



Power Up

Your Karate Strikes With Motion Science

by Dennis J. Nackord

THE HUMAN BODY creates power for athletic performance in three ways: torque, backup mass and gravitational marriage. They're sometimes called turning on an axis, directional movement and dropping the body weight, but no matter how they're described, they involve moving through the dimensions of width, depth and height.

Before going into them in more detail, one physical principle must be mentioned: The more quickly a mass moves, the more energy it contains. Because that's rather obvious, it won't be discussed as a factor in generating power but as a way of regulating how much power is created.

The effect of the power you generate varies according to three conditions:

- The weapon that's used.
- The target that's being hit.
- The direction the target is moving in relation to the weapon.

In other words, using your fist to strike an opponent in the

shoulder as he moves away from you will have less of an effect than using a half fist to strike him in the throat as he tries to close the distance. That's because hitting a softer target (his neck) with a more penetrating weapon (your half fist) as he moves toward you (borrowed force) amplifies the effect of your technique.

Power Principles

- Torque (or width): Your body rotates in many ways when you're trying to create power. It can involve the



Dennis J. Nackord demonstrates how the body moves within the dimension of height.

rotation of your arm during a punch or the rotation of your leg during a kick. Generally, though, torque refers to rotating on an axis that runs from the top of your head down your spine and into the ground. This axis should be kept perpendicular to the floor.

- Backup mass (or depth): Moving your body directly toward the target enables you to add your weight to the energy of your strike.
- Gravitational marriage (or height): Gravity can be a friend or foe. If you fall, it's a foe, but if you use its pull to enhance your strike, it's a friend.

An example of the three principles in action is a baseball player hitting a ball. First, he steps toward the pitch, then rotates on his vertical axis as he drops his weight. He moves his body through the dimensions of width, depth and height—just as athletes in other sports do when they need to generate maximum power.

Role of Speed

Three types of speed are important when seeking to fine-tune your athletic performance:

- Miles-per-hour speed: It's the time it takes to travel a certain distance. Most people have similar miles-per-hour speed in individual movements. It averages 0.08 seconds to complete a simple movement. However, speed in multiple



Moving through the dimension of width means using torque to create power.

movements, like running or executing a hand combination, can vary greatly from person to person because factors such as coordination and strength come into play.

- Reaction-timing speed: It's also similar in most people, but there's an exception: One person's reaction-timing speed in the execution of a highly trained movement can be significantly better than that of the average person because of the number of repetitions the trained person has done and the efficiency he's achieved. Average reaction-timing speed is about 0.2 seconds per movement, while a highly trained reaction speed can be as low as 0.1 seconds. To improve it, you must do many repetitions over a long time. (Notice, however, that the best reaction-timing speed is slower than an average person's miles-per-hour speed.)

- Initial speed: If miles-per-hour speed and reaction-timing speed are similar in many people and can be improved only modestly, there must be another factor that allows one person to be consistently faster than another. That is initial speed, or how fast a movement starts. Although it's affected by your ratio of slow-twitch to fast-twitch muscle fibers, it's the type of speed you have the most control over.

Initial speed is the act of going from nonaction to action and is a function of coordination. Because your opponent will react to the first thing he sees, a



To move through the dimension of depth, the martial artist uses directional movement to generate power (1-3).



Moving while the opponent strikes: Dennis J. Nackord (left) squares off with Jon Van Cleve (1a). When Van Cleve initiates his back-hand strike, Nackord launches his reverse punch (2a).

Moving before the opponent attacks: Dennis J. Nackord (left) and his opponent face each other (1b). As soon as Nackord detects his opponent's body rotation and shoulder movement, which are preludes to his strike, he unleashes a punch that makes contact before the other man can attack (2b).

Moving after the opponent attacks: Dennis J. Nackord (left) faces his foe (1). The man executes a back-hand strike, and Nackord fades from the attack (2). He then counters with a front kick (3).

slow starting speed on your part will enable him to open the range or change the angle, thus rendering your attack harmless. If, on the other hand, you have superior initial speed and the first thing he perceives is your attack in progress, it will be much harder for him to avoid it.

Therefore, fast athletes have a better-than-average initial speed. And to attain that, they must first practice their movements in a slow, deliberate manner to learn the proper starting sequence, timing, coordination and path of motion. Once they've been learned, the speed of the movement can be

increased, boosting overall speed and athletic performance.

Physical Conditioning

There are many facets of physical conditioning, including aerobic and anaerobic training, cardiovascular training and diet. The three key factors in the exercise facet are frequency, duration and intensity. Training for athletic performance requires an ever-increasing effort in all three areas.

In the early stages of conditioning for a specific sport, doing that sport will generally produce positive results. Once a more advanced level is reached, however, supplementary exercise such as running and weight training may be required to increase performance.

At the highest level, where professional athletes dwell, a lifestyle change is required. That usually entails the alteration of sleeping and eating patterns so that a strict schedule of daily physical activity can be followed. Needless to say, that depth of commitment is impossible for most martial artists.

Issues of Timing

Timing is essential if you want to put your newfound power to work in the ring or on the street, but it can be difficult to verbalize or visualize in a martial arts context. Perhaps the best way to think of it is in terms of sequencing, or the order in which things happen.

One kind of timing refers to the order in which you move your body parts to perform a technique or string of techniques. It's known as coordination, or personal timing. Another manifestation is environmental timing, which implies moving in relation to your surroundings—be they people, obstacles or weapons. Crossing a street without getting hit by a car is an example. Timing for athletic performance entails executing your movements in the right sequence and in harmony with your environment. Many coaches consider it the most important attribute of an athlete.

As a martial artist, you must also pay

attention to timing in relation to your opponent's movements. It involves three possibilities:

- **Moving after your opponent:** If he throws a punch, you can allow the arm to extend by moving your body backward, then move forward to follow the punch to its starting position and execute a counterattack. Your goal is to strike after his first technique and before his second.
- **Moving at the same time as your opponent:** This option is more difficult. If he throws a punch, you can slip off the line of attack and counter at the same time. If you're off the line and he's on it, you'll hit the target. It requires more precision.
- **Moving before your opponent:** This is the most difficult type of timing. It's part reaction timing and part anticipation based on experience. As your opponent begins to punch, you fire your counter and hit the target before he can fully extend his weapon.

Importance of Accuracy

In the martial arts, accuracy means hitting the target. The key to achieving consistent accuracy is doing numerous repetitions of the movement in question. Timing is an important element, but because it's already been discussed, this section will focus on the other main component: angle. It includes three parts:

- **Target access:** This term refers to starting from the correct place. You must strike the intended target while avoiding the parts of the opponent's body you don't want to hit. One way to accomplish that is to put your body in the correct starting position relative to your opponent. If his arms are in the way, you must use an off-angle strike (or arched movement). Changing your body angle in relation to your opponent is necessary to get into the correct position for the strike.

Another way to gain access is to use a fake to open the intended striking angle. If the fake works, it will be your opponent's arms, not your body, that move.

- **Angle of entry:** It refers to moving on the correct angle to strike the target perpendicularly. If you strike at an angle other than 90 degrees, some of your force will be wasted.
- **Angle of mass:** This item refers to the correct alignment and direction of your

body mass, including the correct alignment of the weapon. Generally speaking, your body should move in the same direction as your strike. It encompasses the accuracy of the alignment and enhances the strike.

Therefore, to maximize the effectiveness of your techniques, you must have correct accuracy, which starts from the correct position for target access. Your foot or fist must hit the target at a 90-degree angle. Finally, your body mass and weapon must be aligned. If all these

factors are present and combined with the mechanical principles described above, you will achieve the greatest accuracy and power you're capable of producing. ✕

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