etc.) is promoted
- Involving the brain in the interpretation of feedback promotes learning



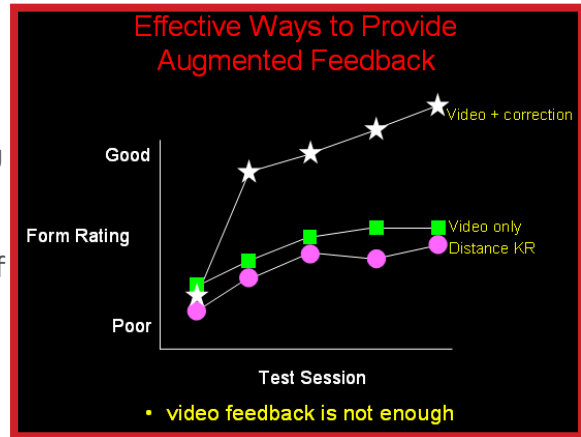
FEEDBACK AND INSTRUCTION IN MOTOR LEARNING

COMMON FAULTS ABOUT WHICH TO PROVIDE AUGMENTED FEEDBACK

Augmented feedback can be provided about many different things at various points during the practice:

- Position: joints, angles, etc.
- Kinematics: time-dependent motions of body parts (velocity, acceleration)
- Kinetic: relation between forces and motions (e.g., ground reaction forces)

What are the most important faults and how do you provide feedback about them?

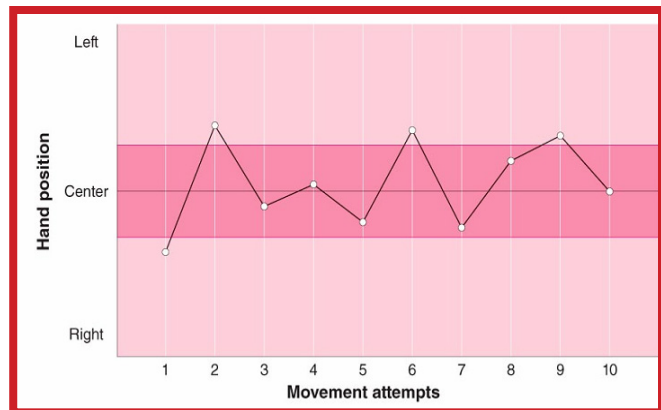


BANDWIDTH FEEDBACK

- Provide augmented feedback only about “significant” errors -- when an error exceeds a relative tolerance for being correct.

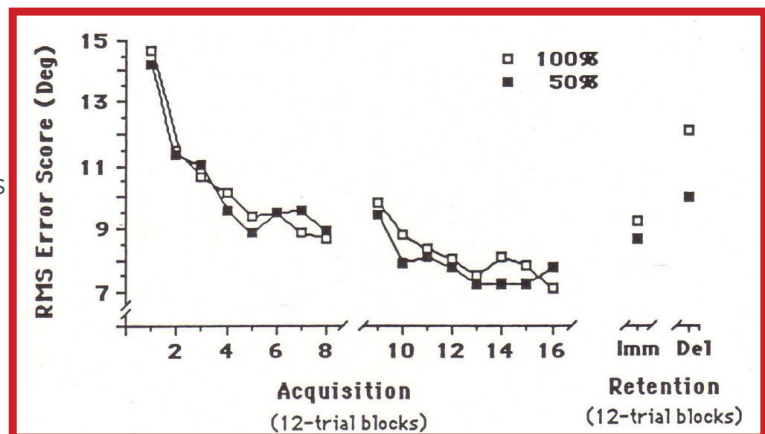
ADVANTAGES OF BANDWIDTH FEEDBACK

- Combines corrective feedback with positive comments.
- Reduces amount of corrective feedback (good for learning)***.
- Can set the parameters to suit the learner.
- Effective for performance and learning.



REDUCING AMOUNT OF FEEDBACK

- Simply reducing the amount of feedback provided to the learner has learning benefits



NOTES





Hitting Screen

Name:

Age:

Date:

Hits: RT LT

Writes Hand: RT LT

Weight:

Height:

Toe Tap Test		Pelvic Tilt		Shoulder 46 Test		Lateral Step Test	
L	One Foot Length Apart	R	Athletic Posture (Subjective)	L	Elbow at Side	R	Knee High Side Step
	Touches		Neutral Tilt		Past 2nd Base (>45)		Good
	Short		S-Posture		Equal to 2nd Base (=45)		Unstable Posture
L	Holding Hips	R	C-Posture		Less than 2nd Base (<45)		Loses Balance
	Improves with Holding		Amount of Motion	Separation Test		Wide Squat	
	No Change		Normal Motion	R	Elbow Up	L	Arms In Front
Hip 45 Test			Hard Time Arching Back		Elbow = or Above		Good Squat
L	45 Degree Angle	R	Hard Time Flattening Back		Elbow Below		Limited Squat
	Greater than 45 degrees		Both Limited	L	Hands Slide	R	Arms Down
	Equal to 45 Degrees		Quality of Movement		Hands Past Elbow		Stable
	Less than 45 degrees		Smooth Movement		Hands over Elbow		Unstable
Seated Trunk Rotation w/ CS			Shake and Bake Movement		Hand Inside of Elbow	Ankle Rocking Test	
L	Bat Behind Back	R	Did Not Test	Holding Angle Test		L	Seated w/o Holding
	Greater than 45 degrees		Pelvic Rotation	Using Top of Top Hand			Good Inversion
	Equal to 45 degrees	L	Without Holding Shoulders	R	Below Bottom of Sternum		Good Eversion
	Less than 45 degrees		Good		Over Bottom of Sternum		Limited Eversion (Roll In)
R	Turning Head	L	Limited		Above Bottom of Sternum		Limited Inversion (Roll Out)
	Good - Over Clavicle	L	Holding Shoulders	R	Switch Hitter (Non-Dominant Side)	L	Seated Holding
	Limited - Short of Clavicle		Improves		Below Bottom of Sternum		Improves Eversion
			Doesn't Improve		Over Bottom of Sternum		Improves Inversion
		L	Coordination	R	Above Bottom of Sternum		Limited Eversion (Roll In)
			Good Rotary Movement		Hitch Hiker Test		Limited Inversion (Roll Out)
			More Lateral Movement	L	Pronation (Palms Down)	R	
					80 Degrees of More		
					Limited		
		L		R	Supination (Palms Up)		
					80 Degrees of More		
					Limited		

Core Rotary Screen
OnBaseU Screen
Normal





Hitting Screen

Name:

Age:

Date:

Hits: RT LT

Writes Hand: RT LT

Weight:

Height:

Toe Tap Test		Pelvic Tilt		Shoulder 46 Test		Lateral Step Test	
L	One Foot Length Apart	R	Athletic Posture (Subjective)	L	Elbow at Side	R	Knee High Side Step
	Touches		Neutral Tilt		Past 2nd Base (>45)		Good
	Short		S-Posture		Equal to 2nd Base (=45)		Unstable Posture
L	Holding Hips	R	C-Posture		Less than 2nd Base (<45)		Loses Balance
	Improves with Holding		Amount of Motion	Separation Test		Wide Squat	
	No Change		Normal Motion	R	Elbow Up	L	Arms In Front
Hip 45 Test			Hard Time Arching Back		Elbow = or Above		Good Squat
L	45 Degree Angle	R	Hard Time Flattening Back		Elbow Below		Limited Squat
	Greater than 45 degrees		Both Limited	L	Hands Slide	R	Arms Down
	Equal to 45 Degrees		Quality of Movement		Hands Past Elbow		Stable
	Less than 45 degrees		Smooth Movement		Hands over Elbow		Unstable
Seated Trunk Rotation w/ CS			Shake and Bake Movement		Hand Inside of Elbow		Ankle Rocking Test
L	Bat Behind Back	R	Did Not Test	Holding Angle Test		L	Seated w/o Holding
	Greater than 45 degrees		Pelvic Rotation	Using Top of Top Hand			Good Inversion
	Equal to 45 degrees	L	Without Holding Shoulders	R	Below Bottom of Sternum		Good Eversion
	Less than 45 degrees		Good		Over Bottom of Sternum		Limited Eversion (Roll In)
R	Turning Head	L	Limited		Above Bottom of Sternum		Limited Inversion (Roll Out)
	Good - Over Clavicle	L	Holding Shoulders	R	Switch Hitter (Non-Dominant Side)	L	Seated Holding
	Limited - Short of Clavicle		Improves		Below Bottom of Sternum		Improves Eversion
			Doesn't Improve		Over Bottom of Sternum		Improves Inversion
		L	Coordination	R	Above Bottom of Sternum		Limited Eversion (Roll In)
			Good Rotary Movement	Hitch Hiker Test			Limited Inversion (Roll Out)
			More Lateral Movement	L	Pronation (Palms Down)	R	
					80 Degrees of More		
					Limited		
		L		R	Supination (Palms Up)		
					80 Degrees of More		
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Core Rotary Screen
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Normal





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Seated Trunk Rotation w/ CS			Shake and Bake Movement		Hand Inside of Elbow	Ankle Rocking Test	
L	Bat Behind Back	R	Did Not Test	Holding Angle Test		L	Seated w/o Holding
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Core Rotary Screen
OnBaseU Screen
Normal



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