



# Blast Insights & Metrics Training Guide

PLANE • CONNECTION • ROTATION

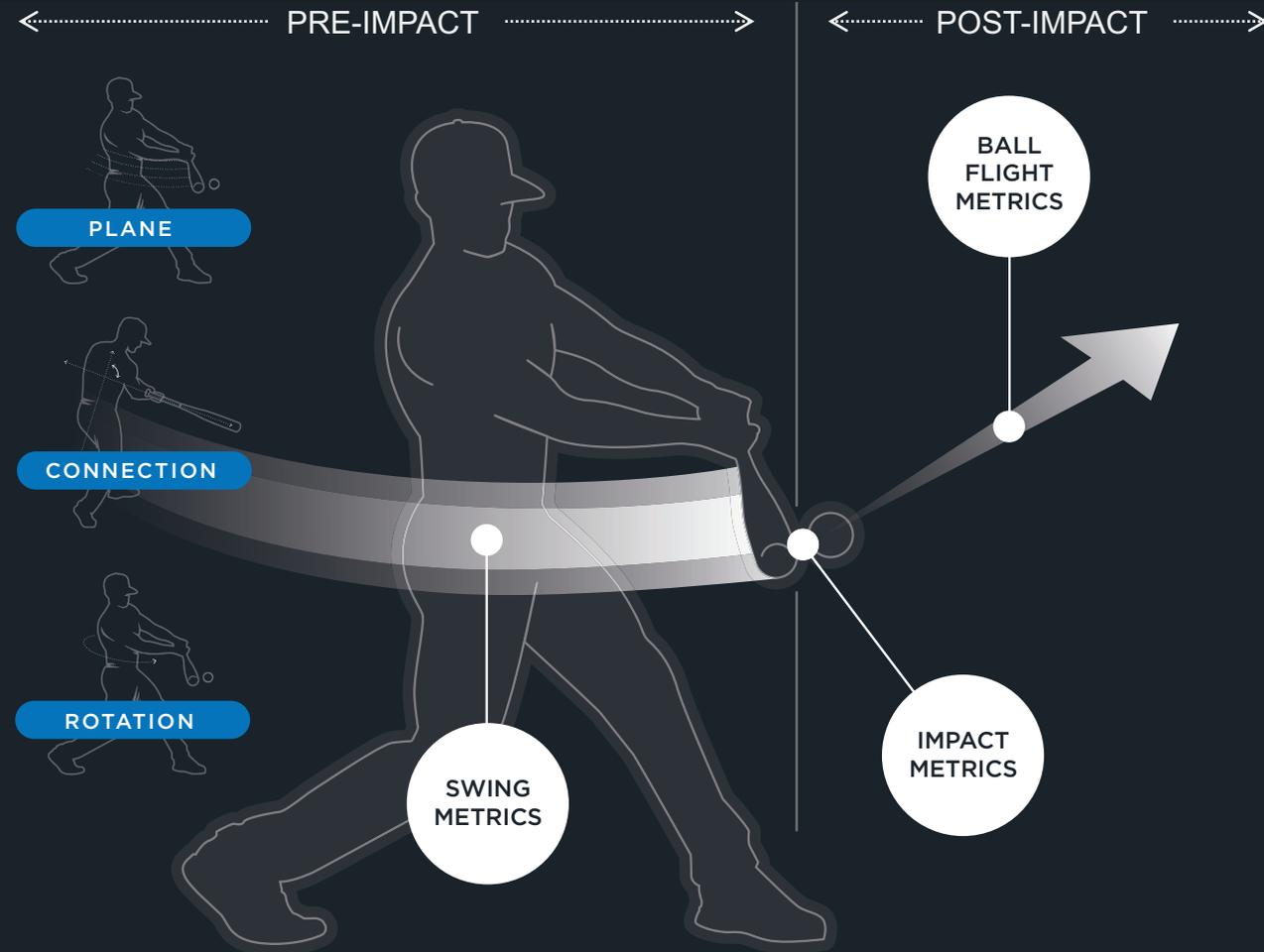


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# Blast Insights – Swing Quality

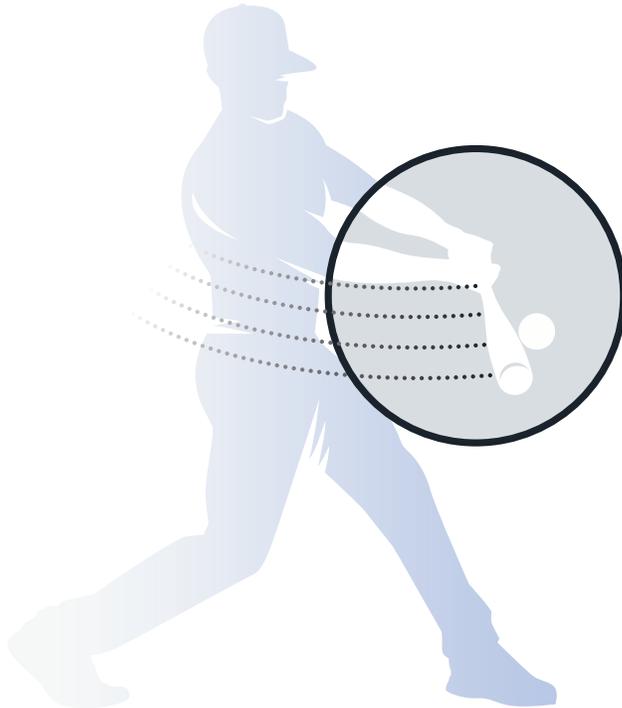
Blast data has proven that the best swing quality is achieved when players focus on three areas: plane, connection, rotation



# Blast Insights – Swing Quality

## Plane

Measures the percentage of the swing where the bat is on the swing plane.

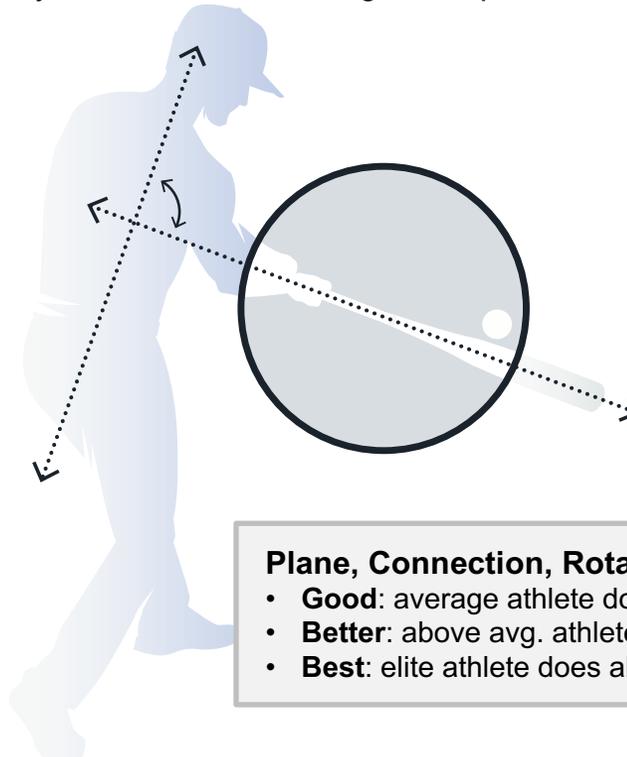


### Related Metrics

Vertical Bat Angle, Power, On Plane Efficiency

## Connection

Measures the relationship between body tilt and vertical bat angle at impact.



### Plane, Connection, Rotation

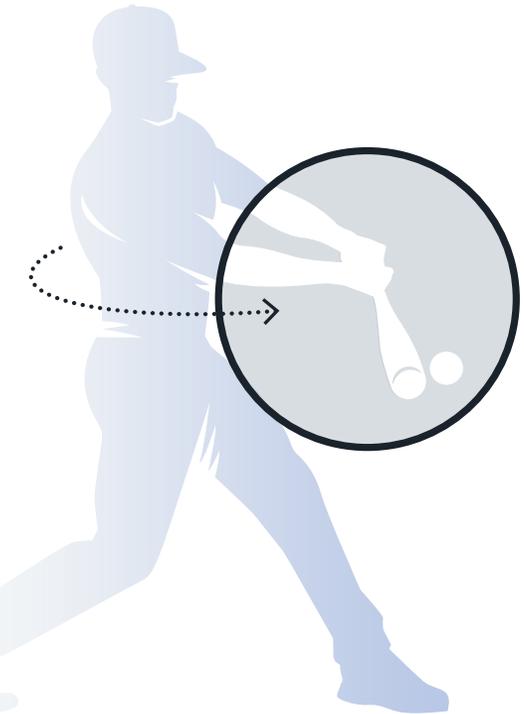
- **Good:** average athlete does 1 well
- **Better:** above avg. athlete does 2 well
- **Best:** elite athlete does all 3 well

### Related Metrics

Time to Contact, Attack Angle, Connection (at impact), Early Connection

## Rotation

Measures how quickly the bat accelerates into the swing plane.

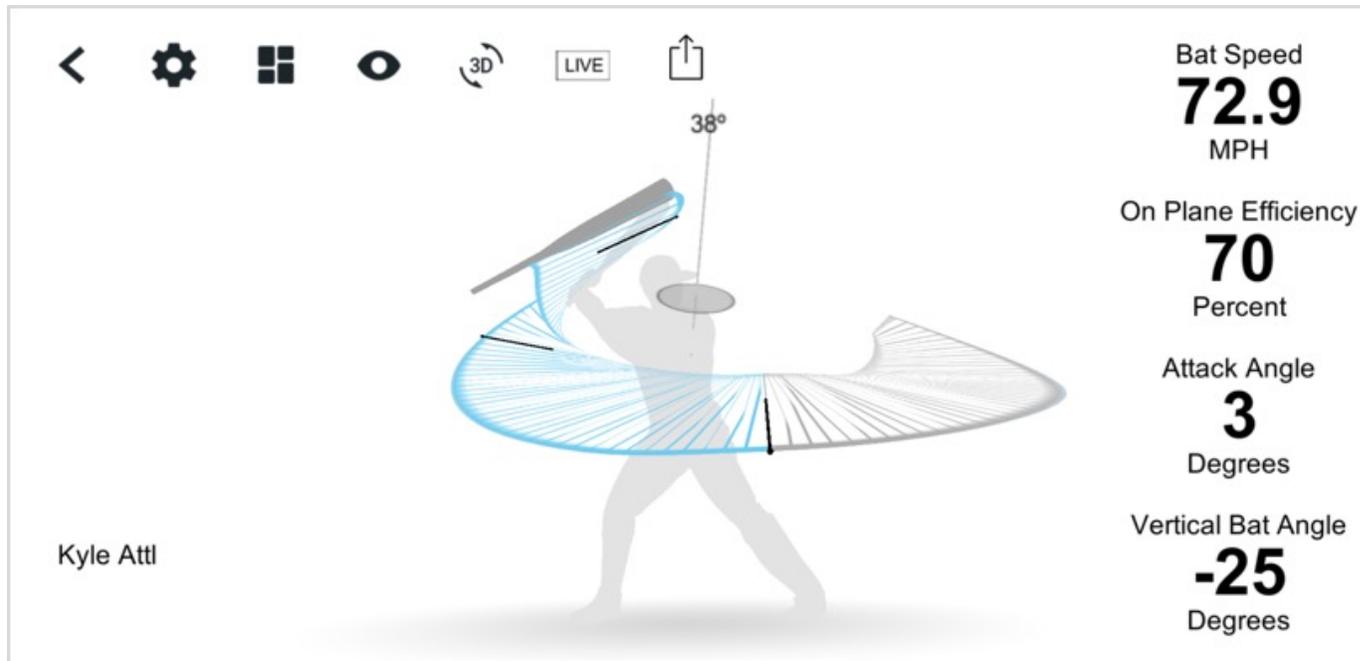


### Related Metrics

Bat Speed, Peak Hand Speed, Rotational Acceleration

# Swing Metrics – Ideal Ranges

On Plane Efficiency %	Rotational Acceleration	Early Connection	Connection at Impact
<b>70% or Higher</b> Range: 65% - 85%	<b>Score above 50</b> for your level of play	<b>Target: 90°</b> Range: 80° - 105°	<b>Target: 90°</b> Range: 80° - 95°



## Connection Notes

- Ideal for Early Connection and Connection at Impact to be relatively the same. Up to a 15° difference between the two is acceptable, however generally the closer the better.
- It is generally ok for hitters to not be exactly 90°, especially if both of their connection metrics are the same.

# Impact Metrics – Ideal Ranges

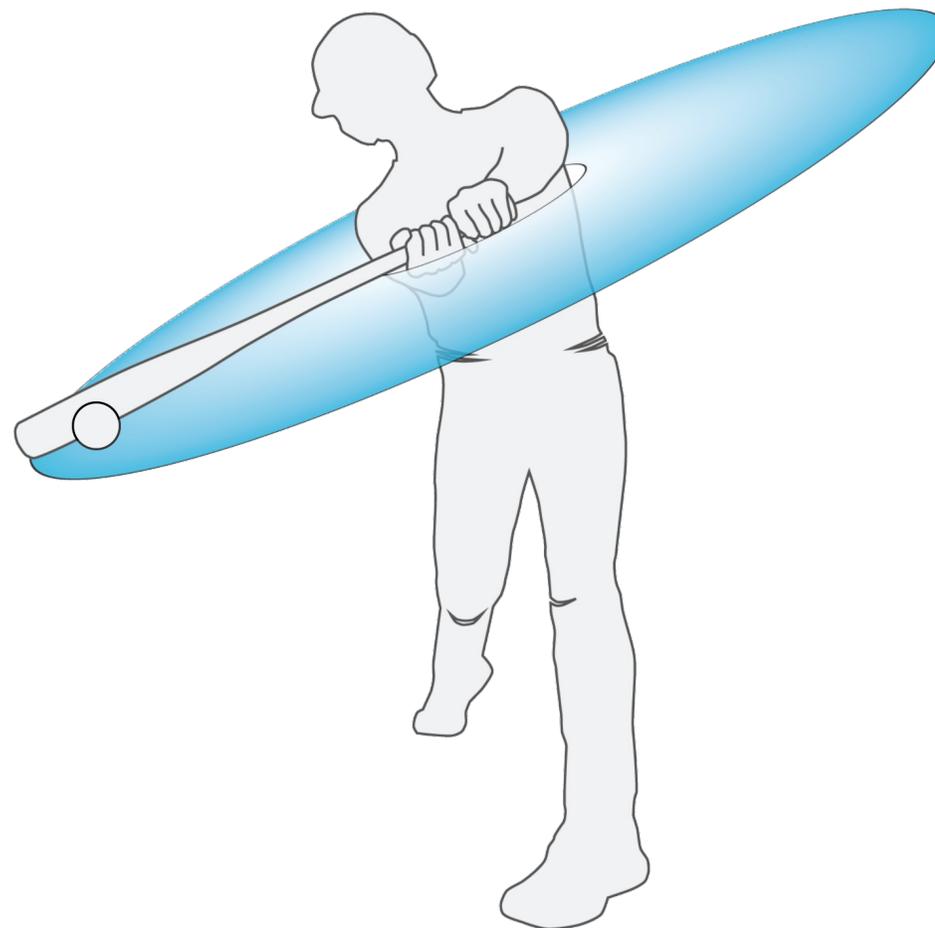
Level	Pro	College	High School Varsity	High School JV	Middle School	Amateur All Levels	Youth
<b>Bat Speed</b>	<b>66 – 78</b> MPH	<b>66 – 75</b> MPH	<b>60 – 70</b> MPH	<b>55 – 65</b> MPH	<b>46 – 62</b> MPH	<b>55 – 65</b> MPH	<b>40 – 56</b> MPH
<b>Attack Angle</b>	<b>5° to 15°</b>	<b>2° to 15°</b>	<b>2° to 15°</b>	<b>0° to 15°</b>	<b>0° to 15°</b>	<b>0° to 15°</b>	<b>0° to 15°</b>
<b>Vertical Bat Angle *</b>	<b>-10° to -40°</b>						
<b>Time to Contact</b>	<b>0.13 – 0.17</b> seconds	<b>0.14 – 0.17</b> seconds	<b>0.15 – 0.18</b> seconds	<b>0.15 – 0.20</b> seconds	<b>0.16 – 0.21</b> seconds	<b>0.15 – 0.20</b> seconds	<b>0.17 – 0.23</b> seconds
<b>Peak Hand Speed</b>	<b>23 – 29</b> MPH	<b>21 – 25</b> MPH	<b>19 – 23</b> MPH	<b>17 – 21</b> MPH	<b>17 – 21</b> MPH	<b>17 – 21</b> MPH	<b>15 – 21</b> MPH
<b>Power kW</b>	<b>3.65 – 5.65</b> kilowatts	<b>3.83 – 5.07</b> kilowatts	<b>2.81 – 4.09</b> kilowatts	<b>2.17 – 3.45</b> kilowatts	<b>1.40 – 3.20</b> kilowatts	<b>2.17 – 3.45</b> kilowatts	<b>0.90 – 2.50</b> kilowatts

\* Pitch location specific

# Swing Plane

## What is it?

- Think of the Swing Plane as an ellipse around your body.
- The Swing Plane is defined by your Vertical Bat Angle at impact. The sensor works backwards from impact to create your Swing Plane. If the hitter maintains that Vertical Bat Angle the entire swing, they would be 100% On Plane.
  - Every swing has its own Swing Plane, based on the Vertical Bat Angle.
  - A good way to think about plane is a fidget spinner. As you move the fidget spinner to hit different pitch locations, the Swing Plane changes.



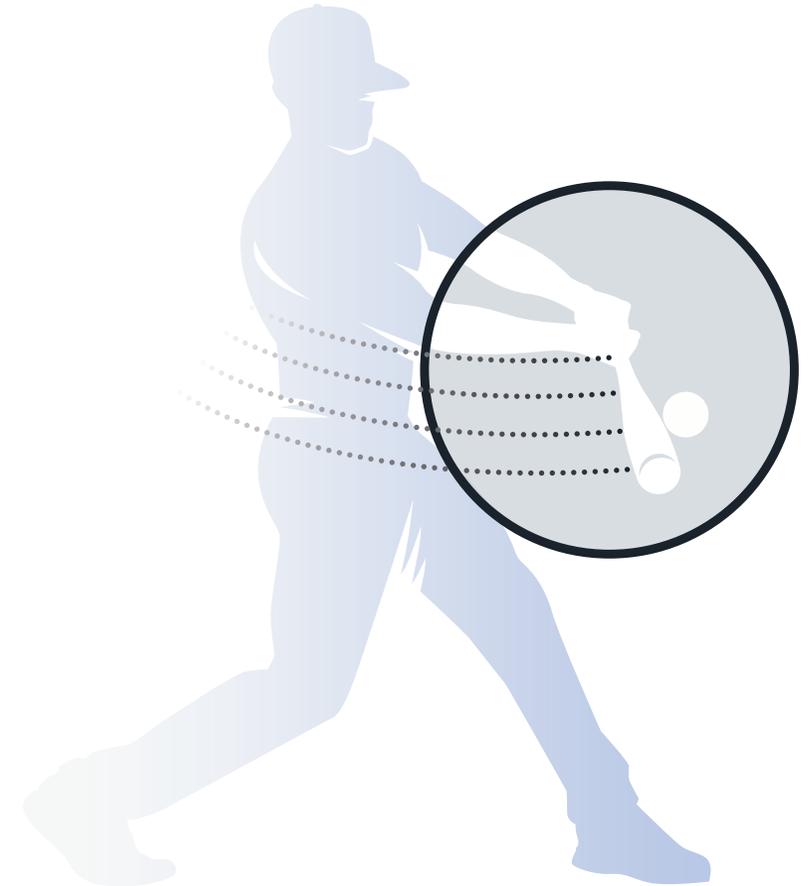
# On Plane Efficiency %

## What is it?

- On Plane Efficiency Percentage (%) measures the percentage of your swing that was on the Swing Plane.

## Why is it important?

- An efficient swing gets On Plane early and stays on plane through contact. In an efficient swing, the hitter wants to build as much forward bat speed On Plane as possible, in the direction of the point of contact.
  - Hitters that have good On Plane Efficiency, tend to barrel up more balls (have higher average Exit Velocities)
  - Hitting the ball hard relates to bat speeds, but hitting the ball hard more often is about being On Plane.



# On Plane Efficiency %

On Plane Efficiency %	Cause(s)	Training Focus	Drills
<b>Metric Range: 70% or Above</b>	<ol style="list-style-type: none"> <li>Hitter gets the barrel on plane very early and deep in the swing path, optimizing acceleration of the barrel through the zone</li> <li>Gets connected early and stays connected to impact.</li> <li>Hitter is good at minimizing variability in the arm/wrist degrees of freedom (DOF).</li> </ol>	<ul style="list-style-type: none"> <li>Vary training environments</li> <li>Vary pitch types</li> <li>Challenge hitter on decision making</li> </ul>	<ul style="list-style-type: none"> <li>Bat on shoulder</li> <li>PVC Pipe</li> <li>Heavy bat</li> <li>Ball Constraint</li> <li>Turn to Contact</li> </ul>
<b>Metric Range: 60 – 70%</b>	<ol style="list-style-type: none"> <li>Some barrel manipulation with the wrist and hands throughout the swing, but rather consistent</li> <li>Early Connection is a little outside desired range. (85° - 105° is good range)</li> </ol>	<ul style="list-style-type: none"> <li>Look at early positioning of the barrel and wrists.</li> <li>Get connected early and stay connected through impact</li> <li>Focus on flattening out the wrist and eliminating extra wrist movement</li> </ul>	
<b>Metric Range: 59% and Below</b>	<ol style="list-style-type: none"> <li>Manipulates barrel with the wrist and hands.</li> <li>Bad Early Connection between body tilt and Vertical Bat Angle (Connection is &gt;110° or &lt; 81°)</li> <li>Early Connection is good, but manipulates bat or body during the swing causing disconnected at Impact.</li> </ol>	<ul style="list-style-type: none"> <li>Same as above, but addition emphasis on fixing a major swing flaw.</li> </ul>	

\* Chart depicts the On Plane Efficiency % metric (not the score)

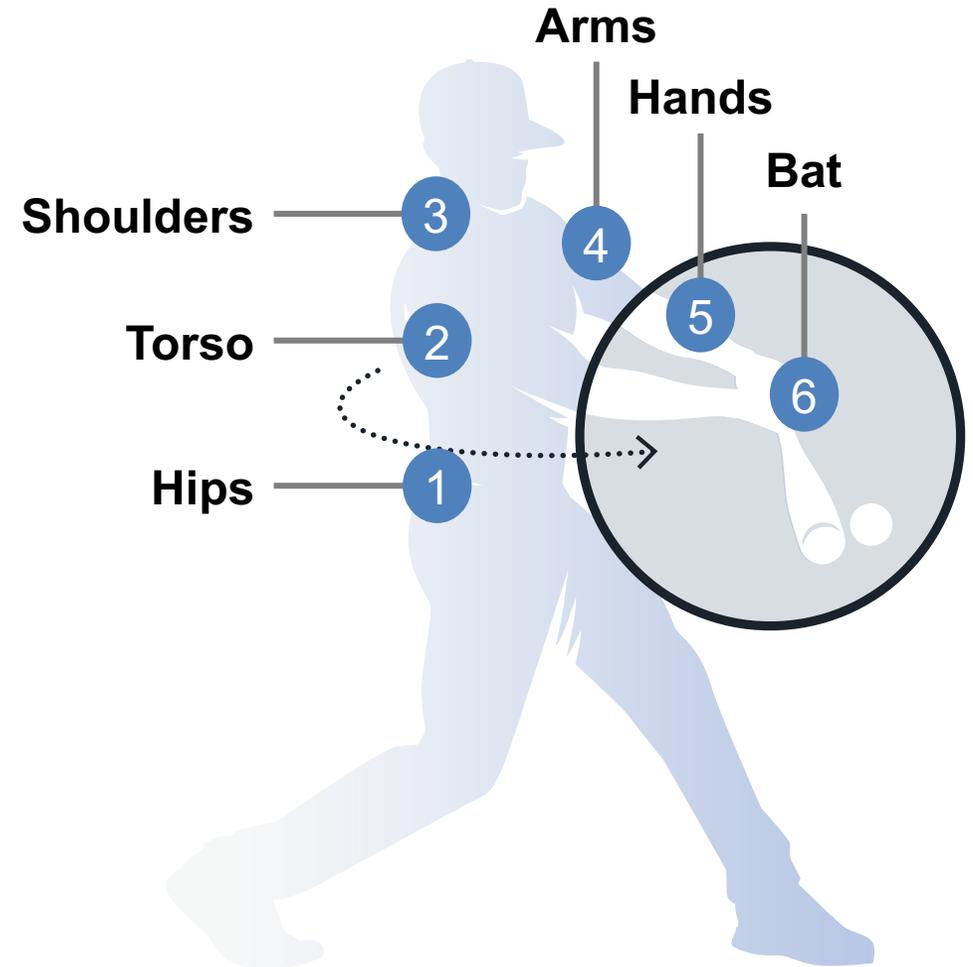
# Rotational Acceleration

## What is it?

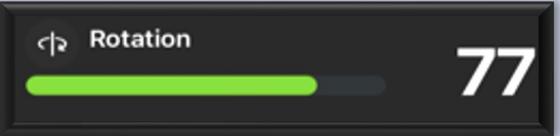
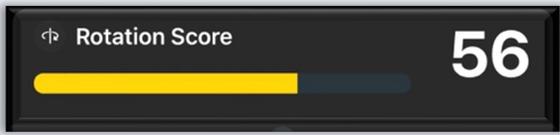
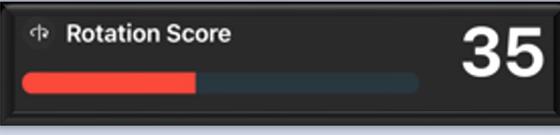
- Rotational Acceleration is a measure of how quickly the hitter accelerates the bat into rotation
  - Hitters that sequence well and use their bigger muscles to accelerate the bat into the swing, have higher values of Rotational Acceleration
  - Hitters that actively pull the bat into the swing with their hands have lower values of Rotational Acceleration.

## Why is it important?

- Measures how quickly you build bat speed & is a great indicator of how well a hitter sequences
  - Players who sequence well will have higher Rotational Acceleration values because it is physically impossible to register high values without proper sequencing
  - High Rotational Acceleration results in hitters with dynamic power, who don't sacrifice consistent contact for power & have the ability to spread power to all fields
  - High Rotational Acceleration also allows for a more adjustable swing to different pitch types and locations because the hands typically aren't committed until late in the swing



# Rotational Acceleration

Rotation Score	Cause(s)	Training Focus	Drills
<p><b>Rotation Score: Green</b></p> 	<ol style="list-style-type: none"> <li>1) Good sequencing and movement patterns.</li> <li>2) Body starts the swing,</li> <li>3) Good Hip/shoulder separation</li> <li>4) Hands are passive early in the swing. Bigger muscles do the work. Hands are moving but hitter is not moving their hands.</li> </ol>	<ul style="list-style-type: none"> <li>• Keep consistency of good Rotational Acceleration</li> <li>• Vary training environments</li> <li>• Vary pitch types</li> <li>• Challenge hitter on decision making</li> </ul>	<ul style="list-style-type: none"> <li>• Trigger, trigger, fire</li> <li>• Rhythm Drill</li> <li>• Open Stance (45°)</li> <li>• Step behind</li> <li>• Heavy bat</li> <li>• Impact bag, close distance</li> </ul>
<p><b>Rotation Score: Yellow</b></p> 	<ol style="list-style-type: none"> <li>1) Average sequencing and movement patterns</li> <li>2) Block rotates, torso and hips go together</li> <li>3) Hands are somewhat active early, but not necessarily a major issue</li> </ol>	<ul style="list-style-type: none"> <li>• Load middle (core)</li> <li>• Maintain load</li> <li>• Passive hands early</li> <li>• Finish Rotation</li> </ul>	
<p><b>Rotation Score: Red</b></p> 	<ol style="list-style-type: none"> <li>1) Hand dominate swing</li> <li>2) Very active with hands early in the swing</li> <li>3) Actively pulls the bat into rotation with the hands</li> <li>4) Less than stellar sequencing and movement</li> </ol>	<ul style="list-style-type: none"> <li>• Load middle (core)</li> <li>• Passive hands early</li> <li>• Maintain load</li> <li>• Swing starts with body rotating</li> </ul>	

\* Chart depicts Rotational Acceleration Scores which are based on athletes set level of play

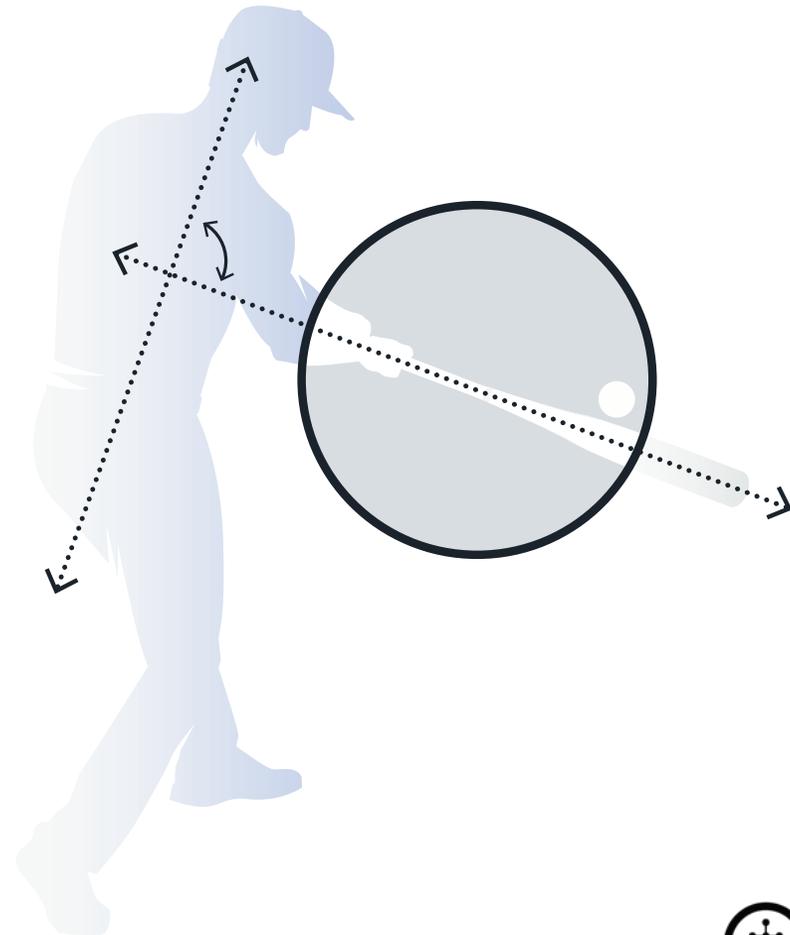
# Connection

## What is it?

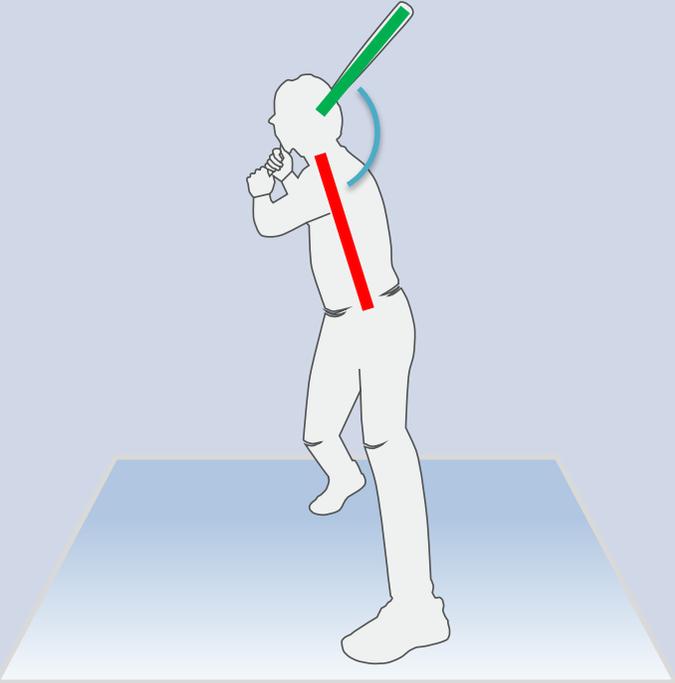
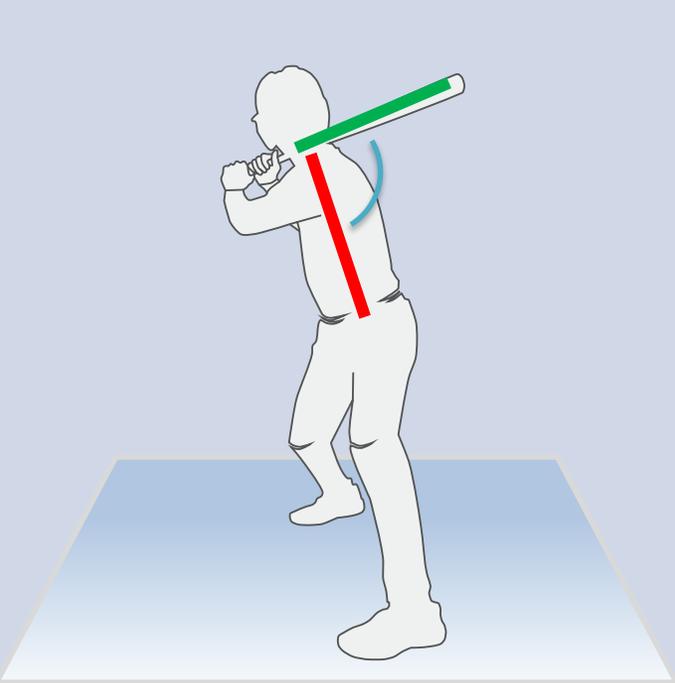
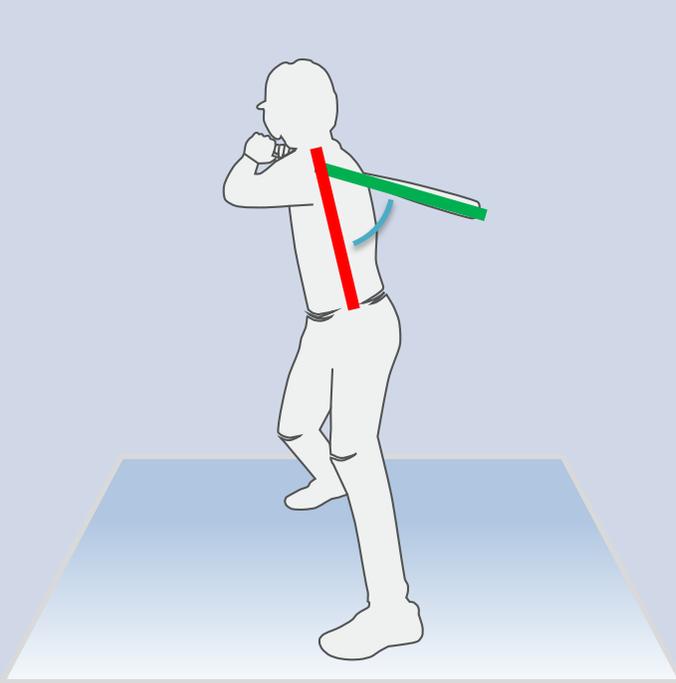
- Connection measures the relationship between your body tilt (displayed on our 3D Swing Tracer) and your vertical bat angle

## Why is it important?

- In a connected swing, you would see a 90-degree relationship, which indicates that you are using your body tilt (hip hinge, lateral tilt or side bend) to adjust for different pitch locations
- Hitters with good connection typically have less "holes" their swing and less cold zones for pitchers to attack
- We measure Connection in 2 different places in the swing, looking for  $\sim 90^\circ$  for both:
  - Early (at the start of the downswing)
  - At impact

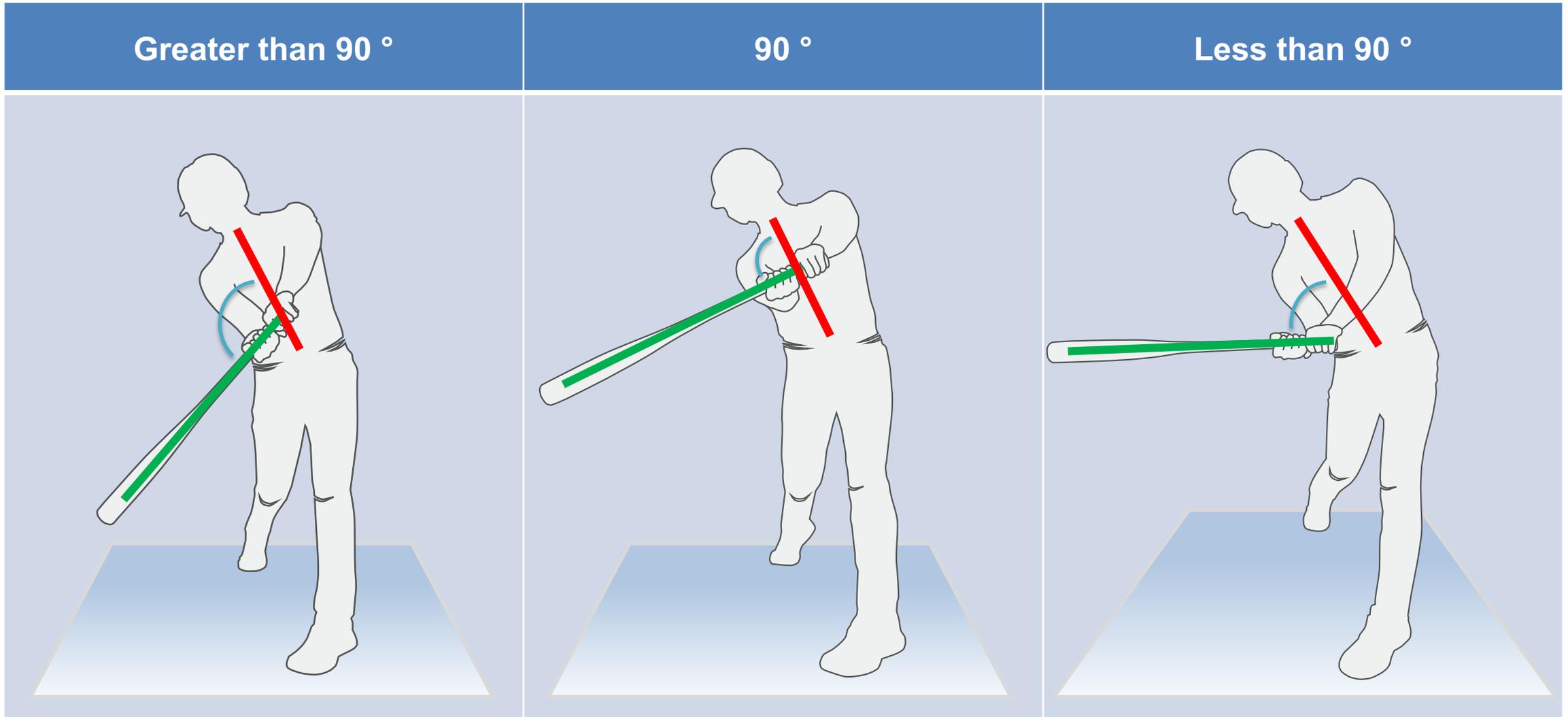


# Early Connection – Consistent Load

Greater than 90 °	90 °	Less than 90 °
		
<ul style="list-style-type: none"><li>• Hitter is &gt; 90° as they begin to rotate.</li><li>• Hitter gets stuck in barrel tip.</li><li>• Steep into the swing plane.</li></ul>	<ul style="list-style-type: none"><li>• Hitter is at 90° as they begin to rotate. Making it easy to swing on-plane. (ellipse)</li><li>• Hitter just has to turn and rotate to contact. Stays on swing plane.</li></ul>	<ul style="list-style-type: none"><li>• Hitter is &lt; 90° as they begin to rotate or their body tilt becomes steeper throughout the swing.</li></ul>

Target Range: 80° - 105°

# Connection at Impact



## **Blast Motion - Thank You!**

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