Analyzing Movement in the Body Arts: Lessons from *Hanbojutsu*

Tom Lang

Introduction

I began studying *Danzan Ryu Jujutsu* in 1971. Soon thereafter, like many other martial artists in the 1970s, I became interested in the now-classic book, *Stick Fighting*, by Masaaki Hatsumi and Quintin Chambers. This book presents the fundamentals of *Kukishin Ryu Hanbojutsu*, the art of fighting with the 3-foot stick, or *hanbo*. *Jujutsu* of course is largely a grappling art consisting of dozens of escapes, joint locks, chokes, pins, and throws. Doing these techniques with a 3-foot *hanbo* or cane just made the art even more interesting.

Over the years, I collected striking and grappling techniques for the *hanbo* and cane. (For simplicity, I will refer to all these grappling techniques generically as *hanbojutsu* and to the stick and cane as *hanbo*.) Some of these techniques were included in a 2006 book titled, *The Stick and Cane in Close Combat: Jointlocks, Takedowns, and Surprise Attacks*.[1] In early 2015, I released a set of three DVDs with more than 4 hours of video presenting some 200 techniques in what I call "Essential Stick & Cane."[2] These techniques were selected, adapted, combined, and sometimes created after reviewing hundreds of books, manuals, videos, and DVDs on fighting with the *hanbo* and cane and various other stick arts. (A bibliography of more than 300 sources is available in *The Essential Stick & Cane Instructor's Manual*.)[3]

In compiling Essential Stick & Cane, it soon became apparent that the key to using the *hanbo* is to learn how to use it effectively as a lever. All the escapes, locks, chokes, strikes, and takedowns with the *hanbo* depend on how and how well you can apply leverage. Obviously, the principles of leverage are found in all human movement, as well as in all martial arts. In *hanbojutsu*, however, these principes are much easier to see because the *hanbo* is used specifically as a lever. Once the principles are learned with the *hanbo*, they are more easily applied in empty-handed martial arts. Thus, I began to use the *hanbo* to teach *jujutsu* and *jujutsu* to teach *hanbo*.

For example, many *hanbo* techniques are similar to empty-handed ones when the *hanbo* replaces the forearm. That is, a grip on the end of a *hanbo* is similar to a grip on the wrist and can be broken with similar movements. Forearms don't look like levers, however, and we don't think of them as such. Replacing them with a *hanbo* not only makes the principles of leverage more obvious. Further, even if the movement at one end of the *hanbo* is small and subtle, the movement at the other end, 3 feet away, is more noticeable, so the techniques and principles are often easier to teach and to learn than they are in the empty-handed arts.

Because the *hanbo* is so often used as a lever, it was only natural that we began to talk about the techniques in terms related to leverage, such lever arms, fulcrums, and mechanical advantage. We start with simple examples of two-dimensional movements not done against full, active resistance. However, the principles always apply, it just takes experience to see them in techniques done under more dynamic circumstances. Here, I describe the mechanical and tactical principles of *hanbojutsu* as I understand and teach them. More information and teaching techniques can be found on the Essential Stick & Cane DVDs and in the accompanying Instructor's Manual.

The Principle of Separating Movement from Motion

One of my instructors used to tell me that the most important principle in learning any martial art is that *movement* is not the same as *motion*. "Motions" are what we see (or think we see), and "movements" are the muscular actions that produce the motions. Especially in the beginning, a major problem in learning martial arts is that we try to imitate the instructor's motions with untrained movements. Because an imitated motion doesn't necessarily require the same movements that produce the desired motion, the techniques are often weak. The purpose of training is to learn to make the movements that produce the motions. Of course, these movements are not obvious and are often not called out specifically during training.

Here's a simple example. Suppose you are standing in front of a door, feet together, with your hand on the knob, ready to open it. The opening of the door will be a *motion*. That is, what we see is the door swinging open. The door can be opened with any of several *movements*, however. You could pull your elbow back; you could keep your arm extended and step straight back with one foot; you could keep your arm extended and twist your hips to that side to pull the door open; or you could combine two or more of the these movements. In each case, the *motion* of the door will be the same, but the *movement* that opens the door will be different. In addition, each of these movements differs by how hard and fast you can pull the door open and by the changes you need to make in your position and posture as you pull the door open.

For any given motion in a martial arts technique, several movements may be possible, each with its strengths and weaknesses. A good martial artist is one who eventually knows, instinctively if not consciously, which movement or set of movements is best in a given situation and who can perform these movements smoothly and correctly.

Here's another example that will lead to one with the *hanbo*. To draw a circle, you could put a drinking glass on a piece of paper and trace around the bottom of the glass. The result would be a circle, and in this case, the movement you made with the pencil would also be circular. But there is another way to make a circle. If you were to draw a circle with an Etch-a-Sketch for example, you would turn one dial to move the stylus straight from one side to another, and at the same time, you would turn the other dial to move the stylus straight up or down. You still draw the same circle, but *the circle is created by the combined movements of two straight lines* (**Figure 1**).

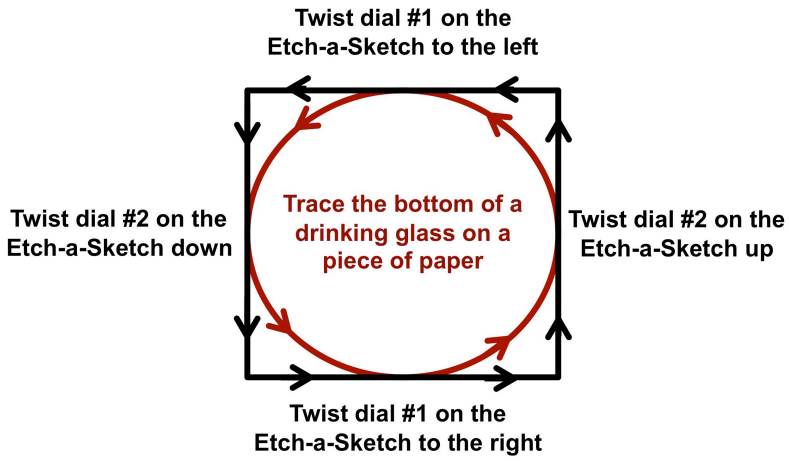

Figure 1. The difference between motion and movement. To make a circle, you can trace the bottom of a glass on a piece of paper, in which case both the "motion" (here the red circle) and the movement of the tip of the pencil will be circular. You can also make a circle with an Etch-a-Sketch by moving the stylus side-to-side by twisting dial #1 at the same time that you move it up or down by twisting dial #2. The circular motion is the result of two straight lines.

Now suppose you are standing with the *hanbo* as shown in **Figure 2** (what I call the diagonal guard) when an opponent grips the tip of the *hanbo*. (For convenience, I will call the front end of the *hanbo* the tip and the back end, the hilt.) You want to circle the tip over his wrist to break his grip as shown. To beginners, the obvious way to make this circle is to move the tip in a circle with the front hand, as if tracing the outside of a wheel (**Figure 3A**). Moved this way, the path of the *hanbo* would look like a cone (**Figure 3B**). The point of the cone would be the fulcrum in the back hand, and the base of the cone would be the circle made by the tip. Although this movement does create the motion of the circle, it is made by circling your front hand, which is a weak movement.

Figure 2. Circling the tip to break a grip. A) Start from the diagonal guard: stand in the alternate corners of a square, grip the hanbo at thirds, palms down, and keep your left hand on your centerline. The *hanbo* will pass diagonally from front left to back right. **B)** Bring the tip above and over his wrist. **C)** Push his hand away to the back corner.

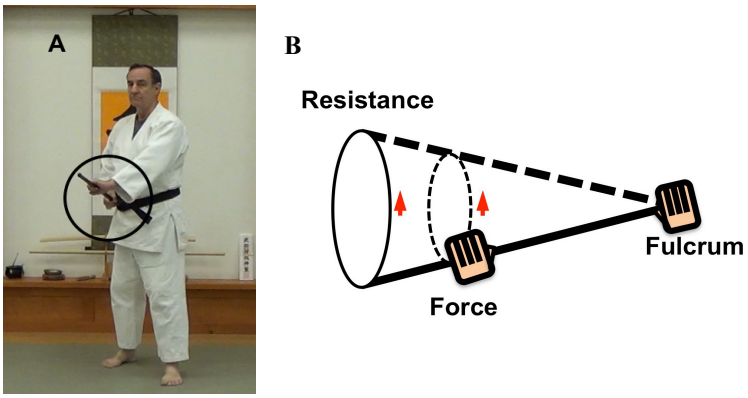

Figure 3. An inefficient way to circle the tip over the wrist of an opponent who has gripped the *hanbo*. A) Many beginners see the circular motion of the tip and **B)** try to reproduce it by moving the tip in a circle with the front hand. This movement is weak, however.

Now suppose you move the tip in a circle by making two straight lines at the same time, as in the Etch-a-Sketch example (**Figure 4A**). You can move the tip from side-to-side with your hips, and you can move the tip up and down by lifting and pressing down on the tip with your front hand. These movements, by themselves and together, are much stronger than the circular one. If you moved this way one movement at a time, the path of the *hanbo* would look like a pyramid on its side (**Figure 4b**). The point of the pyramid would be in your back hand, where the fulcrum is, and the square bottom of the pyramid would be the path of the tip. The top and bottom of the square would be made by moving your hips, and the sides would be made by moving the tip up and down. When you do

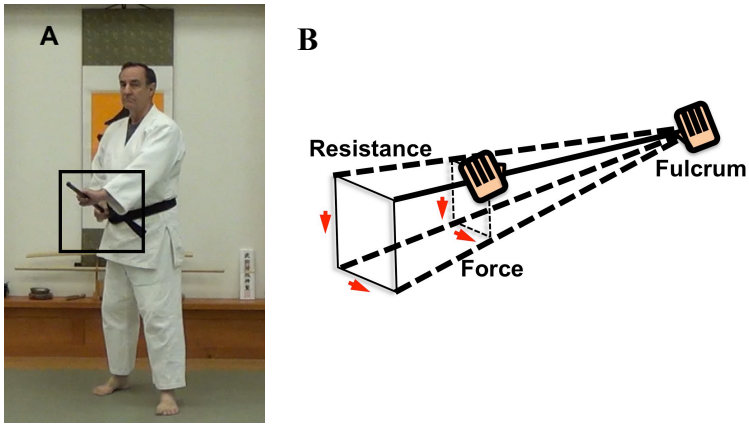

Figure 4. A more efficient way to circle the tip over the wrist of an opponent who has gripped the *hanbo*. A) The stronger way to make the *motion* of a circle is to produce it by creating two straight lines with two *movements*. **B)** Turning your hips side-to-side will move the *hanbo* horizontally, and moving your front hand straight up and down will move the tip down and up, respectively. That is, you produce the *motion* of a circle with two more powerful straight-line *movements*

both these movements at the same time, the *motion* will look like the cone with the circular base, but the *movement* will be the pyramid with the square base.

However, lifting the *hanbo* with your front hand is still a weak motion. To use the leverage of the *hanbo* to full advantage, you need to move the fulcrum from your back hand to your front hand (**Figures 5** and **6**). The position of your back hand allows you to lift up and push down on the hilt with much more force than you could with your front hand.

My instructor also used to say that "movement never originates at the point moved." In other words, to move your hand, don't think of moving your hand, think of moving your elbow or your hips. Think of moving the joints that move your hand, not the hand itself.

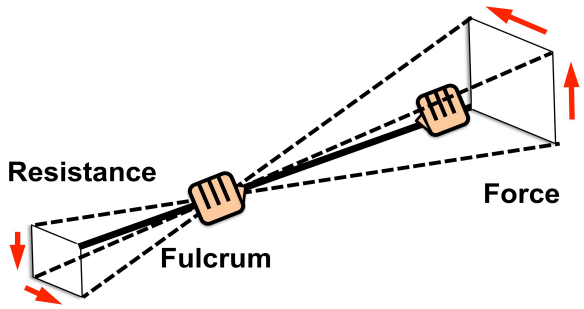

Figure 5. Using the leverage of the *hanbo*. The strongest way to circle the tip is to move it left and right with your hips and up and down with your *back* hand, putting the fulcrum in your forward hand. The motion will still look circular, but the movements will be far stronger than those above.

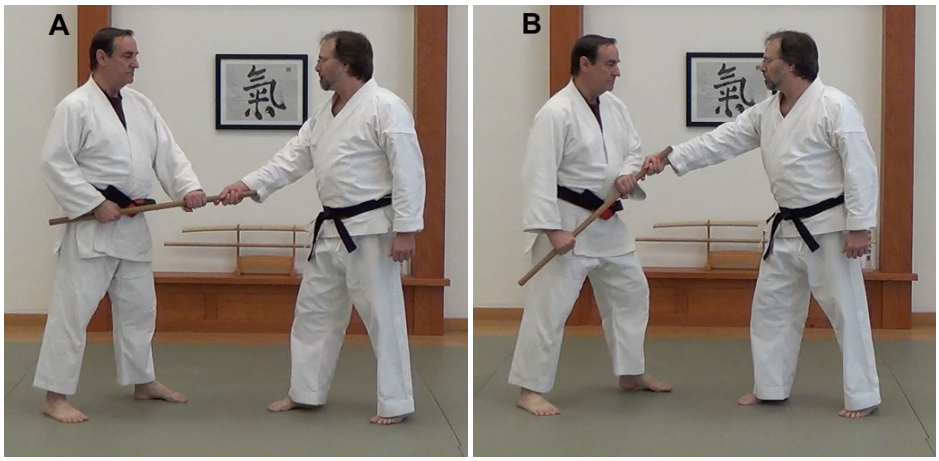

Figure 6. The movements in Figure 5 applied in training. A) From the diagonal guard, **B)** Pushing your back hand down and keeping the fulcrum in your front hand is the strongest way to raise the tip above his wrist. You don't lift your front hand as much as you bring it to your chest. Pinning your forearm to your side also stabilizes the fulcrum in your front hand.

The implications of these concepts are profound. I firmly believe that the ability to separate movement from motion is one of the keys to good teaching to mastery of an art. We try to reproduce what we see, not realizing that what we see is the result of several movements happening a long way away from the part of the body that is being moved. In addition, although these movements usually end at the same time, they often begin at different times, which makes them even harder to identify. Working with the *hanbo*, however, makes these movements easier to see and to appreciate.

The Principles of Linear Motion and Rotation

This same instructor (an *aikido* and *iaido sensei*) also told me that "There are no circles in the martial arts. There are only very complex curves," a reminder that when we simplify instruction, we can oversimplify. We talk about making circles, but as indicated above, many circles are often made by moving in straight lines. However, our arms are well suited to applying force in straight lines; like punching, for example, or drawing a bow. In Figures 5 and 6, pushing the hilt of the hanbo down with the back hand is very powerful: you simply straighten you arm with your triceps muscle.

Also in the above example, turning your hips moves the tip in a small horizontal arc, but the movement is not really circular, it's rotational. Rotation is stronger because the movement comes from the muscles that move your trunk on your hips, not from those that move your hands.

In motions that appear to be circular, look for the straight lines and rotations that create circles and that allow you to maximize the force you can apply by extending or flexing your arms or by turning your hips.

The Principles of Leverage

The principles of leverage have been known for centuries. Simple levers have three parts: the force you apply, the resistance you are trying to overcome (or the pressure you want to apply to the opponent's body), and a fulcrum or pivot point that supports the lever itself. The three classes of levers depend on the relationships among these three parts along a lever arm (**Figure 7**). In a **class 1** lever, the fulcrum is in the middle. In a **class 2** lever, the resistance in the middle, and in a **class 3** lever, the force is in the middle.

A good example of a class 1 lever is a crowbar. The short end of the crowbar goes under the resistance, a fulcrum is placed under the bar as close to the resistance as possible, and the force is applied to the long end. Many of the defenses against a grip on the *hanbo* use the principle of a class 1 lever, especially when the fulcrum is one of your hands. (Review **Figures 5** and **6**, for example.)

A good example of a class 2 lever is a wheelbarrow. The wheel is the fulcrum, the resistance is the dirt in the tray, and the force is the lift on the handles. Class 2 levers can be very efficient, especially when the fulcrum is in your opponent's hand.

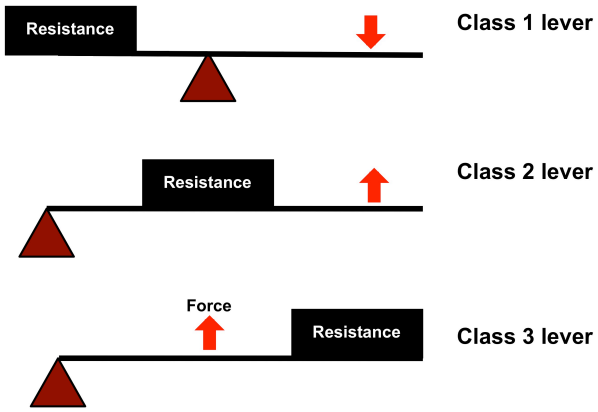

Figure 7. The three classes of levers. The classes differ in the relative position of the force, resistance, and fulcrum along the lever arm.

A good example of a class 3 lever is a pair of tweezers. Here, the fulcrum is the point where the arms are joined, the force is applied to the center of each arm, and the resistance is the object being gripped between the free ends of the arms. Class three levers are not very efficient, which is apparent in **Figures 3B** and **4B**.

The Principle of "Owning" the Stick: Using a Class 1 Lever

One principle of using the *hanbo* is to "own" as much of it as you can. Usually, the more of the *hanbo* you "own" (the farther apart your hands are on the shaft), the more leverage you have. In other words, you need to get the greatest "mechanical advantage."

Mechanical advantage is the mathematical definition of leverage that describes the relationship between the resistance, the force, the fulcrum, and the "lever arms," or the distances between the resistance and the force from the pivot point along the shaft. The relationship is simple: in equilibrium, the amount of resistance, R, multiplied by the length of its lever arm always equals the amount of force multiplied by the length of its lever arm. So, a 5-pound force 2 feet from the fulcrum can be balanced by a 10-pound force applied 1 foot from the other side of the fulcrum: 5 x 2 = 10 x 1. There is a tradeoff between the amount of force needed to move the resistance and the length of the lever arms. In a class 1 lever, the longer the lever arm for the force, 1) the less force you need to move the resistance or 2) the more pressure (force) you can apply to your opponent.

This relationship also means that if both you and your opponent grip the *hanbo*—he with one hand at the tip and you with both hands at thirds on the shaft—the person gripping the *hanbo* farthest from the fulcrum (the one with the longest lever arm) will have the better mechanical advantage. In this case, the relationship between the lengths of the lever arms tells how much advantage one side has over the other. For example, 8 pounds of force applied 2 feet from the fulcrum (8 x 2 = 16) and 4 pounds of resistance at 1 foot

from the other side of the fulcrum (4 x 1 = 4) means that the mechanical advantage of the force is 16 divided by 4 = 4, meaning that the your control of the force has a mechanical advantage that is 4 times as great as the resistance provided by the opponent.

The mechanical advantage of "owning" the stick can be understood the same way. The *hanbo* is 36 inches long, and a hand is about 3.5 inches wide, meaning that the *hanbo* can be divided into about 10 equal units, each about the width of one hand. **Figure 8A** depicts an opponent gripping the tip when you are holding the *hanbo* at thirds. Assume that your front hand (the lighter image in the middle) is the fulcrum and that your opponent is as strong as you are (meaning that the resistance is equal to the force). **Figure 8A** shows that your mechanical advantage is 1.4 times that of your opponent because your front hand is farther away from the fulcrum (3.5 units) than his is (2.5 units).

Now, if you slide your front hand (the fulcrum) to your opponent's hand (the darker image on the left), your mechanical advantage increases to 3 times that of your opponent (**Figure 8B**). This increase happens because moving your hand lengthens your lever arm (the distance between your hands, 4.5 units, or the distance between the fulcrum in your left hand and the force you are applying with your right hand) and shortens your

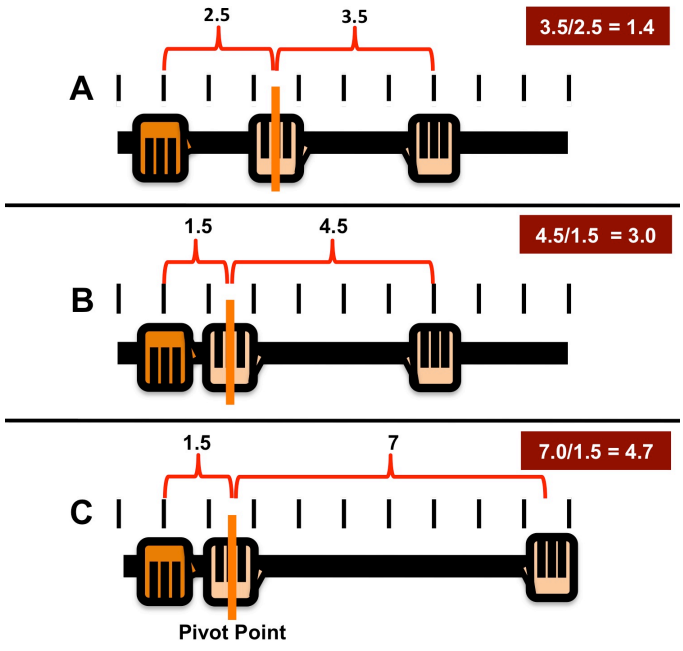

Figure 8. The principle of "owning the stick." Grip the *hanbo* with your hands (in light brown) as far apart as possible to make your lever arm as long as possible and your opponent's as short as possible. The vertical orange line is the fulcrum. **A)** If the opponent grips the tip when you are in the diagonal guard, you have a "mechanical advantage" of 1.4, not much better than your opponent's. **B)** When you increase your lever arm by moving your front hand your opponent's, your mechanical advantage doubles to 3.0. **C)** When you move your back hand closer to the far end of the *hanbo*, your mechanical advantage increases by about half again, to 4.7.

opponent's to 1.5 units. Finally, if you move your right hand to the back end of the *hanbo*, your mechanical advantage increases to 4.7 (**Figure 8C**).

In a class 1 lever, your mechanical advantage may be greater or less than 1. In a class 2 lever, your mechanical advantage is always greater than 1. In a class 3 lever, your mechanical advantage is always less than 1. However, the force, fulcrum, and resistance change constantly, and the position of your body and your opponent's body also determine your options when using the *hanbo* as a lever.

The Principle of the Full-Scissor Hold: Using a Class 2 Lever

In a class 2 lever, such as a wheelbarrow, the resistance is between the fulcrum and the force. This principle appears in *hanbojutsu* as the full-scissor hold, in which you trap an arm, leg, or neck between the *hanbo* and both forearms. (The half-scissor hold traps, say, the neck between the end of the stick and one forearm, and is actually a class 1 lever. It is not described here.) Because you have to grip the *hanbo* with at least one hand, you have only the other hand, if that, to grip your opponent. About the only other way to grip him securely is to apply a full-scissor hold, in which you trap him by applying pressure with both forearms against the shaft, using your hands as fulcrums (**Figure 9**).

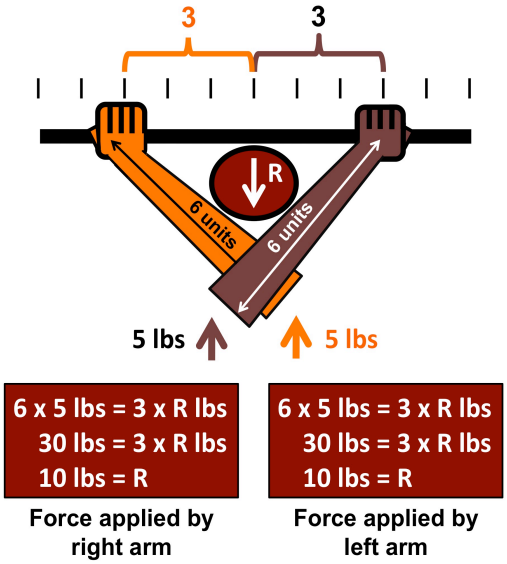

Figure 9. Application of two, class 2 levers as a full-scissor hold. With a full scissor hold, you can control his neck and apply 10 pounds of pressure (R) with each arm by pushing your elbows forward with only 5 pounds of force. Each hand is a fulcrum. Your arms are crossed, so force applied with one forearm compresses the opposite side of his neck.

In a full-scissor hold from behind, you choke him by pushing his throat into the staff in a scissoring movement with crossed forearms, by splaying your elbows. If your forearms are 6 units long and you push with 5 pounds of force with each hand, you apply 10 pounds of pressure to his neck with each forearm (the value of R; **Figure 9**).

The Principle of Striking: Using a Class 3 Lever

In a class 3 lever, such as a pair of tweezers, the force is applied between the fulcrum and the resistance. This time, however, the longer the distance between the fulcrum and the resistance, the less mechanical advantage you have. In **Figure 10**, the fulcrum of a two-handed strike is in your right hand at the hilt, and you are pushing the *hanbo* forward with your left hand. If your forward hand is 2.5 units from the fulcrum, when you apply 5 pounds of force, only 1.3 pounds is delivered to the target 9.5 units away (R). (This explanation is not strictly accurate because a circular strike has an "angular" or "rotating" force that is calculated differently. The simplified explanation is close enough, however.)

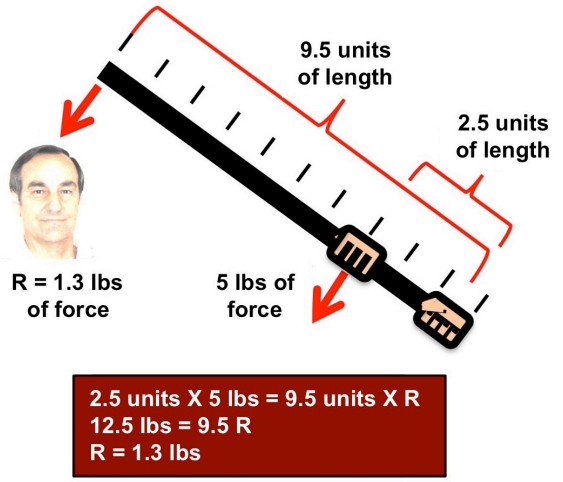

Figure 10. The mechanical advantage of a class 3 lever. Pressing on the *hanbo* with 5 pounds applies only 1.3 pound of force (R) at the tip. However, a strike with a *hanbo* gets its power from the speed of the strike, not from its mechanical advantage.

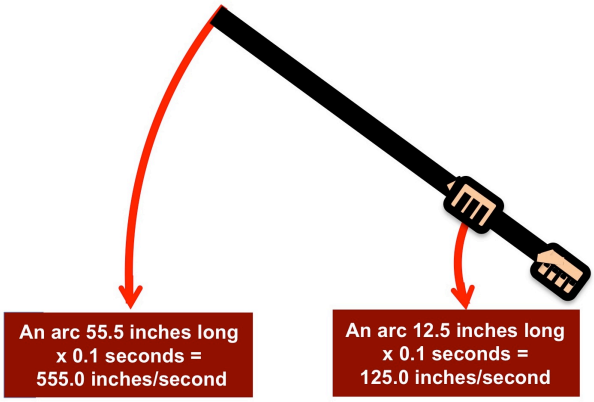

Figure 11. The combative advantage of a class 3 lever. When your forward hand moves through an arc of about 12.5 inches, the tip of the *hanbo* travels about 55.5 inches in the same time, meaning that it travels much faster than your hand. Force increases with the square of the velocity, so the faster the end of the *hanbo* moves (because you have a longer *hanbo* or strike faster), the greater the force of your strike.

What makes the class 3 lever useful is that, during a strike, the tip moves farther and faster than the hand that applies the force. If you press the *hanbo* into a target, your 5 pounds of force drops to only 1.1 pounds 9 units away at the tip. However, if you move your front hand (which is 2.5 units from the fulcrum at the hilt) through an arc 12.5 inches long, the tip 9 units away from the fulcrum moves through an arc 55.5 inches long (**Figure 11**). If it takes you a tenth of a second to move your front hand, your hand is moving at a speed of 12.5 inches/0.1 seconds, or 125 inches per second. The tip of the *hanbo* moves through its arc in the same time: 0.1 seconds, but its velocity is 55.5 inches/0.1 seconds, or 555.0 inches per second. Because force increases with the square of the velocity, the faster the tip of the *hanbo* moves, the greater the force of the strike.

The Principle of Controlling the Fulcrum

The relative position of the force, fulcrum, and resistance define what class of lever is in play. Also, the different classes of levers have their own strengths and weaknesses. So, one way to change the class of lever to a more advantageous one is to change the position of the force, fulcrum, or resistance on the *hanbo*.

In the first examples above, when your opponent gripped the tip and you responded by circling the tip over his wrist to break his grip with your front hand, you were using the *hanbo* inefficiently as a class 3 lever. When you circled the tip with your back hand and used your front hand as a fulcrum, you were using it effectively as a class 1 lever (**Figures 5, 6,** and **12**). In other words, you moved the fulcrum to your advantage.

When your opponent grips the tip, however, you have some options. In any event, the first thing you should do is to slide your front hand to his to own as much of the *hanbo* as you can (**Figures 12** and **13**). As described above, this movement increases your leverage and reduces his. In fact, when the fulcrum is this close to the resistance, it almost eliminates it, which means you can easily strike him with the hilt (**Figures 14** and **15**).

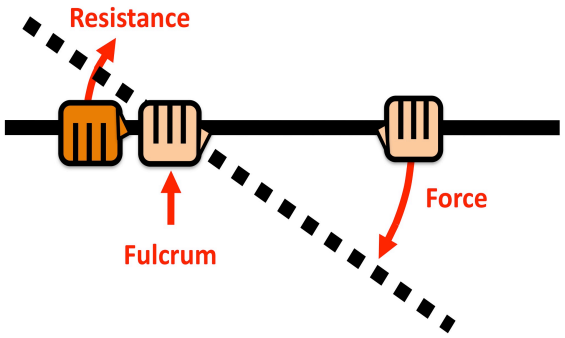

Figure 12. The class 1 lever shown in Figures 5 and 6. In this side view, your opponent has gripped the tip of the *hanbo*. If you maintain the fulcrum in your left hand, pushing your right hand down to move the tip up, over his hand will easily overcome the resistance of his grip.

Figure 13. The principle of controlling the fulcrum: making a class 1 lever. Your opponent has gripped the tip. One response is to see his grip as the resistance, your forward hand as the fulcrum, and your back hand as the force, as indicated in **Figures 5, 6,** and **12**. As long as you can maintain the fulcrum in your forward hand, the principles of a class 1 lever apply.

Figure 14. The principle of controlling the fulcrum: changing to a class 3 lever. A second response to his grip is to use his hand as a fulcrum as you strike him in the ribs with the hilt. Your right hand applies the force for the *hanbo*, and your left hand assists by keeping the fulcrum at his hand, but importantly, he has no leverage and therefore can't stop your strike. The "resistance" in this case is the power of your strike.

When you strike this way, you essentially create a class 3 lever—a strike—with the fulcrum of the lever in his hand, the force in your back hand, and the "resistance" being the actual amount of force with which you strike him with the hilt (**Figures 14** and **15**).

For the sake of discussion, if, from the same grip on the tip, you decide to pull with your front hand, you essentially move the fulcrum to your back hand (**Figure 16**). Your force is almost directly opposite his resistance, which means whoever is stronger, wins; neither

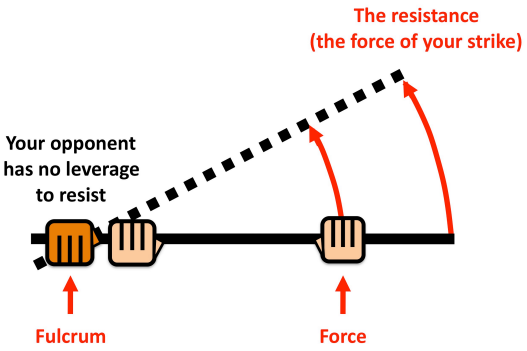

Figure 15. The class 3 lever shown in Figure 14. In this top view, as soon as he grips, slide your left hand to his, which eliminates his leverage and therefore his ability to offer any resistance. The strike with your right hand is essentially a punch. Your left hand doesn't add much force, but it allows you to keep control of the *hanbo* as you strike.

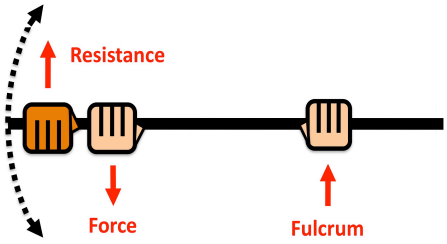

Figure 16. The principle of controlling the fulcrum: changing to another class 3 lever. A third—but poor—response to his grip is to create a class 3 lever that is the opposite of the one in **Figures 14** and **15**. You have moved your hand close to his, but then you begin to push or pull against his hand with yours, which means essentially that you have put the fulcrum in your right hand. His lever arm is slightly longer than yours (farther from the fulcrum), but not enough to matter. In this case, you have eliminated any leverage either of you and have turned the technique into a contest of strength.

of you has much of a mechanical advantage. It's another class 3 lever, but one not as bad as those shown in **Figures 3** and **4**.

We discovered that whoever controls the fulcrum has the advantage. In the simple examples described so far, you controlled the fulcrum and the opponent offered only passive resistance. When he resists, however, his movement can change the fulcrum and hence the leverage and maybe even the class of lever.

For example, suppose your opponent has trapped your forearm in a full-scissor hold with two, class 2 levers (**Figure 17**). When he pushes his forearms to the shaft to tighten his hold, he is pushing in one plane of motion; here, it is roughly horizontal. To counter this hold, control and change the fulcrum: make the *hanbo* turn about another axis. Pushing the left end of the *hanbo* up with your free hand and cutting down, outside his upper forearm, into his lower forearm, with your trapped hand, you move the fulcrum 90 degrees to his plane of motion, which breaks his hold (**Figure 18**).

Figure 17. A full-scissor hold. As before, each of his hands is a fulcrum, your forearm is the resistance, and the pressure of his elbows toward the *hanbo* is the force. All these elements are in the same, flat, plane, however; the hold is two-dimensional. As long he can maintain this two-dimensional position, he has a strong hold.

Figure 18. The principle of controlling the fulcrum: making a new fulcrum. One counter to a full-scissor hold is to turn the *hanbo* end-for-end in a vertical circle and to press into his lower forearm with your yours, which unwinds his arms, eliminates his leverage, and breaks his hold. You make a new fulcrum for the *hanbo* (the *hanbo* turns over your right forearm) and add a third, vertical, dimension by pushing the *hanbo* 90 degrees to the original horizontal plane, where he is now weakest.

Final Thoughts

As mentioned, all of the above examples are based on the assumptions that the fulcrum doesn't move and that the force and resistance are being applied in the same plane. In reality, these assumptions are rarely true. The fulcrum is moving and the force and resistance are being applied at different angles. In fact, some of the best combative strategies with the *hanbo*, both offensive and defensive, are to move the fulcrum away from where your opponent wants it to be and to get him to change the direction of his force or the amount of resistance he can apply to the *hanbo*.

This approach to instruction is probably more academic than many martial artists would like, but it has great value. It is an approach that teaches students how to learn to move the *hanbo*, not just how to do techniques. The ability to distinguish between motion and movement and to understand the relationships between force, fulcrum, and resistance are skills critically important to learning any martial art, whether this ability is conscious or not. Making it conscious has the potential to shorten the time to competence and to increase the time that training can be done with proper technique.

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