

Fastball Fact and Fiction - The Science of Real Velocity

Every pitcher wants to throw harder. Every professional scout and/or college recruiter will tell you that 90mph is a magic number. There is a lot of fiction and not enough real fact about pitchers and their fastballs. The National Pitching Association performed a scientific study to better understand what contributes to the velocity of a fastball. These findings may just challenge the way you think of fastball velocity.

Our goal is to help pitchers and coaches, maximize fastball performance, and minimize risk of injury. Hence the name of the study: Safe, Usable, Velocity (SUV).

What is velocity?

There are three ways to look at the velocity of a pitch.

1. *Perceived velocity or the way a pitched baseball is "read" by a hitter because of real velocity and deception.*
2. *Effective velocity or how a previous pitch's speed and location affects a hitter's read on the next pitch's speed and location.*
3. *Real velocity or the actual MPH "read" on a radar gun.*

Obviously, since we wanted to determine what generates velocity in a delivery, we had to come up with valid and defensible testing protocols. We chose to isolate and measure the contribution of hip/shoulder rotation to real velocity by quantifying pitch speed from our NPA two-knee drill position which has the pitcher down on both knees facing the target at approximately a 45 degree angle. Putting a pitcher on two knees allows us to:

1. *Minimize and/or eliminate any directional weight shift.*
2. *Isolate and measure the impact of hip/shoulder separation and rotation for correlation with maximum ball velocity on each throw.*

Where pitchers get their momentum.

Once we quantified a pitcher's maximum velocity on his knees we moved him to a mound. Pitchers move farther and faster directionally, when they stride down a hill. By charting his maximum velocity pitching on the mound and comparing the maximum velocities generated in each test we could calculate the percentage that rotation and the percentage that direction contributed to his maximum real velocity.

Our biggest surprise came with the revelation that the larger percentage of total velocity comes from a pitcher's rotational momentum (hips and shoulders) and not his directional momentum (legs)!

Let's take a look at how the different body parts work in the pitching delivery and what the study showed about their contribution to the velocity of the ball.

Legs

Legs are the foundation through which kinetic energy is initiated--the mechanism by which the total body mass is delivered down the mound. This is achieved through what we call weight transfer. This weight transfer turns potential energy into kinetic energy and helps determine the efficiency of both the timing and force thus affecting the amount of energy getting through the body to the baseball. Proper weight transfer sets up the efficient interaction and timing of rotational and directional momentum.

Ball velocity is optimized when:

1. *Posture is maintained.*
2. *The back leg stabilizes while the back knee flexes, firms up, and loads (isometrically) during front leg lift.*
3. *There is an aggressive first forward movement with butt and center of gravity leading head/spine into front foot contact.*
4. *During this one second of weight transfer, a pitcher's lift leg should stay off the ground as long as possible to create a longer stride.*
5. *Head/spine stay on a natural line into a natural landing (foot strike) position.*
6. *Landing leg stabilizes, landing knee flexes, firms up and loads (isometrically) to translate kinetic energy up through body and out onto baseball at release point.*

Hips/Shoulders

Our research has indicated 80% of ball velocity is generated by rotational momentum when:

1. *Hips and shoulders separate between 40° - 60° around an upright spine.*
2. *Hips and shoulders maintain their angle of separation as long as strength and flexibility will allow while total body tracks forward into landing foot.*
3. *Throwing shoulder/glove shoulder delay rotation until hips have slowed/stopped their rotation.*
4. *Scapular "loading" is allowed to be an unconscious accommodation that helps the throwing shoulder to stabilize and compensate for the weight of the throwing arm/ baseball as they change direction and snap from external rotation into release point.*

Spine/Torso

Our research has indicated 20% of ball velocity is generated by directional momentum when:

1. *Total body tracks head and spine on line in the exact direction created by shifting weight from posting foot to landing foot.*
2. *Low back/spine hyperextend to keep torso upright and stacked as shoulders square up and track into a flexed and firm front leg.*
3. *Glove swivels and stabilizes over front foot as throwing arm lays back in external rotation.*
4. *Low back/spine goes into flexion just before throwing forearm snaps straight into release point.*

Again, the spine/torso (squat thrusts) of a golfer swinging a club does the same thing as the spine/torso (stack and track) of a pitcher throwing a baseball.

With the availability of the velocity study data comes the obvious question: Can we become more mechanically efficient so we can make the most of our genetic potential to throw the ball faster? The answer is **yes!**