The Body-Swing Connection

If You Don't Assess, It's Just A Guess

Robert Watson DC, MS

Medical Level 3 TPI

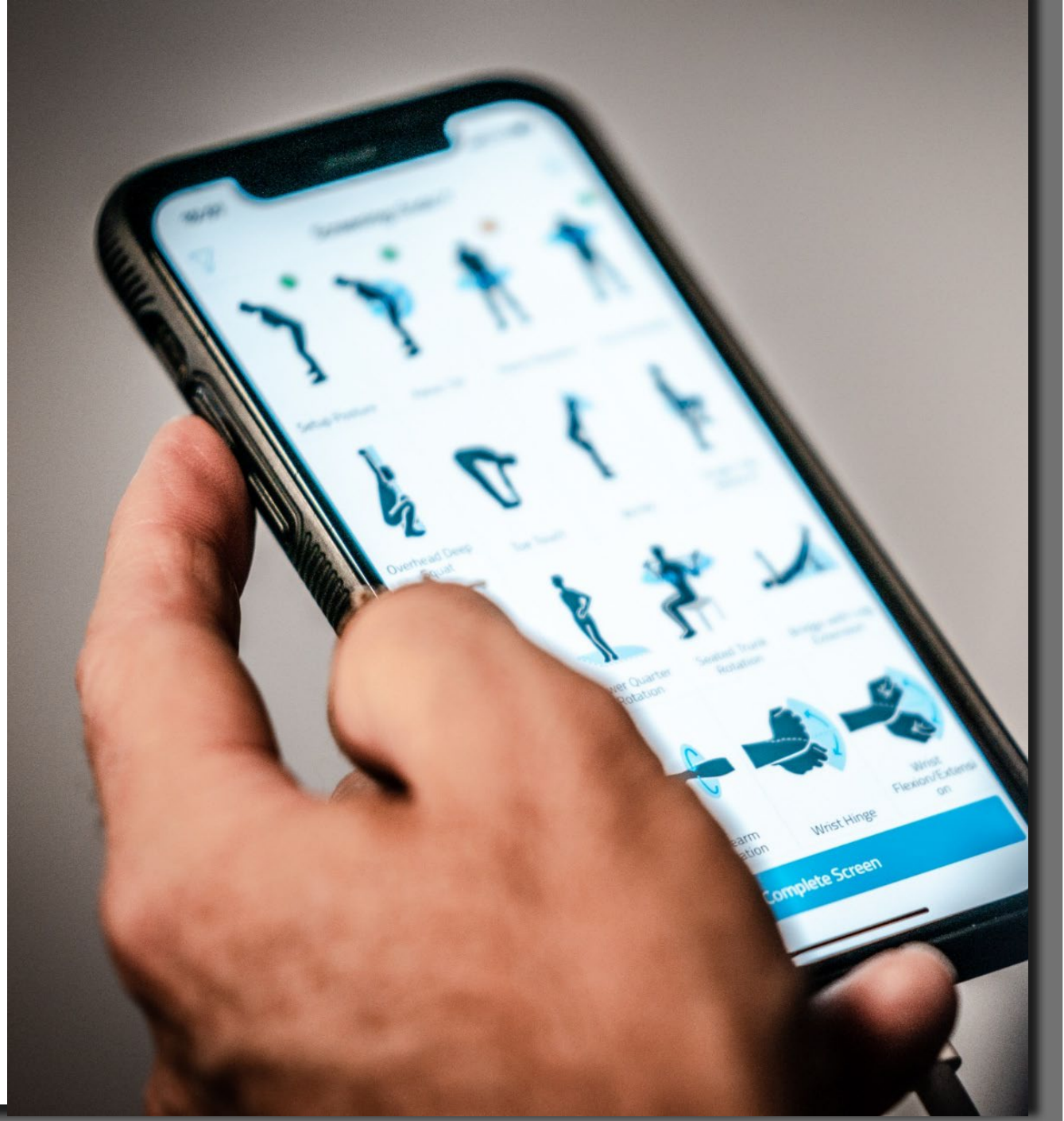
Titleist Performance Institute

TPI (Titleist Performance Institute) is the world's leading educational organization dedicated to the study of how the human body functions in relation to the golf swing. For over twenty years, TPI has gathered the world’s largest technical database of the game’s top Tour professionals as well as every-day golfers. TPI collects 3D motion capture, force, pressure, launch monitor, strength, power, and movement data on every player that visits the TPI campus. Using this data, TPI discovered how a properly functioning body allows a player to swing a golf club in the most efficient way possible. Conversely, TPI determined how physical limitations in a player’s body can adversely affect the golf swing and potentially lead to injury. This relationship is what TPI calls The Body-Swing Connection and is the foundation of all professional Certification courses offered by TPI.

What is a Golf Swing?

How Does it Work?

- TPI Philosophy: There are an infinite number of ways to swing a golf club. However, there is one most-efficient way for each player to swing a club and it is based on what they can physically do.
- How do we know, what we can physically do?



What Does a Golf Exam Look Like?

- History
- TPI screen
- SFMA (selective functional movement analysis)
- Slow motion video capture
- 6-D motion capture (3 directions and 3 rotations)

What are we looking for?

The Big 12 (15 for swing)

1. C-Posture
2. S-Posture
3. Flat Shoulder Plane
4. Early Extension
5. Loss of Posture
6. Sway
7. Slide
8. Chicken Wing
9. Casting/Scooping
10. Reverse Spine Angle
11. Over the top
12. Hanging Back
13. Hiking (swing only)
14. Flying Elbow (swing only)
15. Reverse Pivot (swing only)

Note: not only influence the shot, these involve injury inducing mechanics

Results from over 7,000 amateur golfers demonstrate the follow:
28.1% have low back pain
20.3% have shoulder pain
17.03% have knee pain
9.29% have hip pain
7.9% have wrist pain
7.22% have ankle pain
6.45% have elbow pain

Most Common Mechanism of Injury:
1. Poor Body Mechanics
2. Poor Swing Mechanics
3. Overuse

Most Common Mechanism of Injury (pro):
1. Overuse

S-Posture 25.3% of the players have S-Postures

What? Pelvic bend above 26 degrees at set up

Why? Tight low back, Tight groin, Weak core, Weak Gluts

Why do I care? Decreases power by shutting down glutes and increases risk of low back injury

What does it look like?

C-Posture 33.1% of the players have C-Posture

What? Pelvic bend below 13 degrees at set up

Why? Tight upper traps, tight chest, weak lower traps, weak deep neck flexors. Clubs too short, lack of hip hinge

Why do I care? Decreases backswing, increases risk of shoulder injury

What does it look like?

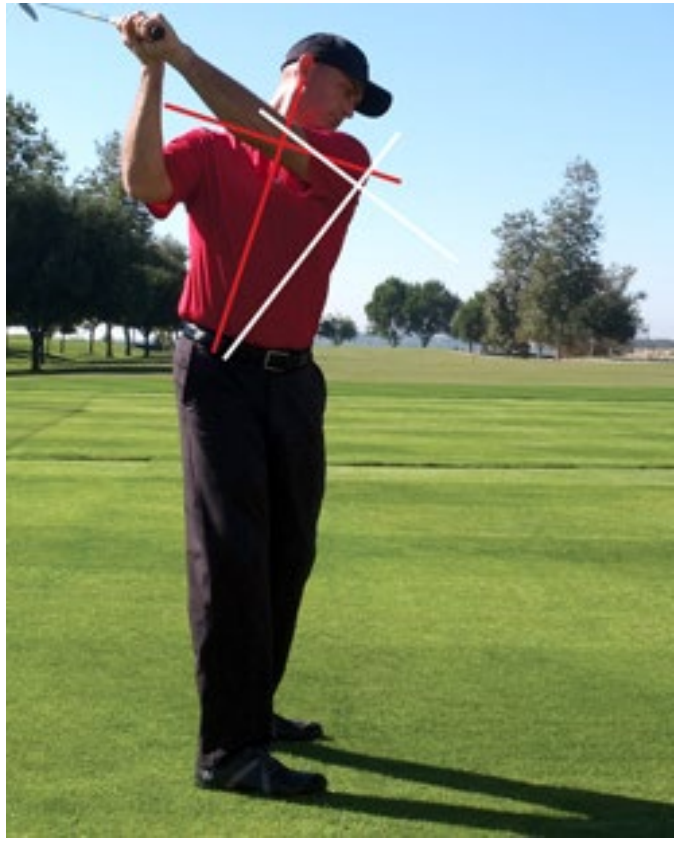
Loss of Posture 64.3% of players have a Loss of Posture

What? Thorax thrust and lift positive within the backswing

Why? Limited deep squat and toe touch, inability to separate shoulders and hip, weak core, stiff hips and shoulders, clubs too long, wrong swing path

Why do I care? Decreases consistency, loss of power

What does it look like?



Flat Shoulder Plane

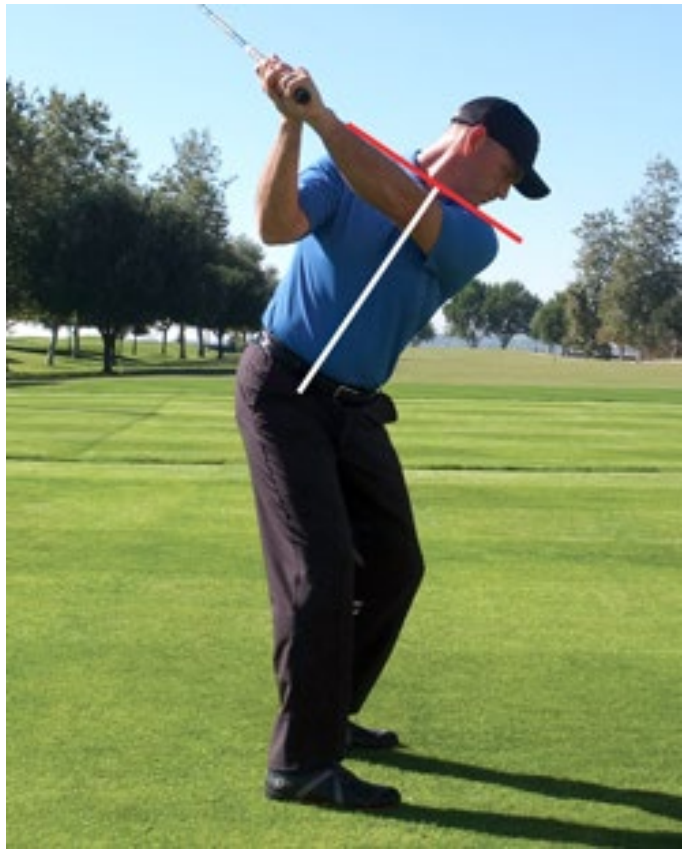
45.2% of players have a Flat Shoulder Plane

What? Not enough thorax side bend at transition

Why? Tight lats, incorrect set up (jockeying), stiff shoulders, can't separate

Why do I care? Swing plane has to change mid-swing, inconsistency

What does it look like?



Early Extension

64.3% of players Early Extend

What? Pelvic thrust positive during downswing (hips going toward the ball), causing the golfer to lift the upper body

Why? Inability to deep squat, internal rotation of lead hip, clubs too long, standing too far from the ball, too much weight on heels

Why do I care? Blocks…. **and** Hooks… Military golf

What does it look like?

Over The Top

43.5% of the Players are Over-The-Top

What? Torso firing before the pelvis or shoulder in kinematic sequence

Why? Inability to separate hips and shoulders, lack of understanding of a good kinematic sequence, poor balance (don't trust themselves to shift weight)

Why do I care? Lose efficiency, power, and increasing risk of injury. Slices

What does it look like?

Sway 37.2% of the Players Sway

What? Thorax sway negative during backswing. Pelvic side bend too negative in backswing, pelvic sway too negative in backswing

Why? Lack of trail hip internal rotation, weak lateral stabilization (glute med!)

Why do I care? Adds another variable to the backswing that will have to be corrected for inconsistency

What does it look like?

Slide 31.4% of the players slide

What? Pelvic side band too positive through impact, pelvic sway too positive into impact

Why? Left hip limited internal rotation, weak lateral stabilization (glute med!)

Why do I care? Adds another variable to the backswing that will have to be corrected for inconsistency

What does it look like?

Hanging Back 32.3% of the Players Hang Back

What? Thorax sway not positive through impact, pelvic sway does not go positive through downswing.

Why? Poor strength in trail leg (glutes again), injury of lead leg (player doesn't want to shift weight), not enough loft on low lofted club, ball too far back

Why do I care? Fat shots and no power

What does it look like?

Reverse Spine Angle

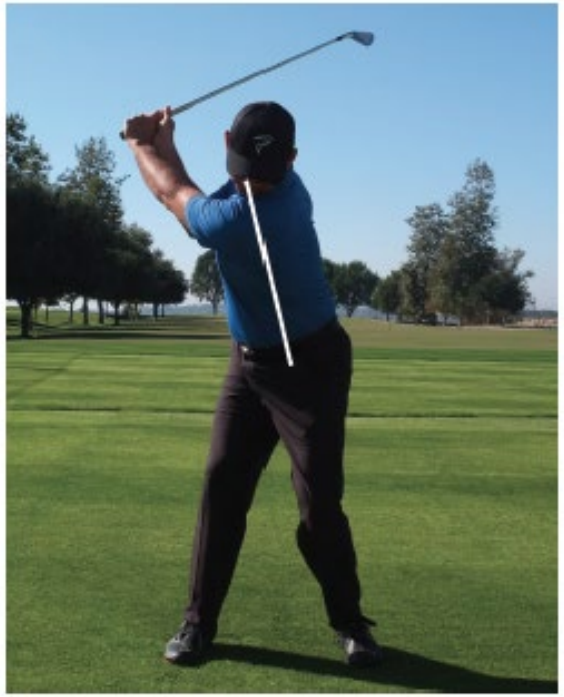
38.5% of the Players have a Reverse Spine

What? Thorax side bend going negative at transition

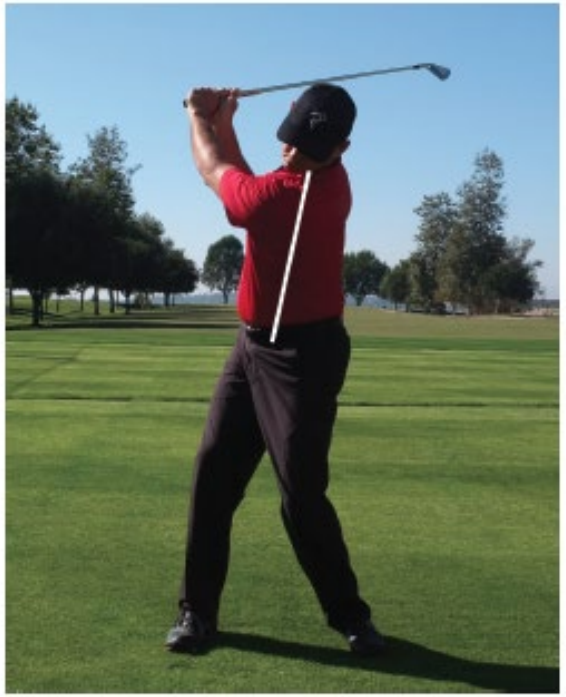
Why? Reduced spine mobility, can't separate, right hip internal rotation, player trying to keep head still, really bad S-posture

Why do I care? Primary cause of low back pain, can't start from lower body (wrong kinematic sequence), core shut down (reciprocal inhibition), slices, BAD!

What does it look like?



CORRECT



REVERSE SPINE

Casting/Scooping

55.9% of the Players Early Release or Scoop

What? Wrist ulnar deviation early in downswing, extension through impact

Why? Weak grip strength, poor wrist flexibility, POOR USE OF LOWER BODY

Why do I care? Weak impact as you peak speed before impact, adds loft and thus inconsistent distances

What does it look like?

Chicken Winging

35.6% of the players have a chicken wing

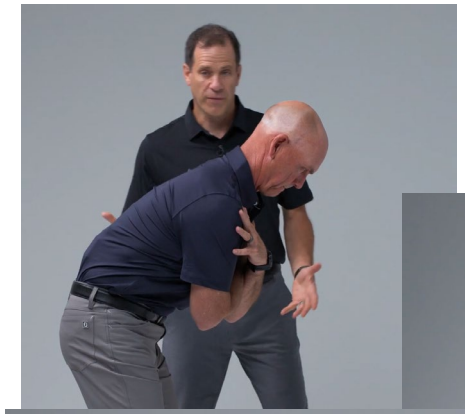
What? No wrist supination after impact

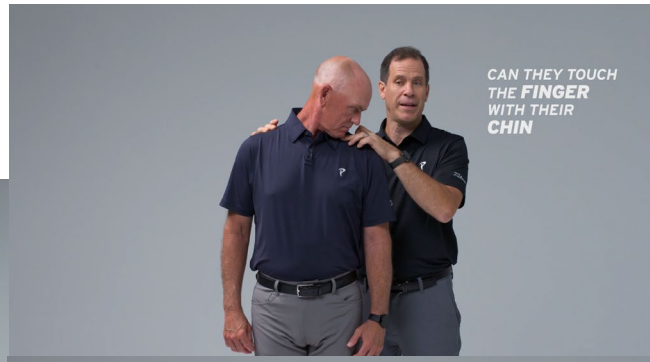
Why? Poor lead shoulder flexibility, poor sequencing of swing

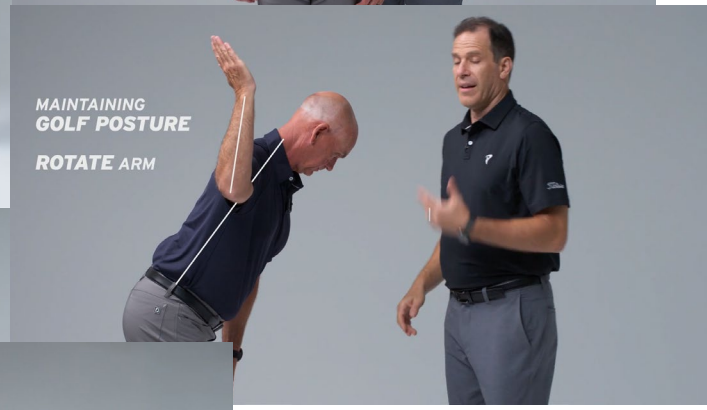
Why do I care? Hard to generate club head speed without wrist supination/pronation

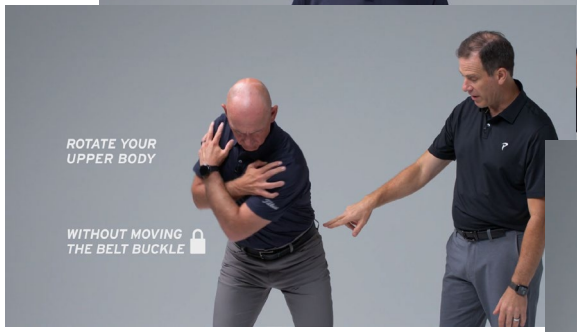
What does it look like?

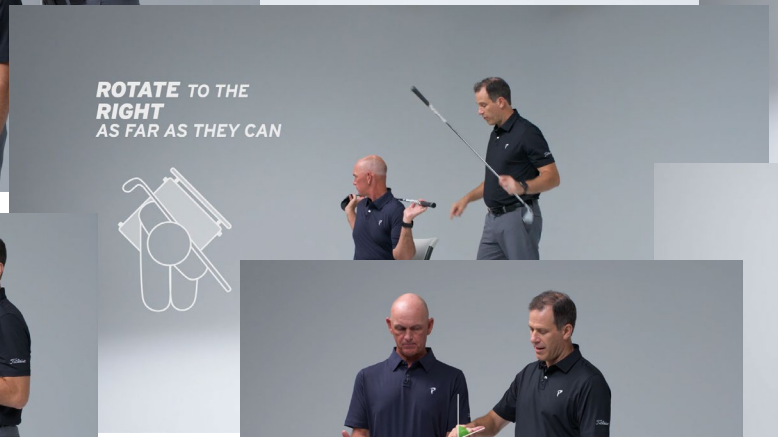
What does a TPI Screen Look Like?

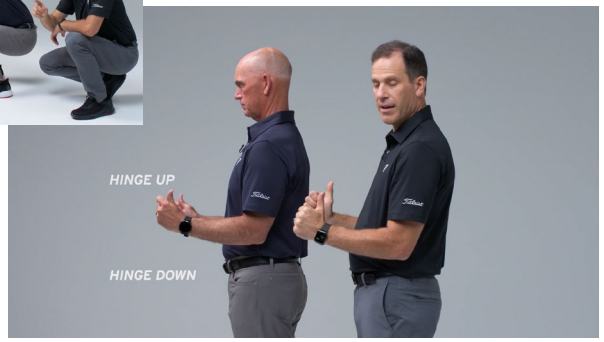












What About the SFMA?

- A series of 10 top tier tests and breakouts to identify specific problematic body parts
- Key Concepts to understand: Regional Interdependence

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

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

Example Breakout

- We perform a breakout when the patient fails a top tier test
- If they pass, we can assume the mobility and stability requirements are met.
- Example: Multisegmental Flexion

Criteria for a pass:

70 degrees sacral angle

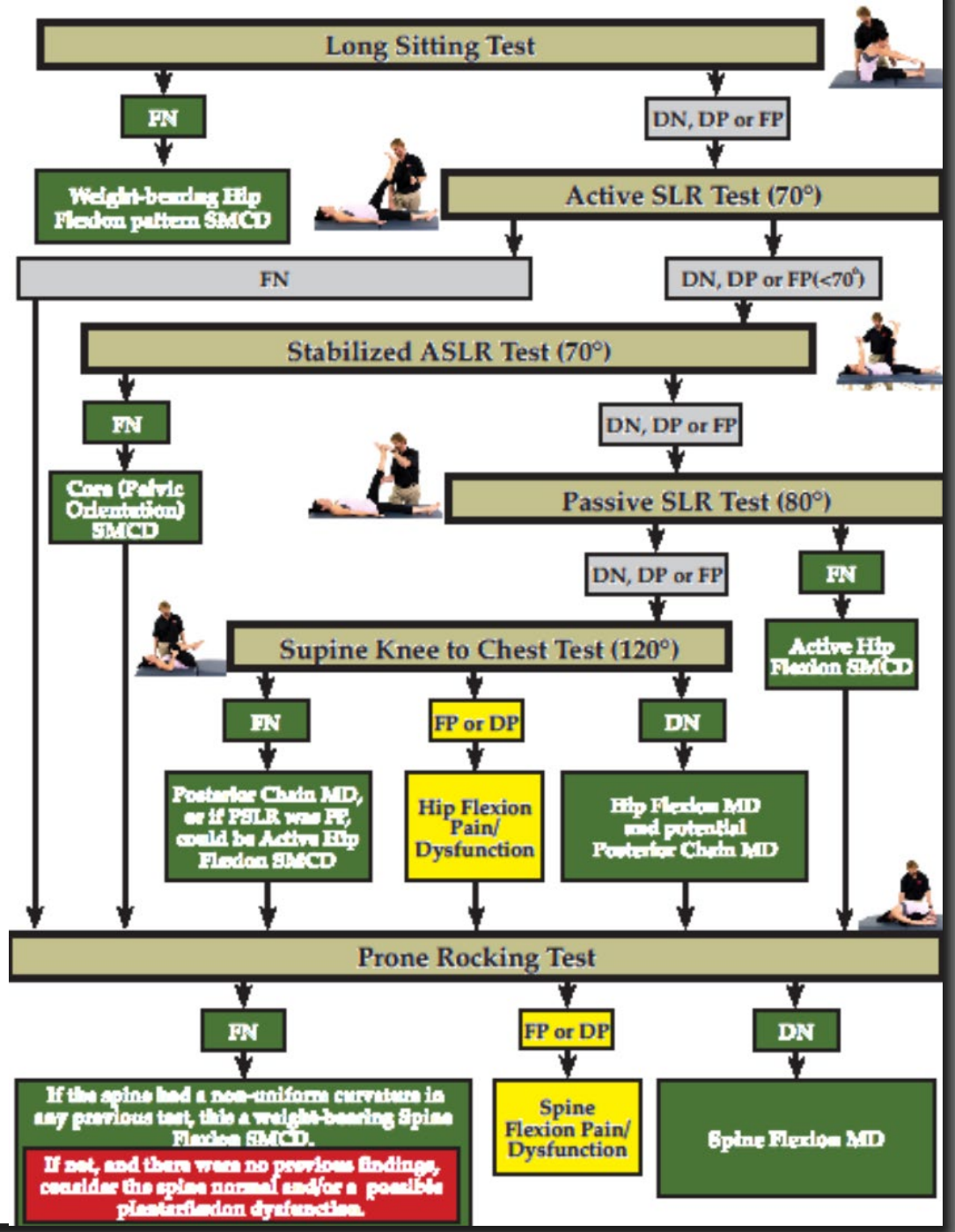
Touches toes or beyond

Weight shift

Uniform spine curve

No excessive effort

Pain?



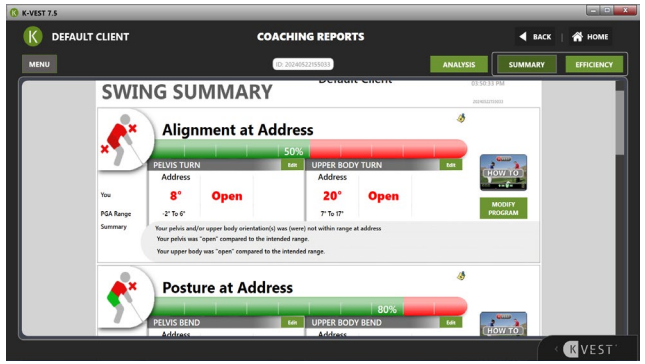
How Data is Collected

- K-Vest
- Collects data in 6d (rotation, bend, side bend, sway, thrust, and lift)
- Uses weak magnetic field and three sensors along with a digitization process that triangulates digital sensors.

Data Capture

- Patient takes a series of swings
- Data is checked to ensure collection is occurring correctly
- The sequencing does not change if a shot is hit fat/thin/left/right
- Patient is allowed to get loose
- On average 5-10 swings are captured for analysis

What Does This Data Look Like?



Put it Together

- 54 y.o. male presents with chief complaint of right sided low back pain. He is a right handed golfer and low back pain only occurs while golfing. He denies any known mechanism of injury on or off the golf course. He endorses the use of topicals and OTC medications such as Tylanol to finish 18 holes, otherwise he is unable to do so. He reports majority of pain is in the follow through. Orthopedist ordered x-ray and mri of lumbar which were both negative. He denies radiating symptoms, paresthesia, or paresis. No history of LBP.

TPI Top Tier Screen (positive findings)

- Posture: S-posture
- Pelvic tilt: Fasciculation while posteriorly tilting pelvis
- Toe Touch: Limited B/L
- 90/90: R shoulder external rotation worse in golf posture
- Single Leg Balance: 0-6 seconds on left 6-10 seconds on right
- Lower Quarter Rotation: Limited in back and downswing B/L
- Cervical Rotation: Right side - Limited (cannot rotate to mid-clavicle) Left side - Limited (cannot rotate to mid-clavicle)
- Forearm Rotation: Pronation - Normal (greater than 80 degrees) Supination - Limited right
- **Seated Trunk Rotation: Right side - Greater than 45 degrees Left side - Greater than 45 degrees** *Negative????*

SFMA Top Tier Screen

- Cervical Flexion: FN
- Cervical Rotation: FN B/L
- Cervical Extension: FN
- Multi-segmental Flexion: DN
- Multi-segmental Extension: DN
- Multi-segmental Rotation: DN R "tightness", DN L "tightness", R worse than L
- Upper Extremity Pattern 1: DN R "tightness", FN L
- Upper Extremity Pattern 2: FN B/L
- Arms Down Deep Squat: FN
- Single Leg Stance: DN

SFMA Breakout Results

- Multisegmental Flexion: Mobility Dysfunction Posterior Chain
- Multisegmental Extension: Mobility Dysfunction Anterior Chain
- Multisegmental Rotation: Stability/Motor Control Dysfunction extension/rotation of lumbar spine to left. Hip internal rotation Mobility Dysfunction left.
- Upper Extremity Pattern 1: Common Extensor tendon right Mobility Dysfunction. Pectoralis major Mobility Dysfunction right
- Single Leg Stance: Lower extremity proprioception deficit left

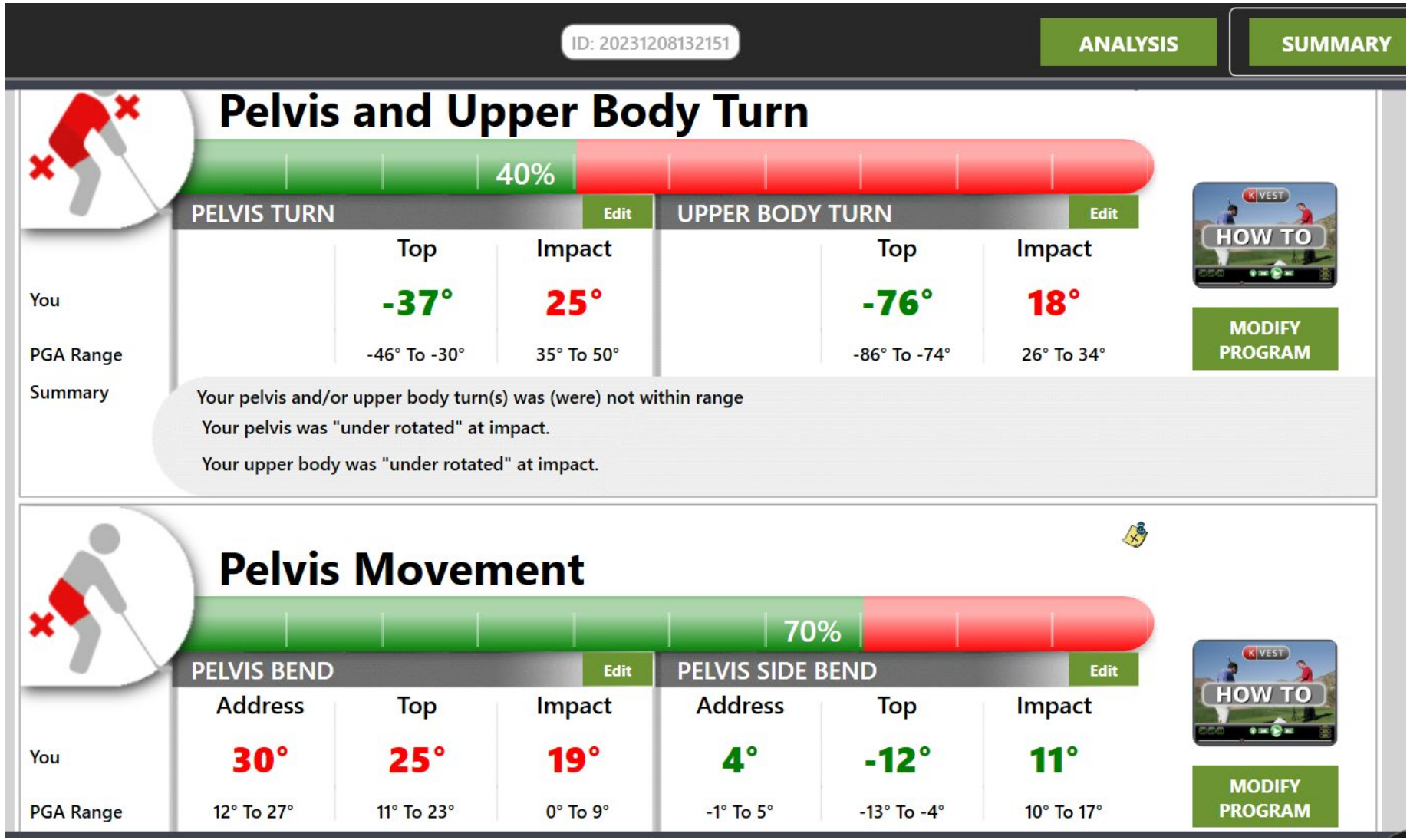
Big 12 Swing Faults (positives)

- Sway - Positive
- Casting - Positive
- Over the Top - Positive
- S-posture - Positive
- Loss of posture - Positive
- Early extension - Positive
- Hanging back - Positive

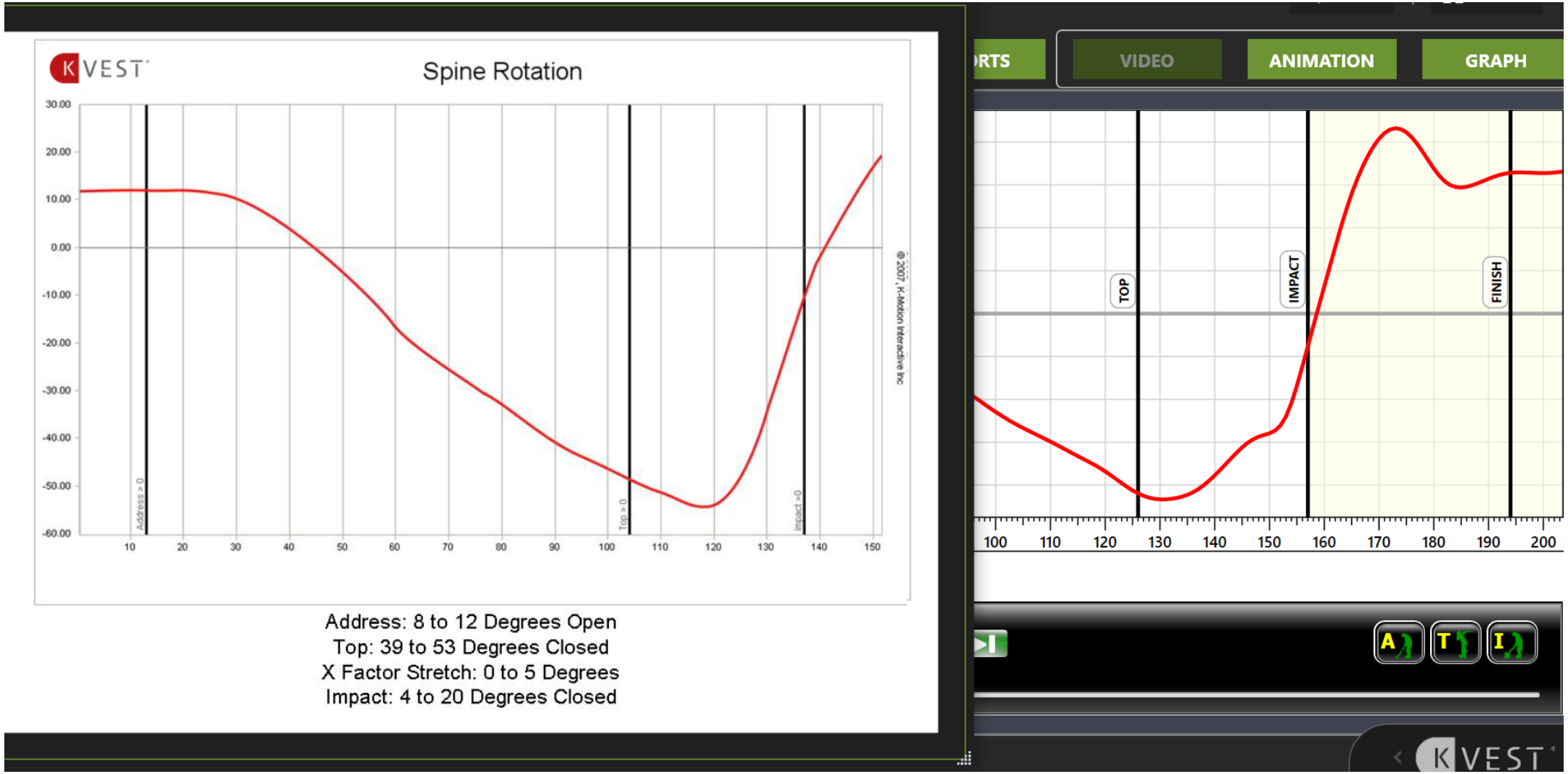
Relevant Injury Inducing Mechanics (Back Pain)

- -Hanging Back / Trail Leg Restricted Follow Through: Hanging back is when a golfer does not shift weight correctly back onto the front side during the downswing. **This causes large deceleration torque in the low back and spine.**
- -Early Extension: Early extension occurs when the hips move closer to the ball in the swing. Early extension can stress the low back in two ways. First, if done with spine extension it places excessive stress on the facet joints due to rapid extension in the spine. Second, if done with spine flexion, it can stress the intervertebral discs and lead to herniations.
- -S-Posture: S-posture is characterized by too much thoracic kyphosis combined with excessive lumbar lordosis. This can be due to the player sticking their tail bone out too much at set up or from postural dysfunction (lower crossed syndrome) that is evident even in standing posture. This excessive lordosis already sets the player into lumbar extension. This posture and potential deactivation of the core and gluts can cause other issues such as loss of posture or reverse spine angle if severe enough. This, in turn, puts the lower body out of position on the downswing and affects the players sequencing.

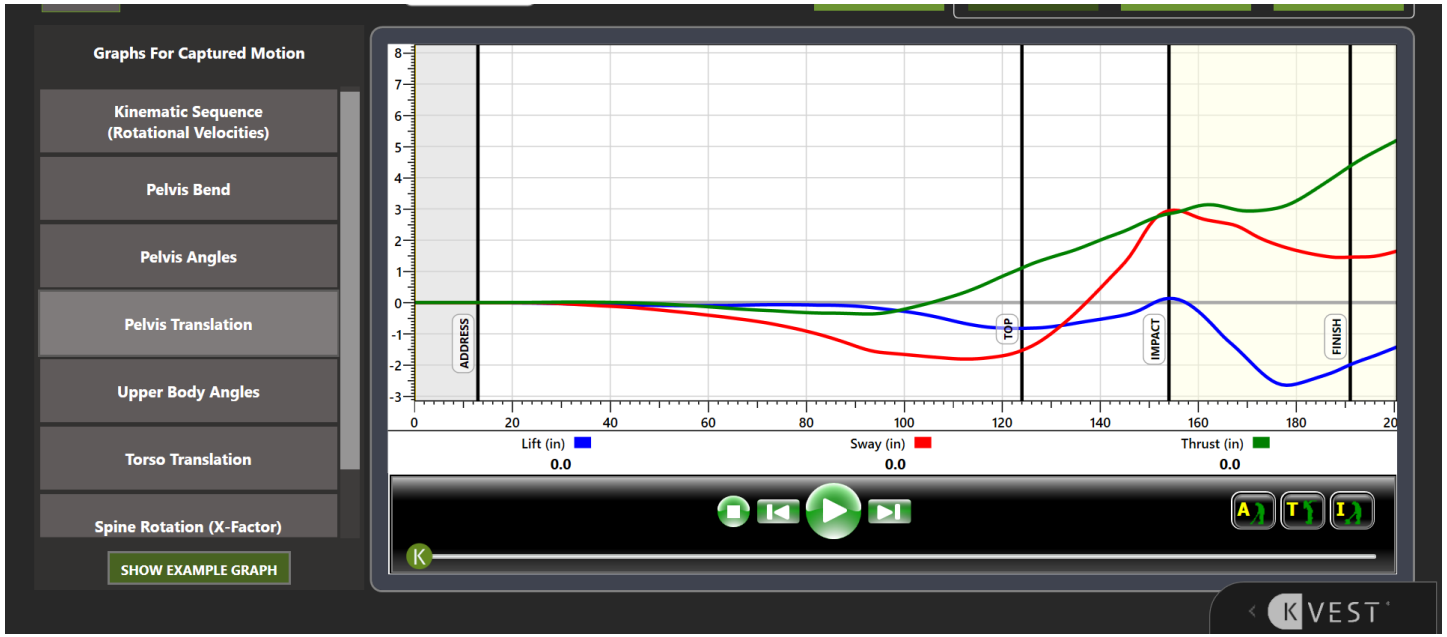
What Does the Data Show?

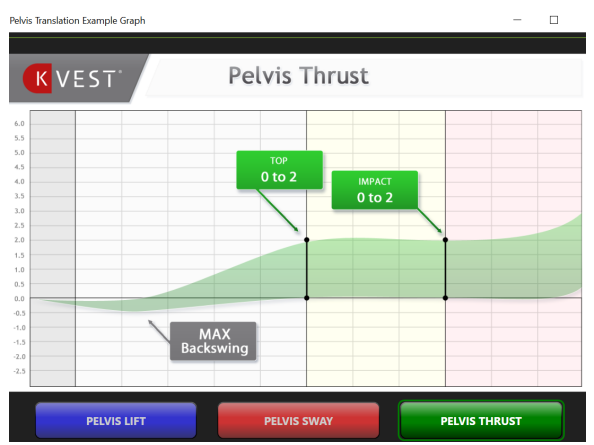


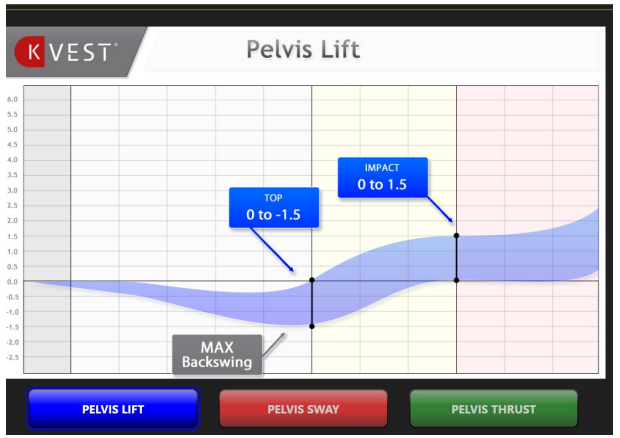
One Detail

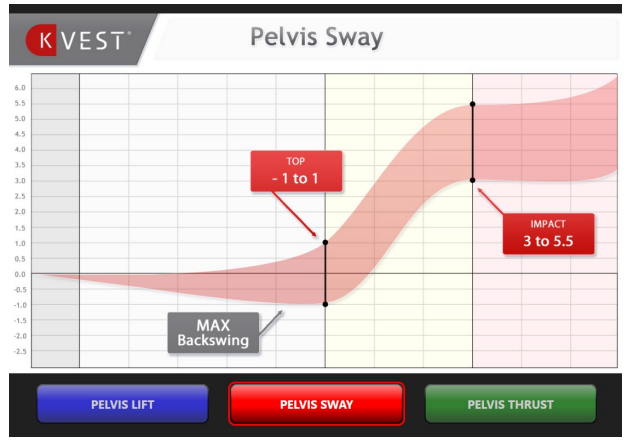

KVEST
Spine Rotation
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
Address > 0
Top > 0
Impact >0
© 2007, K-Motion Interactive Inc.
Address: 8 to 12 Degrees Open
Top: 39 to 53 Degrees Closed
X Factor Stretch: 0 to 5 Degrees
Impact: 4 to 20 Degrees Closed
VIDEO
ANIMATION
GRAPH
TOP
IMPACT
FINISH
100
110
120
130
140
150
160
170
180
190
200
A
T
I
KVEST

Hanging Back









Lumbar X-Ray

On Follow-Up

- External rotation of lead hip chosen as swing change
- Patient given Push Club, Spikes Up, and finally Walk Through drills to get weight shift proper
- Patient took a couple of swings in clinic to confirm no low back or hip pain
- Referral placed to return to ortho for left hip OA

Works Cited

- Phillips, D. Rose, G. (2021). *Medical Level 2 Tpi.* TPI EDU LLC.
- *SFMA Level 1, (2022). FMS*
- *SFMA Level 2, (2022). FMS*
- *TPI EDU LLC. (n.d.). TPI onlineed. https://course-player.mytpi.com/en/course/1018?_gl=1%2A1k002tq%2A_ga%2ANjc5NTM1NjczLjE3MTc1MTIzNDA.%2A_ga_5GHLLEBB4R%2AMTcxODA0NDk3MS4zLjEuMTcxODA1MjE4Ni40My4wLjIxMDgwNTM3NDU.*
- *McCarroll, Redding AC, Shelbourne KD. Injuries in the amateur golfer. Phys Sports Med. 1990;18:122-26*