

How to increase Bat Speed & Bat Quickness / Acceleration

What is Bat Speed?

Bat Speed: Bat speed is measured in miles per hour (MPH) and considers only the highest speed of the bat head (peak velocity) through the hitting zone. Only the best hitters reach their highest bat speed just PRIOR to contact with the baseball. Most hitters produce high bat speeds through their mechanical efficiency. However, a hitter can also produce higher bat speed with more strength (specific resistance training program).

What is Bat Quickness / Acceleration?

Bat Quickness / Acceleration: Bat quickness is measured IN TIME (1/100th of a second) and shows how quickly the bat head travels from initial movement (launch) to contact.

Bat Speed & Bat Quickness is a result of Bio-Mechanical Efficiency & Torque (Rotational Force). Strength is one variable that contributes to this goal.

Bio-Mechanical factors related to bat speed:

How do we know what good mechanics are? Over the last twenty years the computers at Bio-Kinetics Research & Development have told us many things by breaking down and analyzing hundreds of the best hitters in baseball. What makes our data so unique is that it was taken from live Major League Competition; from this video we were able to create 3-dimensional motion analyses. The following is what we often refer to as the absolutes of good hitting. While going over the absolutes it is important to remember it's not how you do it, it's if, when, and in what order you do it that's important. If there was only one right way to swing a bat every one in the Major Leagues would look exactly the same.

For us at Bio-Kinetics R&D, bio-mechanical efficiency is defined as all the body's systems working together in a continuous dynamically balanced state in the best possible place, time, and order.

Dynamic Balance:

Dynamic balance is knowing and controlling your center of gravity from start to finish. Controlling the center of gravity means going from the ball of one foot to the other while keeping the posture stable with the head directly over the center of gravity. At foot landing, the front foot will be slightly open with the weight being on the inside of the ball of the foot. At this point the hitter will be at his strongest balanced position and ready to produce a turning or rotary force called torque. Torque produces rotational acceleration.

Kinetic link / Sequential Rotation:

Some call it sequential rotation; others refer to it as torque (rotational acceleration) and scientists often call it the kinetic link principle. Regardless of the language, what it amounts to is producing kinetic energy (KE) from the ground forces to the lower half of the body and sequentially transferring that energy from the feet, into the lower torso, up into the upper torso and finally into the hands & bat. Optimal transfer of energy will only take place when the previous segment is moving at its maximum velocity.

Axis of Rotation:

Maximum rotational velocity takes place on a vertical axis with a strong posture and dynamic balance. The faster the body rotates the faster the bat is going. The bat, with violent action, is fired through the hitting zone as the front side becomes firm. The front leg will snap straight just before contact is made. This allows the remaining links (upper body-hands-bat) to accelerate forward at its highest potential rate of velocity.

Bat Lag:

Bat lag is the final link of the rotation sequence; feet first and hands last. The bat lags behind and is delivered by the entire body, to and through the ball. The bat itself is the very last link to rotate. When the lower half of the body has rotated and the belt buckle is facing the pitcher, the bat will still be coming from behind the hitter and gather speed because of the rotation of the lower body segments (i.e. kinetic link). Knowing HOW the body works in sequence from the feet to the hands is very important to understanding the true force and efficiency of hitting.

Hitting drills to improve bio-mechanical efficiency:

Hitting drills are designed to help a hitter become more efficient at a hitting a moving baseball. The body must learn how to time and recognize all pitches. Then the body must deliver the bat through the ball at an exact contact point. All this will be accomplished in less than 4 tenths of a second. Now that's an athletic event! The drills we use should be in line with the absolutes of hitting and always be in the correct sequence and dealing only with what really happens during a swing.

Some drills are done at high speed and are close to actual game speed.

1. Live batting practice vs. regular pitchers

Live batting practice vs. real pitchers is as close to game conditions as a hitter can get. The problem is that the hitter's adrenaline is not at game speed and there could be a high percentage of failure. The attitude of the hitter now becomes extremely important. Knowing that seeing good fastballs and breaking balls will definitely make a hitter better has to be the focal point, not the immediate results. Finding live pitching is not easy, as most pitchers have to be ready for actual games, so the next best drill is live batting practice from coaches at a closer distance.

2. Live batting practice by coaches at a close distance

This batting practice allows for some control of the situation, and different areas of the strike zone can be worked on over and over. There is much more success with a coach pitching because the ball is not traveling as fast and there is less movement. Confidence is a factor with this drill and usually the hitter feels good when finished. A good drill specific to hitting involves a ball coming toward a hitter that has to be timed and recognized.

3. Standing in vs. pitcher's on side work to recognize and time pitches

This is a tremendous drill that is not utilized enough. Hitters can see fast pitches, breaking balls, and movement over and over again. The quicker the hitter can pick up the ball out of the pitcher's hand (within the 1st 5 feet) and recognize speed and location - the bigger and slower the ball will look!

Remember that a hitter does not hit what the pitcher throws, he hits what he sees! Just as a ball looks "huge" when taking a 3-0 pitch - so can it look that way anytime. This drill should be a must for all hitters, high school age and older.

Some drills are designed for teaching the body to create energy under a controlled environment.

1. Soft toss from a screen set in front of hitter

This drill allows the hitter to work on bat angles and hitting pitches in all areas of the strike zone. A hitter learns contact points, angles for left field, centerfield, and right field hitting, and how to create bat quickness and speed using the correct hitting sequence.

2. Soft toss from the side of the hitter

This drill also allows the hitter to work on all areas of the strike zone, but the hitter must deal with difficult angles at times, as the ball is coming from the side. It is still an acceptable drill if the person tossing knows how to flip correctly and keeps the hitter in a good rhythm and sequence.

3. Long tee (soft toss) to an open field

This drill is also done from straight on (screen) or from the side and gives instant "feed back" with every swing. Incorrect contact points, short distances, topspin, etc. are all immediately recognized and can be corrected instantly.

4. Tee work into a screen

This is a good drill to get loose and is usually best while waiting to hit, or when the hitter is alone and just needs to polish his mechanics. Using a tee can cause a hitter to keep his head down (eyes buried on the home plate area) when contact is made. The correct way to use a tee is to start with the eyes looking out at the pitcher and tracking the ball to the tee without severe head movement backwards. The eyes will remain just out front of the tee and ball.

5. Dry swings for “visualization”

This is a great drill for the hitter who needs to teach the body how to attack different pitches in the strike zone. Using an “under loading” bat and a heavy bat is recommended for this drill – one will teach speed and the other will teach strength. Teaching the mind to “see” (visualizing) all pitches is so very important.

Some drills are counter productive and will not re-enforce what really happens during a good swing.

1. One arm drills swinging “down through ball”

Swinging “down through” the ball does not happen and practicing this is teaching the wrong skill. Done correctly, the one arm drill can build strength. Using a “short” bat the one arm drill can distort the relationship between the sweet spot of the bat and your hands. knowing this relationship (distance) is a key for success.

2. Tee work off the new tees that require a downward swing

Again, swinging down does not occur during a good swing and should not be taught.

3. One knee drill - “tomahawking” high pitches

The hands are always “above the ball and the bat head is always below the ball” on the way to contact. Tommy hawking, or chopping at a high pitch (bat head above the hands) does not happen – so don’t practice it.

4. Batting practice vs. machines at very high speeds

While the thought process behind seeing pitching at high speed is more game like and you can see good breaking balls, this can also really hurt a lot of hitters. There is no timing when facing a machine, and when the ball speed is high the hitter does not have time to get into full rotation and becomes a “top _ first hands” hitter. The machine should be set at a slower than average speed (around 50-60 mph) to allow the hitter to make his own timing and be “on time” so that the correct sequence of hitting can be used.

5. Swinging a heavy bat during skill work

Swinging a heavy bat is all right for building strength, but when trying to hit a moving baseball from a pitcher or coach the body will cheat (because it’s not strong enough) to get to the baseball and poor mechanics will appear. Use a heavy bat for visualization or soft toss only.

6. Rapid-fire soft-toss to quicken up hands and bat speed

This does not quicken up the hands or the bat speed. It actually slows down bat speed because the hitter cannot get into rotation and can only use the hands. This is entirely out of sequence and is teaching the body incorrectly! With that said, there are coaches that believe this drill will build strength in the smaller muscles of the arms that may lead to more bat speed. To date there is no research to support this and the small benefits that might come from this drill would not outweigh the possible bio-mechanical inefficiency that may come from practicing the swing incorrectly.

Resistance Training To Improve Bat Velocity:

Research shows that bat velocity can be increased through a specific resistance training program. As previously discussed, the baseball swing starts at the feet and ends at the hands. As such a player can not just strengthen one muscle group and expect to see a dramatic increase in bat speed. A player must build a good balance of functional as well as absolute strength from the lower torso up through the core and into the upper torso and arms to see an improvement. Strength is only the foundation. The key components are Torque (rotational force), Force (mass x acceleration) & Kinetic Energy ($1/2 \text{ mass} \times \text{velocity}^2$). Power is the measuring tool at which the above rate of work is done.

A player who engages in resistance training and is trying to train his muscles to fire faster must also maintain good flexibility throughout the entire body. If a player does nothing but add bulk to his body he will become inflexible. The more inflexible the player is, the smaller the displacement between segments and the slower the transfer of energy from one segment to another. Therefore a player must not only add strength but must also maintain or add flexibility.

Resistance Training Drills:

Much of the resistance training to increase bat speed will be done in the weight room. That's for another article. For the purpose of this article we will be looking at two skill specific methods of training bat speed that can be done on the field. Over & Under load swinging and the rotational power ball throw.

Dr Coop DeRenne at the University of Hawaii has conducted several studies on bat swing velocity over the last two decades. A study published in the National Strength and Conditioning Association journal on weighted bat implements had the following finding:

High school and college hitters trained with bats with in the 27 to 34 oz. range using a precise specific training program produced the greatest bat velocity increases. Work outs with implements either lighter than 27 ozs or heavier than 34 ozs resulted in significantly slower bat velocity. The very light, below 23 oz and the heavy, over 51 oz produced the slowest bat velocity.

Therefore, the recommendation would be that a high school and college warm up (Coop = using own bat) and train in a dry swing environment or live batting practice using light or heavy bats two or three ounces above or below standard bat weights using precise training protocol. Swinging weighted bats over 3 ounces or under 3 ounces would be counter productive to increasing bat speed.

Underload\overload Weighted Implement Bat Sequence Program to increase bat velocity: Dry swing and live hitting program.

This drill allows the body to attack pitchers or attack visualized pitches at a high speed. Research (Dr. Coop Derenne, Univ. of Hawaii research) suggests for high school and collegiate hitters using a underloading\overloading bat (20% lighter or heavier – bat range is 27 oz. to 34 oz.) in a weighted implement sequence program will increase bat velocity. This teaches the body and hands how it feels to be at that high speed and after a period of time the body remembers and a small % of speed carries over into the games at bats.

Rotational Power Ball:

When training rotational force it is very important to train the body in the same sequence as the activity when ever possible. If you train the strength out of sequence you are teaching your muscles to fire incorrectly. The muscles are going to repeat what they are trained to do. So if a player trains his muscles to fire in such a way that is different than the activity, his neuromuscular memory is going to want to repeat that same action in competition. The following protocol is just one of several ways the power ball can be used in resistance training.

The Description

Rotational Power Ball Throw

In this exercise, the athlete throws a Power Ball for maximum distance. The rotational throw is an excellent measure of rotational force and total body power, and simulates the rotational movement common to baseball.

- 1. Stand perpendicular to the start line, with your dominant side away to the start line. Think of yourself at the plate in a hitting stance.*
- 2. The Power Ball should be cradled in two hands with your back hand (palm facing the start line) on the back of the ball, and your front hand under the ball.*
- 3. Draw the Power Ball back, as you would a bat, keeping the Power Ball between your waist and chest. Your back hand should not come above chest height. Unlike, a real batting form, keep your arms fully extended with only a slight bend in your elbows.*
- 4. In one fluid motion, with your arms fully extended and supporting the ball, laterally rotate your body as you sling the Power Ball out and forward. As you rotate, your body will simulate a bat swing beginning with the drop of your front heel and continuing through as you rotate your core.*
- 5. Your arms should finish extended and high, with the release point tracking as if you were hitting a ball up the middle.*
- 6. If the Power Ball is not launched straight out, but fly's right, you released the Power Ball too early. (right handed)*
- 7. If the Power Ball is not launched straight, but fly's left, you released the Power Ball too late. (right handed)*

This can be done into a very strong sturdy wall preferably cement or with a partner. Continue this with sets of 10 to 20 on both your strong side and switch side regardless of you being a switch hitter or not both sides need to be worked to increase range of motion.