Unbalancing the Center of Gravity of an Opponent:
An Exploration of Sweeping Techniques and Their Application

Sweeping Technique (De Ashi Barai)

by David Gómez
Mark Groenewold, Editor
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David Gómez performs a sweeping technique (de ashi barai) during a basic one step sparring drill.
Sweeping techniques, simply defined, are used for the purpose of off-balancing the center of gravity of an opponent. The foot or hand can be used in conjunction with each other to perform a sweeping technique. Sweeping techniques disengage proper posture, the alignment of the upper or lower body relative to the center of gravity, and results in off-balancing the center of gravity of one’s opponent. The method of technique utilized to off-balance the center of gravity will be guided by means of pushing or pulling. Body dynamics such as hip rotation and body shifting enhance the power of pushing and pulling from within a stable stance.

A key component to sweeping techniques is proper timing. Catching the exact moment prior to one’s opponent stabilizing a transition move, or positioning the sweeping technique to the weak side of an opponents stance at exactly the precise moment, is the definitive factor in off-balancing someone’s center of gravity. Additionally, for maximum displacement of the upper body or lower limbs of an opponent, ideally, it is necessary to get beneath an opponent’s center of gravity.

Conversely, immobilizing the lower body and toppling the upper body to the ground, while this may resemble some throwing techniques, can also be broadly classified as falling within the area of “sweeping technique”. In a general sense, while not thought of as the most traditional form of sweeping, there are times when throwing techniques are sweeping techniques.

The ultimate goal of sweeping someone is to off-balance the center of gravity of an opponent just long enough to strike or incapacitate them. This goal will be explored in section 6 at three levels of skill: beginner, intermediate and advanced. Each drill will clearly demonstrate all the elements necessary for successful sweeping technique, timing, body dynamics, stance and positioning.
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Michael Ehrenreich stands with his center of gravity properly positioned over a strong base in an open “get-ready” (yoi) position. Understanding the importance of the center of gravity in the human body aids greatly in all karate movement/techniques.
Section 1:
The Center of Gravity and the Human Body

What is “center of gravity”? Where is the body’s center of gravity? Why is it necessary to have an understanding of the human body’s center of gravity for sweeping techniques?

By definition, the center of gravity is the central point where the entire weight of an object can be “balanced”. If gravity is uniform, the center of mass is the same as the center of gravity.¹ The center of gravity of a child’s seesaw is at the center of the board when no one sits on it. If the seesaw is pivoted at its center, it will remain balanced. When two children of different weights get on opposite ends of the seesaw, the force of gravity will be greater on one end. The center of gravity will then be between the center of the board and the end where the greater force is acting—that is, where the heavier child is sitting. The seesaw will tilt toward that end. If the heavier child moves toward the center of the seesaw, the center of gravity also moves toward the center of the board and it will again balance.²

If gravity is constant, body weight is a continual force acting at the center point of the body—the inner center of gravity. The human spine, unlike the spine of most animals, has a curve in the lower back. This curve helps make upright posture possible by placing the body’s center of gravity over the pelvis. More specifically, the body’s center of gravity is located about four centimeters below the navel, between the latter and vertebral column.³ If the position of a human’s inner center of gravity is moved in an unequal proportion to the constant found between upper and lower body weight distribution, sweeping techniques become relatively simple to apply, as the disbursement of natural body weight is disproportionate to natural body dimensions.

Posture

Posture and stance are two sides of the same coin. You can’t have one without the other. The coin has a center layer and a center point, and for this verbal illustrative, that’s the center of gravity. Proper posture perfects
stances because it places the center of gravity at just the right ‘balance point’. However, I will deal with posture and the center of gravity relative to stance in greater depth shortly. First I would like to address what good basic posture is.

Illustration 1 depicts 3 views of proper posture, relative for karate purposes, from an open standing “ready position”. A “ready position” differs from a simple standing position. A “ready position” places the center of gravity as far forward as possible with an “intention” of “forward momentum” while keeping the center of gravity firmly over a stable base. A simple standing position places the center of gravity in a neutral state, over the pelvis with no such “intention”.

Illustration 1: Posture

Proper Posture Key Points: Relax the shoulders, pull the chin in and roll your hips forward by slightly tensing the lower buttocks to align the upper and lower back.

Proper posture engages the head and torso as one unit. To accomplish this, first, relax the neck and shoulders. The shoulders should be lowered, not raised. Pull the chin in to align the back part of the neck with the upper back. The eyes should be level, as if looking about 20 feet into the distance. Slightly tense the lower buttocks and stomach muscles which will roll your hips underneath you and slightly forward. The upper torso of the body should “feel” like one unit. The buttocks should not stick out and the chest or shoulders should not lean forward. This position, or posture, will allow the most central part of your body, your center of gravity, to have a forward feeling momentum yet will sit firmly above your feet for maximum stability.
In developing proper, and thus stable posture, there are many things which must be meticulously attended to. Simply stated, without proper posture, the center of gravity can be easily compromised with sweeping techniques.

**Posture and the Center of Gravity Relative to Stance**

JKA style Shotokan Karate has a large variety of stances it employs for offensive and defensive purposes. Posture plays a major role in aligning the center of gravity relative to these stances. All stances must maintain proper posture to maintain a stable center of gravity. Without proper posture the center of gravity is easily displaced with sweeping techniques. The center of gravity must be firmly established over a strong base to keep the body standing in a stable manner. The stability of a stance depends to a great degree on the area included within its base. Stances that lower the hips, thus lowering the pelvis and the center of gravity, tend to be more stable.

An understanding of the proper placement of the center of gravity relative to stance(s) is necessary when attempting a sweeping technique. If you can spot that the center of gravity is ‘off balance’ or ‘out of place’, it becomes much easier to execute a sweeping technique. If the placement of the center of gravity is correct, it then becomes the objective of the karate-ka to disrupt the “balance” (posture-upper and lower weight distribution) with a sweeping technique.

**The Center of Gravity of Side Stance, Front Stance, and Back Stance**

Of all the stances used, three of the most commonly used are the side stance, the front stance, and the back stance. Each stance has approximately the same area of base, but each has an entirely different placement of the center of gravity. Proper placement of the center of gravity is crucial if stability is to remain a constant in each stance. Illustrations 2, 3, and 4 (on the following page) depict the base area, weight distribution, and proper placement of the center of gravity of side stance, front stance, and back stance.

In illustrations 2, 3, and 4, the space from heel to heel is the base, the dot indicates the placement of the center of gravity, and the weight distribution is represented by the inch mark noted on the base line.
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Illustration 2 - Side Stance:
- Base area of 40 inches
- Weight distribution is 50/50, equal weight on each leg.
- Using a plumb line, the center of gravity is midway from heel to heel, at the 20 inch mark.

Illustration 3 - Front Stance:
- Base area of 40 inches
- Weight distribution is 60/40, 60% weight on the front leg and 40% weight on the back leg.
- Using a plumb line, the center of gravity is approximately 60% closer to the front heel, at the 24 inch mark.
Illustration 4 - Back Stance:
- Base area of 40 inches
- Weight distribution is 70/30, 70% weight on the back leg and 30% weight on the front leg.
- Using a plumb line, the center of gravity is approximately 70% closer to the back heel, at the 28 inch mark.

Types of Center of Gravity Displacement: Upper and Lower Body

By definition, in any stance, if the balance between the upper and lower body is altered, the center of gravity is easily displaced. This makes it simple to take a person off their feet. Also, the upper body displaces the center of gravity if posture is misaligned. Likewise, stability is also compromised if the base, the space from foot to foot, is altered before the center of gravity has adjusted itself to it's new length and weight distribution.

In a solid object, the center of gravity must move in concert with it's base. However, the human body is unique in that it can move it’s center of gravity first and align it’s base fractions of a second later. Failure to move your base and center of gravity as a cohesive unit results in catastrophic instability.

Sweeping: Disrupting Upper Body Balance

Typically, the hands are used to disrupt the balance of an opponent’s upper body. Other methods may also be used, but for the purpose of illustrated examples found herein, I will concentrate on disrupting the upper body solely with the use of the hands. Examples of how the hands are used, in what positions, and to what targets, are discussed under section 2, “Sweeping Foot, Leg (Inner Thigh) and Hand Positions”.
Pulling, pushing, or turning someone’s upper body before their center of gravity can place itself in its “new” location creates major instability. The upper body and lower body must always be in balance. If the upper body is moved, the center of gravity and lower body must also move to prevent the subject from falling.

Tilting the head slightly, either forward or back, will also misalign posture causing the instability required to take someone off their feet. Examples of pulling, pushing, tilting the head to misalign the posture, can be found in section 6, “Training Exercises: Basic Training Exercises”.

### Sweeping: Disrupting Lower Body Stability

Altering the main support structure (the legs/feet) by way of moving (or locking) them from being under the center of gravity, before they can adjust to a new position, will cause instability of the lower body. Instability of the lower body can be created using similar methods as that employed in disrupting the upper body—pulling and pushing with a sweeping foot.

Additionally, other methods can be employed that are unique to lower body (limb) displacement. Methods such as bumping body weight against body weight, catching the front or rear leg before it roots itself into a stance, or creating a ‘bar and bridge” to topple an opponent are also possible. Examples of sweeping the lower body can be found throughout section 6, “Training Exercises”.

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**Notes:**

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Since the foot, leg and hand are used to off-center balance and perform sweeping techniques, it is critical that the correct point of contact of the feet, leg, and hands be used. A basic principle (behind all techniques) in karate is the maximum concentration of the strength of the entire body for the purpose of defense and attack. For this to hold true in sweeping techniques (as in all karate techniques), the correct point of contact in the hand, foot, or leg must be used if the proper concentration of strength is to transfer correctly.

The following illustrations (illustrations 5, 6, 7, 8, 9a & 9b) and descriptions of foot, leg, and hand contact points, while not exhaustive, are some of the most commonly used positions to perform sweeping techniques. Practical use of each foot, leg, and hand position for a sweeping technique can be found throughout section 6, “Training Exercises”. Please note, each of these foot, leg, or hand contact points (positions) are also used for a variety of techniques. I have only illustrated and described their use in reference to sweeping techniques.

**Foot Contact Points**

Illustration 5: The Instep (haisoku)

*Used in a scooping action to pull or push the base/lower body (the feet or behind the knees) from supporting the center of gravity.*
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Illustration 6: Sole and Arches of the Foot (kakato)

Used in a scooping action to pull or push the base/lower body (the heels) from supporting the center of gravity.

Leg Contact Point

Illustration 7: The Leg/Inner Thigh

Used to create a “bar and bridge” to topple the upper body and sweep the base of an opponent’s stance.

Hand Contact Points

Illustration 8: Back Hand (haishu)

Used to tilt the head and misalign posture.
Illustration 9a: Sword Hand (Seiryuto, also known as Shuto)

*Used to redirect and topple the upper body at the shoulder level.*

Illustration 9b: Palm Heel “Open Fingers Modified” (teisho)

*Used to redirect and topple the upper body at the stomach level.*