

**Maurice Smith · Herb Perez · Royce Gracie**

MA  
TRAINING

# MMA<sup>TM</sup>

## TRAINING

© 01046 JANUARY 1998

# Speed *and* Power

**What to Do, What Not to Do**

**Mouse's 16 Tips for  
Tournament Success**

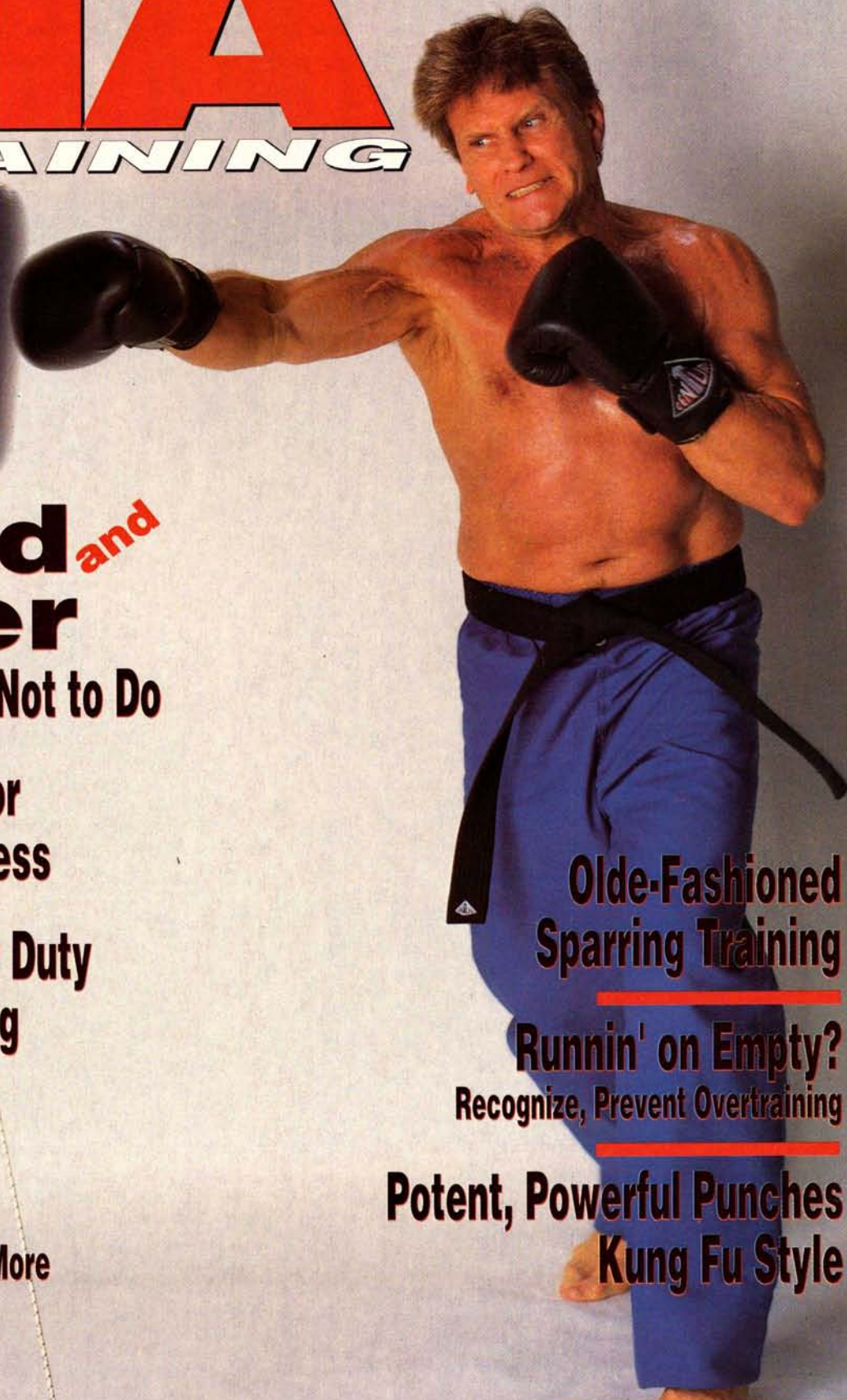
**Taekwondo Heavy Duty  
Heavy Bag Training**

**Product Reviews**

- Century WaveMaster
- Kobudo Warrior Gear
- Perimeter System and More



U.S. \$2.95 • Canada \$3.25  
Printed in USA



**Olde-Fashioned  
Sparring Training**

**Runnin' on Empty?  
Recognize, Prevent Overtraining**

**Potent, Powerful Punches  
Kung Fu Style**

**FREE  
INSERT  
INSIDE**



# Speed, Power and Explosiveness

What To Do and What Not To Do To  
Enhance These Three Vital Qualities

by Matt Brzycki

Martial artists are continually looking for ways to improve their speed, power and explosiveness. Indeed, what fighter wouldn't want to deliver faster and swifter punches and kicks while, at the same time, be able to react more quickly to an opponent's aggression?

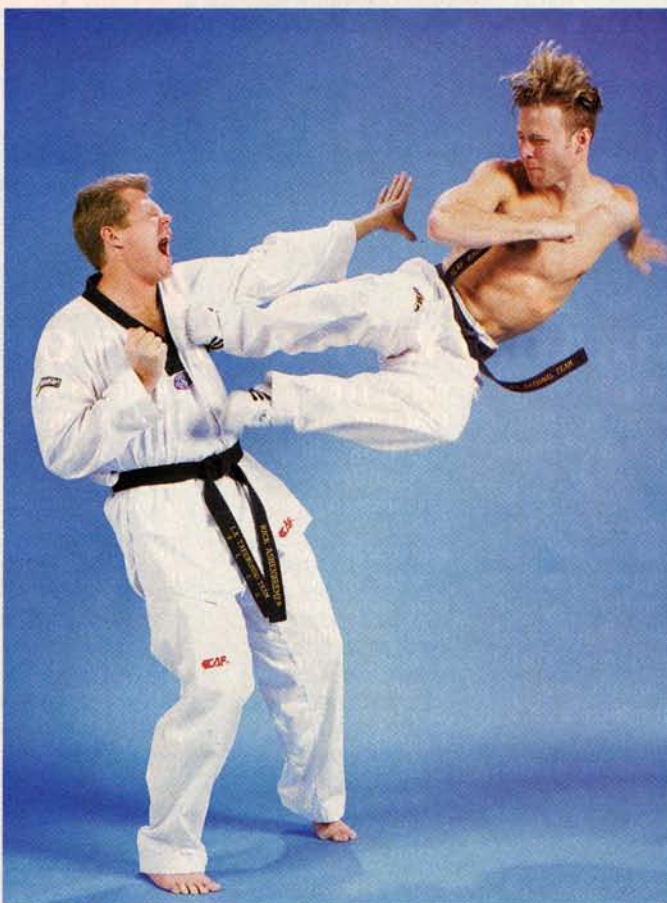
## Fact or Fiction?

Among the methods that have been purported to improve speed, power and explosiveness are lifting weights explosively, practicing skills with weighted objects and performing plyometric drills. Before accepting these or any other methods, however, it's important to separate fact from fiction.

## Explosive Lifting

One of the most hotly debated subjects in the field of strength training is the speed at which repetitions should be performed. There are two main schools of thought among strength coaches.

One group advocates high-speed, explosive repetitions. The other group recommends low-speed, controlled, deliberate repetitions.



*Every martial artist wants to be fast, powerful and explosive. And all it takes is dedication, hard work and proper training.*

Promoters of high-speed movements argue that you must train explosively in order to become "explosive." In particular, the Olympic-style movements and related "quick lifts" have been glorified as exercises which—when performed at rapid speeds of movement—supposedly transfer this explosiveness to fighting skills such as throwing a punch or a kick.

However, there's simply no evidence in the motor learning literature to support the notion that doing explosive movements in the weight room—such as a power clean—will contribute to improving your explosiveness as a fighter.

The explosiveness demonstrated during a movement such as a power clean is specific only to a power clean. Likewise, the explosiveness demonstrated during a spinning back kick is specific only to a spinning back kick.

Doing power cleans will not help your explosiveness in a spinning back kick any more than doing a spinning back kick will improve your explosiveness in a power clean.



## Muscle Fiber Composition

Your potential to move fast is based upon your muscle fiber composition.

Your muscles are composed of two major types of fibers: fast-twitch (FT) and slow-twitch (ST). Relative to ST fibers, your FT fibers contract more quickly and produce greater force, but they fatigue more easily. The assumption is that if you lift explosively you will somehow convert ST fibers to FT fibers and/or preferentially recruit the FT fibers.

First, there's no definitive proof to firmly support the belief that muscle fibers can be converted from one type to another.

Second, the selective recruitment of muscle fibers is physiologically impossible.

Your muscle fibers are recruited by your nervous system in an orderly fashion according to the intensity requirements—not by the speed of movement.

In the beginning of an exercise, your muscular intensity is relatively low. Demands of low-muscular intensity are met by your ST fibers. With each ensuing repetition, your muscular intensity increases. Your FT fibers are used only when your ST fibers cannot meet the intensity requirements. All of your fibers are working when your FT fibers are being used. This orderly recruitment pattern remains the same regardless of whether the movement speed is fast or slow. No matter what, your ST fibers are recruited first and your FT fibers are recruited last. In a nutshell, muscle fibers are recruited by need—not speed.

This sequential recruitment of muscle fibers is actually ideal in terms of physiological efficiency. Your ST fibers—which generate less force than FT fibers—are recruited early when the intensity demands are low. Furthermore, their resistance to fatigue is advantageous in generating a sustained force output over a series of muscular contractions (i.e., a set of an exercise). It would not be economical for your nervous system to recruit the quicker-to-fatigue FT fibers in the early stages of an exercise.

Remember, lifting weights at rapid speeds does not necessarily mean that the muscular intensity is high. In fact, Dr. Tom Pipes, an exercise physiologist and author of *The Steroid Alternative*, suggests there's an inverse relationship between speed and intensity. As the speed of movement goes up, the muscular intensity goes down, he says.

## The Drawbacks

Moreover, explosive lifting is not without its drawbacks.

First, high-velocity repetitions are actually less productive than repetitions performed in a slow, deliberate manner.

Why? Whenever a weight is lifted explosively, momentum contributes to the movement. After the initial explosive movement, little or no resistance is encountered by the muscles throughout the remaining range of motion. In simple terms, the weight is practically moving under its own power.

To illustrate the reduced efficiency during explosive repetitions, imagine that you were using a leg extension machine and raised the weight so quickly that the pad left your lower legs halfway through the repetition. Think about it. The pad is attached to the movement arm of the machine which, in turn, is connected to the resistance by some means—such as a chain, cable or strap. If the pad is no longer in contact with your lower legs, there's no load on your muscles. If there's no load on your muscles, then your muscles had no stimulus—or reason—to adapt.

Sure, your muscles were "loaded" during the first part of the movement—while the pad was still against your shins—and you'll get some results from the exercise. But during the last part of the movement—when the pad left your shins—

your muscles will be severely "underloaded." At that point, the only load or resistance your muscles encounter is from the weight of your lower legs.

More importantly, explosive lifting can be dangerous. If explosive lifting doesn't cause immediate



*To become fast, powerful and explosive, you must practice your skills over and over. Remember, however, practice makes perfect—but only if you practice perfect.*



musculoskeletal damage, it can predispose you to future injury.

Dr. Jack Wilmore, exercise physiologist and author of *Training for Sport and Activity*, notes that "actual structural damage is a possible outcome of certain types of explosive exercise."

Dr. Fred Allman, a past president of both the American Orthopedic Society for Sports Medicine and the American College of Sports Medicine, states, "It is even possible that many injuries ... may be the result of weakened connective tissue caused by explosive training in the weight room."

Using momentum to lift a weight increases the internal forces encountered by a given joint. The faster a weight is lifted, the greater these forces are amplified—especially at the point of explosion. In one study, a subject squatting with 80 percent of his four-repetition maximum incurred a 225-pound peak shearing force during a repetition that took 4.5 seconds to complete and a 270-pound peak shearing force during a repetition that took 2.1 seconds to complete—clear evidence that faster speeds of movement increase the shearing forces on joints.

Remember, lifting weights at rapid speeds of movement is only a temporary demonstration of power—not a permanent adaptation. There's absolutely no scientific evidence to suggest that "explosive" lifting leads to "explosive" athletic performance.

It's much safer and more efficient to lift weights in a deliberate, controlled manner. Regardless of whether you're using machines or barbells, the weight should be raised without any jerking or explosive movements and then lowered under control. In that way, momentum will not play a significant role in the efficiency of the exercise.

### **Weighted Objects**

It's also widely believed that using weighted imple-

ments while working out will improve speed, power and explosiveness. This has led to the practice of trying to simulate sports skills in the weight room using a variety of weighted objects, including barbells, dumbbells, medicine balls and ankle weights. In the motor learning literature, practicing athletic skills with weighted implements is known as "overload training."

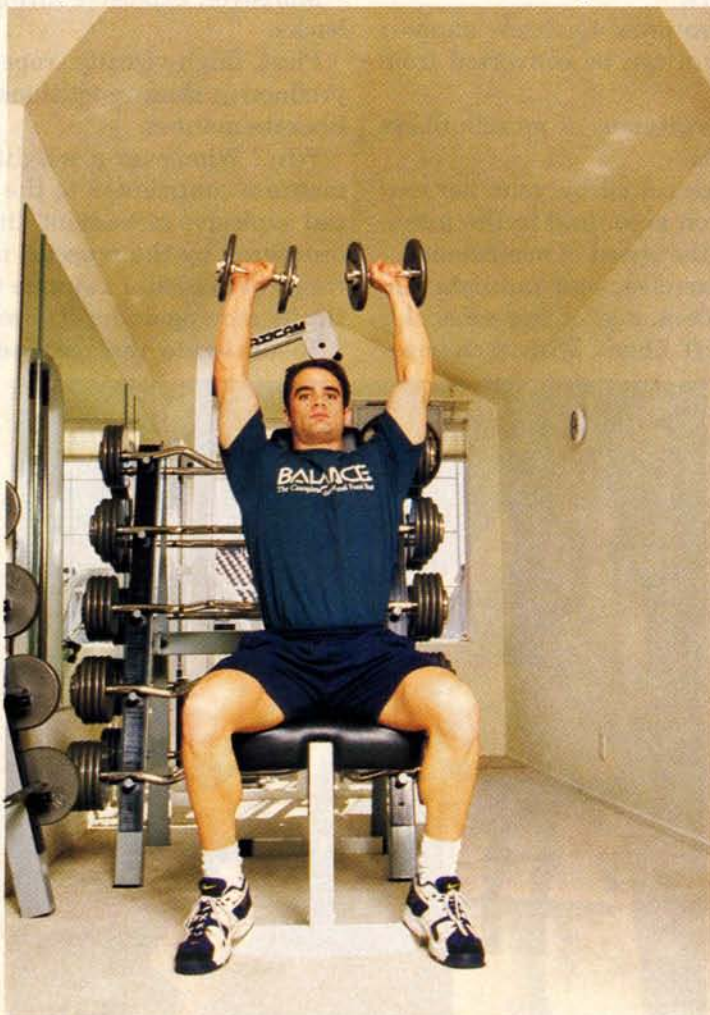
Motor learning research refers to a "kinesthetic aftereffect" after doing this type of training. This is defined as a "perceived modification in the shape, size or weight of an object ... as a result of experience with a previous object."

Athletes experience the kinesthetic aftereffect during overload training. This phenomenon is exemplified by fighters who throw punches while holding dumbbells or execute kicks while wearing ankle weights. Doing this merely creates a perceptual illusion that makes the fighters feel they can punch or kick faster. In a sense, their neurological pathways are fooled into believing their limbs are lighter.

Another example is the fighter who runs with a weighted vest. When he takes the vest off, he believes he can actually run faster. Essentially, the kinesthetic aftereffect is nothing more than a sensory illusion.

Research has shown that the kinesthetic aftereffect is not accompanied by a measurable improvement in performance in the skills that have been practiced while using weighted objects. For example, investigations into the effects of using weighted shoes and ankle weights found that the groups who practiced without the weighted devices actually improved their speed more than the experimental groups who practiced with the weighted devices.

If a skill is to be performed at a given speed, it should be practiced at that speed in order to facilitate the learning of the skill. By practicing a skill at a slower speed than would normally be used in the



*To improve your speed, power and explosiveness, you must strengthen your major muscle groups. However, there is no evidence that lifting explosively will contribute to your explosiveness as a fighter.*



performance of the skill, you're training your neuromuscular system to perform at a slower speed and, as a result, may actually cause you to move slower.

Consider fighters who throw punches while holding onto dumbbells. Will their punches with the dumbbells be faster, slower or the same as their punches without the dumbbells? Obviously, their punches are slower. Therefore, it follows that the use of weighted implements actually impairs the learning of sports skills.

### **Plyometrics**

Plyometrics are highly controversial. Most of the support for plyometrics is based upon anecdotal evidence. There is little unbiased scientific evidence that definitively proves plyometrics are productive. In reality, a large number of research studies, including a 1978 study that determined there was no significant difference in the vertical jump between a group who did leg presses and those who did plyometrics have concluded that plyometrics are no more effective than regular strength training activities when it comes to improving speed, power and explosiveness.

One plyometric guru, Donald Chu, a past president of the National Strength and Conditioning Association, even admits that the information about plyometrics is anecdotal and methodologically weak.

More importantly, the possibility of injury from plyometrics is positively enormous. A growing number of strength coaches have been questioning the safety of plyometrics.

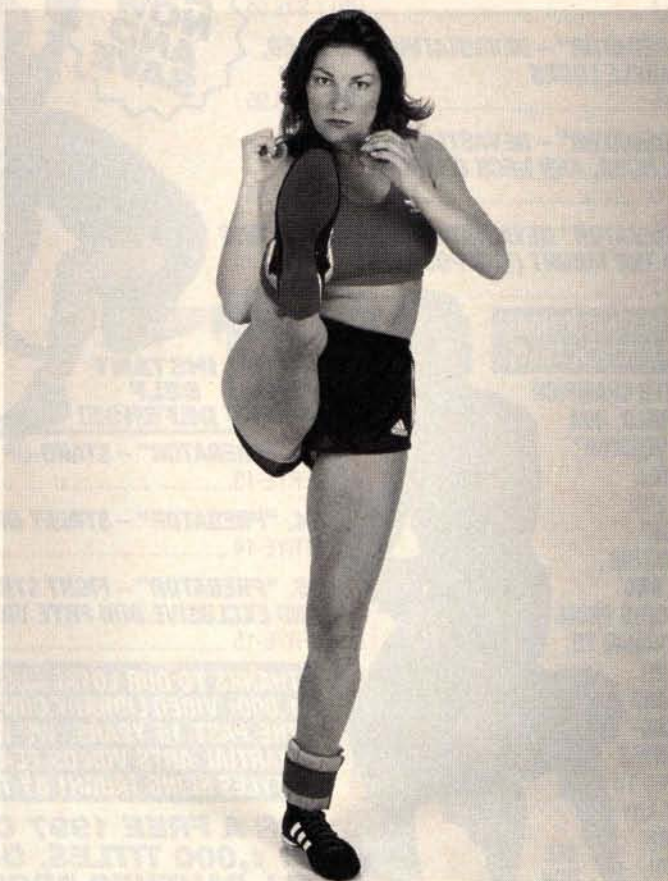
When performing plyometrics, the musculoskeletal system is exposed to repetitive trauma and high-impact forces. This extreme biomechanical loading places an inordinate amount of strain on the connective tissues of the lower body. The most common plyometric-related injuries are patellar tendinitis, stress fractures, shin splints and ankle and knee strains. Compression fractures related to the use of plyometrics have also been reported. Other potential injuries include—but aren't limited to—sprains, heel bruises, ruptured tendons and meniscal (cartilage) damage. It's no surprise that many prominent orthopedic surgeons, physical therapists and athletic trainers view plyometrics as an injury waiting to happen.

In short, plyometrics have not been proven to be productive and carry an unreasonably high risk of injury.

### **Improving Speed, Power and Explosiveness**

So how do you improve your speed, power and

*While it is widely believed that using weighted implements while working out will improve your speed, power and explosiveness (bottom, right), research shows there is no measurable improvement in those skills while using weighted devices.*



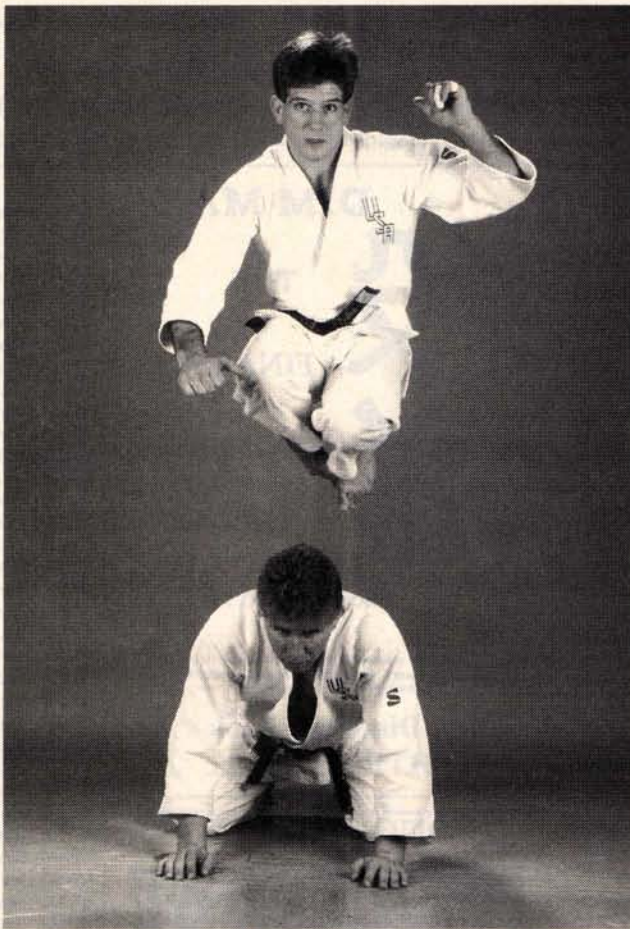


explosiveness?

There are two things that you must do.

First, you must literally practice your fighting skills thousands and thousands of times. Each time you must do the skills with perfect technique so that their specific movement patterns become firmly established in your motor memory. The skill must be practiced perfectly and exactly as you would use it when fighting. Remember, practice makes perfect ... but only if you practice perfect.

Second, you must strengthen your major muscle groups. However, this should not be done in a manner that mimics a particular skill. A stronger muscle can produce more force; if you can produce more force, you'll require less effort and be able to perform the skill more quickly, more efficiently and more explosively. But again, this is provided that you've practiced enough in a correct manner so that you'll be more skillful in applying that force. So, if your goal is to become a more explosive fighter, you must become proficient at your



*Even though many top competitors do plyometrics, there is little unbiased scientific evidence that definitively proves plyometrics are productive.*

fighting techniques and you must strengthen the muscles of your hips, legs, upper torso and arms.

When fighters are described as "explosive," essentially what is being said is that they perform, move or react quickly and forcefully. This is primarily due to the fact that their movement patterns for a particular skill are so firmly ingrained in their "motor memories" that there is little or no wasted effort. In other words, it's because the fighters are highly efficient with their technique—not because they lifted weights explosively, practiced skills with weighted objects or performed plyometric drills. *M.A.*

*About the author: Matt Brzycki is the coordinator of health fitness, strength and conditioning at Princeton University. He has written nearly 150 articles on strength and fitness and authored three books, including A Practical Approach to Strength Training, which is in its third edition. In the early 1980s, he trained at Martin's Karate Institute in Wilkes Barre, Pennsylvania, under Jim Martin, Sr.*

## Thanks to Bruce Lee

Joe Lewis Credits His Speed to the "Little Dragon"

by Jerry Beasley, Ed.D.

*Former full-contact karate champion Joe Lewis credits some of his speed to training with Bruce Lee. Following is an excerpt from Beasley's forthcoming book about Joe Lewis.—Editor*

Bruce Lee was the perfect coach for me. I went through his whole system. We practiced sticky hands, vertical punching, trapping and many other things. At first I signed up for private lessons. Eventually, however, I just showed up and trained.

We spent a lot of time talking, exchanging philosophies, watching fight films and other things like that. Bruce and I never actually put on gear and sparring each other, but we did a lot of the *jeet kune do* drills he was developing. All the time I worked with Bruce, which was more than two years, he never took me to

his school. We always met at his house, at a restaurant, a tournament or somewhere. He was a very charming guy.

I also practiced with my own sparring partners all the time. When I went to parties, I used to do a lot of Bruce's drills. That is when I developed a lot of speed. I used to work with guys who weighed 140 pounds. Using the techniques Bruce taught me, I used to beat the lightning-fast black belts.

Eventually, I think it was in 1968, I quit training with Bruce. But I kept practicing, and I eventually started teaching *jeet kune do* principles in karate seminars across the country. When I used a *jeet kune do* technique, I would always give credit to Bruce. Interestingly, the karate guys didn't care where the technique came from as long as it worked.