

## Add Leverage to Your Swing Increase Power

Archimedes was to have famously stated, "If you give me a lever long enough and a place to stand, I can move the world." An obvious hyperbole on his part, but he does have a point. Mechanical leverage is an elementary concept in physics that refers to the amplification of an input force resulting in a greater output force. In physics, where a lever-bar pivots around a stationary point called a "fulcrum" a mechanical advantage is attained called leverage. When a system receives an input force and subsequently increases the magnitude of the output force the load is then leveraged.

In our physical world there are (3) fundamental classes of levers which have variations in the location of the fulcrum or pivot point; as well as the location of the input and output forces. A class-1 lever has the fulcrum between the force and the load, as in a seesaw. The class-2 lever has the fulcrum at one end, the force at the other end with the load in the middle, as in a wheelbarrow. The class-3 lever has the fulcrum at one end, the load at the other end, and the force in the middle such as a golf club, fishing pole or softball/baseball bat (see diagram A).

As with any lever, by increasing the distance over which a force is applied creates a mechanical advantage (see figure 4). We've all opened a new gallon can of paint using a screw driver. Supplying the down pressure at the end of the handle of the screw driver makes it's much easier to open. A 5-inch screw driver can make it so you only have to apply about  $1/5^{\text{th}}$  the amount of down pressure at the handle-end versus right next to the paint can resulting in an  $\sim 5:1$  ratio of mechanical advantage using the same amount of force.

Mechanical advantage works well with your softball swing. Leverage is attained by using the lead-arm shoulder as the pivot point of the swing rather than the wrists. If the lead-arm wrist is allowed to cup at impact, there is an immediate disconnect from the bat and the upper-arm shoulder pivot point, neutralizing the desired leverage effect (see figure 2). By utilizing leverage and gaining a mechanical advantage in your swing, the batter can increase his or her power considerably while applying the same body forces. Swing leverage technique will amplify the input forces from the batter attaining a greater ball-exit-speed off the bat.

The lead-arm wrist position at impact should look like you just pushed opened an umbrella keeping the wrist firm with just a slight bow to it and not cupped. The top-hand should be pressing in behind the bottom hand at impact (see figure 3). If the lead-arm wrist breaks over at contact, leverage will be lost. You'll be hitting the ball with your hands and forearms and losing the body input forces so necessary in reaching your maximum bat-speed (see figure 2).

The swinging of a bat has a double pendulum form. The first pendulum is where the wrists are cocked with the bat lagging behind the hands and then released to impact. The forearms will roll allowing the unhinging of the wrists into the correct contact position. This technique will put the hitter in a powerful leveraged position at impact. The swing continues on to the second pendulum stage by pivoting off the lead-shoulder with the body forces now transferred to the shoulder pivot point. Allow the top hand to release from the bat then finishing the swing from the shoulder pivot point. By increasing the length of the lead lever-arm the batter will apply the necessary leverage to send the ball flying.

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