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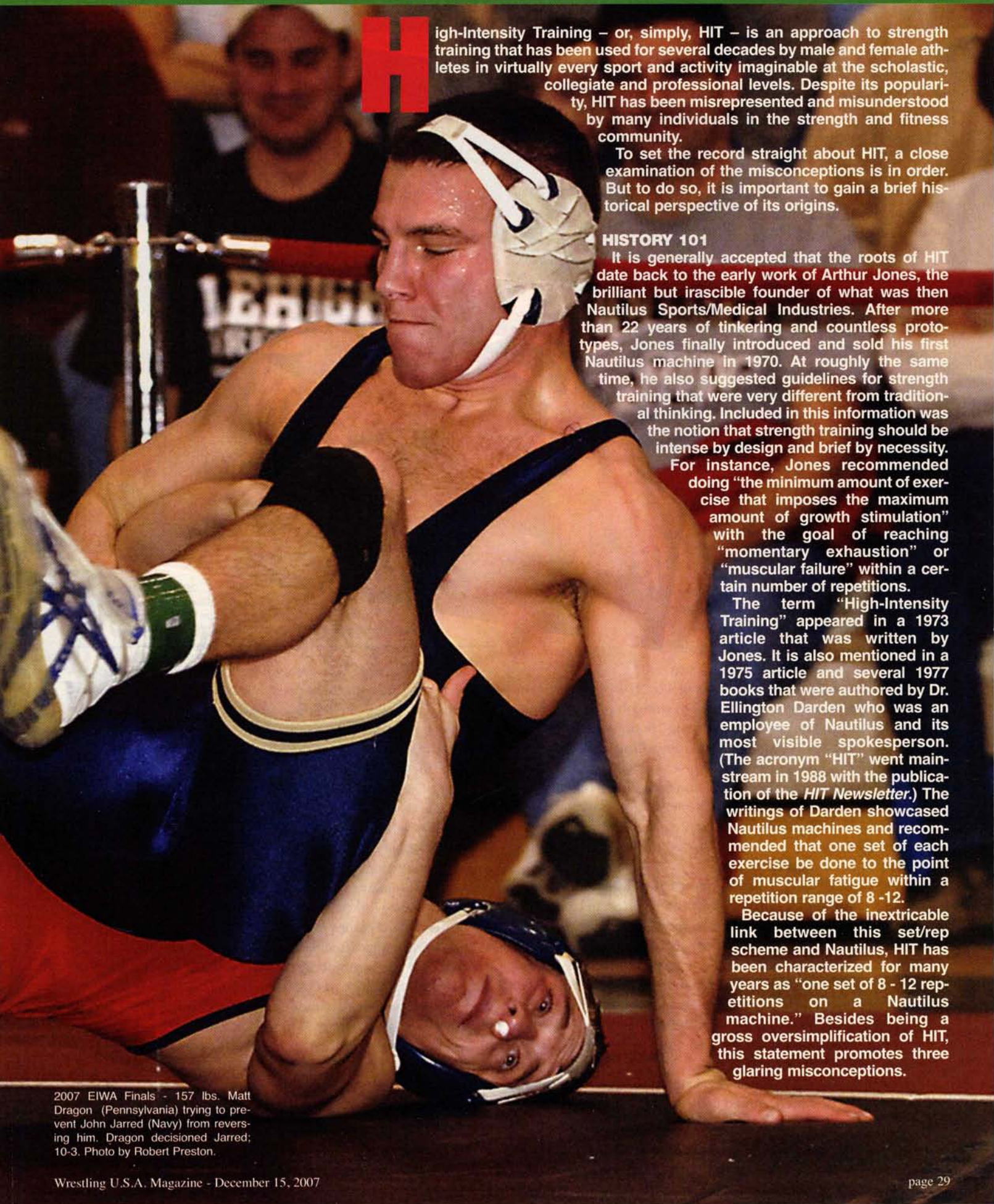


## Setting the Record Straight About **High-Intensity** **TRAINING**



By Matt Brzycki





**H**igh-Intensity Training – or, simply, HIT – is an approach to strength training that has been used for several decades by male and female athletes in virtually every sport and activity imaginable at the scholastic, collegiate and professional levels. Despite its popularity, HIT has been misrepresented and misunderstood by many individuals in the strength and fitness community.

To set the record straight about HIT, a close examination of the misconceptions is in order. But to do so, it is important to gain a brief historical perspective of its origins.

#### HISTORY 101

It is generally accepted that the roots of HIT date back to the early work of Arthur Jones, the brilliant but irascible founder of what was then Nautilus Sports/Medical Industries. After more than 22 years of tinkering and countless prototypes, Jones finally introduced and sold his first Nautilus machine in 1970. At roughly the same time, he also suggested guidelines for strength training that were very different from traditional thinking. Included in this information was the notion that strength training should be intense by design and brief by necessity.

For instance, Jones recommended doing “the minimum amount of exercise that imposes the maximum amount of growth stimulation” with the goal of reaching “momentary exhaustion” or “muscular failure” within a certain number of repetitions.

The term “High-Intensity Training” appeared in a 1973 article that was written by Jones. It is also mentioned in a 1975 article and several 1977 books that were authored by Dr. Ellington Darden who was an employee of Nautilus and its most visible spokesperson. (The acronym “HIT” went mainstream in 1988 with the publication of the *HIT Newsletter*.) The writings of Darden showcased Nautilus machines and recommended that one set of each exercise be done to the point of muscular fatigue within a repetition range of 8 -12.

Because of the inextricable link between this set/rep scheme and Nautilus, HIT has been characterized for many years as “one set of 8 - 12 repetitions on a Nautilus machine.” Besides being a gross oversimplification of HIT, this statement promotes three glaring misconceptions.

2007 EIWA Finals - 157 lbs. Matt Dragon (Pennsylvania) trying to prevent John Jarred (Navy) from reversing him. Dragon decisioned Jarred; 10-3. Photo by Robert Preston.

## Sets

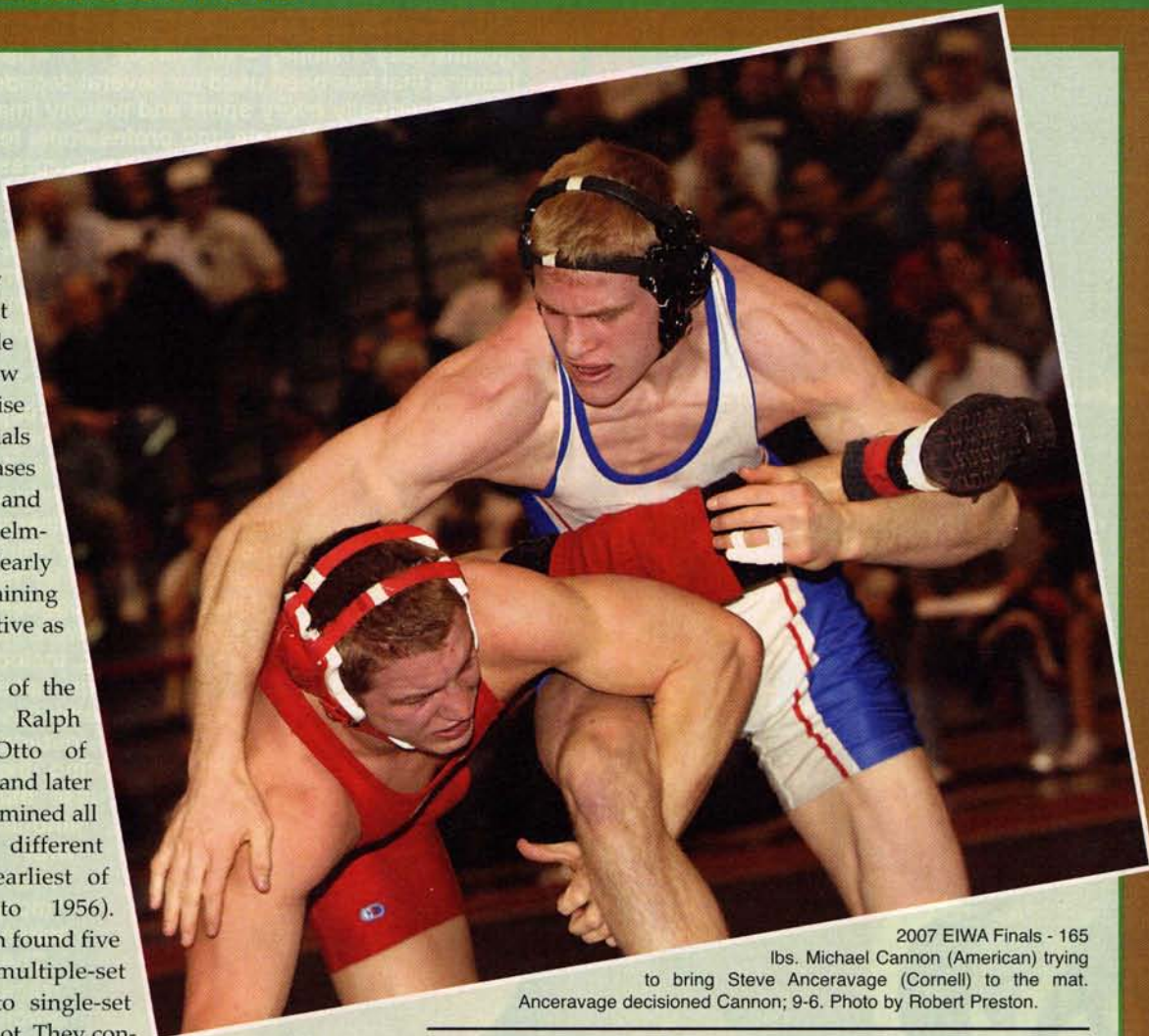
One misconception is that HIT always involves one set and only one set of an exercise. First, it is necessary to understand that research has been unable to determine exactly how many sets of each exercise are required for individuals to achieve optimal increases in their muscular size and strength. But the overwhelming majority of research clearly shows that single-set training can be at least as productive as multiple-set training.

An exhaustive review of the literature by Drs. Ralph Carpinelli and Bob Otto of Adelphi University (NY) and later reviews by Carpinelli examined all studies that compared different numbers of sets (the earliest of which dated back to 1956). Collectively, their research found five studies that showed multiple-set training was superior to single-set training and 57 that did not. They conclude: "The preponderance of evidence suggests that for training durations of 4 to 25 weeks there is no significant difference in the increase in strength or hypertrophy as a result of training with single versus multiple sets."

So, there is a great deal of highly compelling scientific proof that one set of an exercise can be just as effective as multiple sets. While many versions of HIT do indeed involve one set of each exercise, there are some multiple-set applications. As an example – and this may come as quite a shock to most – Jones himself initially recommended that as many as three sets of each exercise could be done.

Another example is the program of Ken Mannie, the fiery Strength and Conditioning Coach at Michigan State University. One of the elder statesmen among those who train collegiate athletes, he has been a proponent of HIT for more than 30 years. Coach Mannie prescribes a myriad of protocols for his athletes. Some routines call for two, three and even four sets of the same exercise. Sometimes the sets are performed in succession – as in most traditional multiple-set protocols – while other times they are segmented into push/pull, pre-exhaust or post-exhaust schemes.

According to Coach Mannie, the number of sets performed for each exercise is determined by several factors including the available equipment, the emphasis of the workout or simply



2007 EIWA Finals - 165 lbs. Michael Cannon (American) trying to bring Steve Anceravage (Cornell) to the mat. Anceravage decided Cannon; 9-6. Photo by Robert Preston.

personal preference. "For competitive weightlifters," he adds, "the fact that the congruent neuromuscular pathways must be fashioned for skill encoding makes multiple-sets a polestar variable."

Rather than dwelling on the number of sets that his athletes perform for each exercise, Coach Mannie focuses on the total number of sets that they do in their workouts. When performing total-body workouts, his athletes target their major muscles with 15 - 18 sets per workout in the off-season and 10 - 15 during the in-season. So even though the number of sets per exercise may vary from one to four, the aggregate number of sets per workout remains the same. Also, he pays close attention to balancing their workouts with adequate stimulation in a variety of movement planes for all of the anterior, posterior, medial and lateral compartments.

But lost in the commotion over how many sets are used in HIT is the importance of intensity (or effort). "HIT is an exercise protocol which demands that athletes exert a maximum effort in each set," stresses Gregg Humphreys, the Head Judo and Sambo Coach for Miletich Fighting Systems in Bettendorf, Iowa. "The most critical aspect of HIT is the effort that is put forth by the athlete," he adds.

The truth is that the level of intensity dictates the number of sets that can be done. "Training with high effort requires that

fewer sets be performed due to more direct muscle overloading and less energy available for forthcoming sets," says Tom Kelso, the Strength and Conditioning Coordinator at Saint Louis University and a longtime advocate of HIT. "One set can do it or even a second or third set. But if the effort is truly high, doing too many sets eventually leads to diminishing returns. It is not just a one-set-and-done proposition but more a question of quality versus quantity."

Mat Borger, a Fitness Tech who works for the federal government, offers this thought-provoking perspective: "Many individuals confuse the end with the means. Often, it is forgotten that the 'end' of a set is to safely fatigue the targeted muscle or muscles. Muscular fatigue elicits adaptation which is the ultimate 'end' of strength training and why it is done in the first place. Sets are merely a measure of the work required to reach that end, thus making them the 'means to the end.' It is not a matter of whether or not muscular fatigue is reached in a specified number of sets; rather, it is a matter of whether or not maximum stimulation was provided at all."

### Repetitions

Another misconception is that HIT always uses 8 - 12 repetitions. "A repetition range of 8 - 12 fits within the anaerobic nature of strength training," explains Coach Kelso, "and it works for *any* program, provided that progressive resistance is used. Since individuals have different muscle fiber types and nervous systems, various repetitions can be used to maximize their response and add diversity to training. It is all about producing muscular fatigue and HIT can use many repetition ranges for that purpose."

Interestingly, Jones actually suggested a variety of repetition goals including as few as 6 and as many as 20. For some exercises, he recommended a reverse pyramid of three sets consisting of 10, 8 and 6 repetitions.

Consider the approach of Kim Wood who was the Strength and Conditioning Coach of the Cincinnati Bengals for almost 30 years. A devotee of HIT since the early 1970s, Coach Wood keeps it basic: He recommends a target of 20 repetitions for the lower body and 10 repetitions for the torso.

With more than 25 years of experience as a strength coach in the National Football League, Dan Riley is also a practitioner of HIT. Coach Riley recommends a variety of set/rep schemes to his professional athletes including three sets of six repetitions in the bench press with a barbell (but more on equipment selection in a bit).

Chip Harrison, the Strength and Conditioning Coach at Penn State

University and another advocate of HIT, frequently manipulates the repetition ranges of his athletes. "It is common for our athletes to use varied repetition schemes throughout the course of a season or over time in order to produce the desired training response," notes Coach Harrison. "While we may invest a good bit of time using a repetition range of 8 - 12, it is just as likely that our repetition range will be 4 - 6 or 15 - 20."

### Equipment

A third misconception is that HIT always incorporates a Nautilus machine (or some other machine). "Unfortunately, too many people still associate HIT with using Nautilus machines," says Mike Shibinski, the Strength Coach at Princeton High School in Cincinnati. "To truly understand the basis of HIT is to realize that you do not have to use just Nautilus machines."

In order to increase muscular size and strength, a muscle must be loaded with some form of resistance. The source of that resistance really does not matter. Mike Bradley, an Assistant Strength and Conditioning Coach at Florida State University and yet another longtime supporter of HIT, says, "The main factors that determine gains in size and strength are genetics and the level of intensity, not the type of equipment that is used." He continues, "Muscles do not have eyeballs that allow them to see if the resistance comes from a machine or a barbell." Coach Kelso takes this point one step further: "Trust me, I have seen strength increases realized by athletes who used barbells, dumbbells, sandbags, manual resistance, plate-loaded and selectorized machines and their bodyweight."



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In reality, HIT can employ a wide variety of equipment to load muscles. With this in mind, Coach Harrison recommends "a diverse and varied selection of exercises and choices of modality."

Remember, too, that all equipment has advantages and disadvantages. For instance, machines can vary resistance according to muscular needs but they are expensive and usually require a separate machine for a separate function. On the other hand, free weights are inexpensive and offer plenty of variety. However, Coach Bradley makes this observation: "Many different exercises can be performed with free weights but how do you perform a leg curl with a barbell or a neck exercise with a dumbbell? This question may not be important if you are a competitive weightlifter but it is important if you are a competitive wrestler."

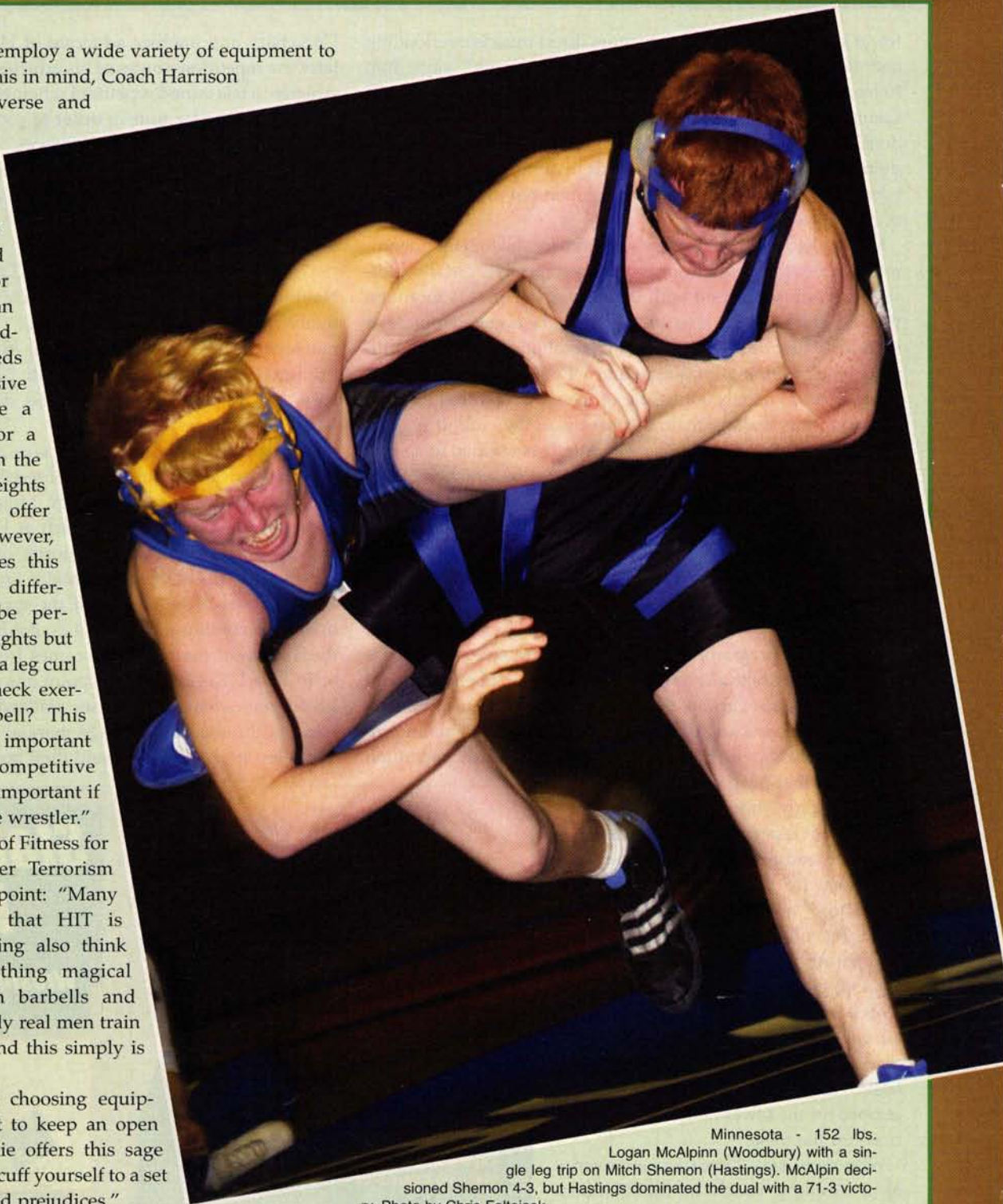
Sunir Jossan, Chief of Fitness for the National Counter Terrorism Center, makes this point: "Many people who think that HIT is machine-based training also think that there is something magical about training with barbells and dumbbells or that only real men train with free weights. And this simply is not the case."

When it comes to choosing equipment, then, it is best to keep an open mind. Coach Mannie offers this sage advice: "Do not handcuff yourself to a set ideology or antiquated prejudices."

## WHAT HIT IS

So what is HIT? Since it was first popularized nearly 40 years ago, there have been endless interpretations, variations and applications of HIT. The fact of the matter is that most HIT practitioners incorporate their own personal twists and perspectives.

However, different versions of HIT do have several com-



Minnesota - 152 lbs.  
Logan McAlpinn (Woodbury) with a single leg trip on Mitch Shemon (Hastings). McAlpinn decisively won 4-3, but Hastings dominated the dual with a 71-3 victory. Photo by Chris Falteisek.

mon denominators. As the name implies, HIT is characterized by intense, aggressive efforts: Each exercise is typically performed to the point of muscular fatigue or "failure." A minimal number of sets are usually performed, often only one set of each exercise but sometimes several sets. Another characteristic of HIT is the emphasis on progressive overload: Whenever possible, an attempt is made to increase

either the repetitions that are performed or the resistance that is used from one workout to the next. In addition, HIT does not include fast-speed movements or "explosive" exercises: All repetitions are done with a controlled speed of movement so that momentum does not play a significant role in raising the resistance. HIT does not attempt to mimic sport skills in the weight room using weighted objects: Skill training is done outside the weight room by practicing sport-specific technique unhindered by additional resistance. Finally, HIT is usually fast-paced: It involves a minimal amount of recovery time between exercises.

### PARTING THOUGHTS

Coach Humphreys states, "HIT is not tied to a particular type of equipment, number of sets or repetition range. It can be performed with free weights, machines, manual resistance or anything that provides progressive resistance. And it can involve one or multiple sets with varying repetition schemes." Adds Coach Harrison, "HIT is an approach to programming rather than an unalterable adherence to some preconceived notion of exercise volume, set and rep schemes or choice of training modality."

But perhaps no one ever summed up HIT better than Dr.

Ken Leistner, a Strength Coach in Long Island (NY): "HIT is going all out, not almost all out; it is taking each set to one's absolute limit, not almost to the limit; it is using whatever piece of equipment that is available, not just a machine or group of machines; it is not the words of two or three men but a commitment to work as hard as possible while in the gym or weight room . . . without socializing, resting excessively between sets or falling prey to the this-is-not-going-to-work-so-I'll-copy-the-star attitude."

### THE LAST REP

HIT can be effective for anyone – regardless of training experience or aspiration – as long as it encourages progressive overload and allows sufficient recovery. The past three-plus decades have yielded literally tens of thousands of examples of individuals who have proven that HIT can be extremely efficacious.

*Matt Brzycki has authored, co-authored or edited 16 books on strength and fitness including four that are devoted to wrestling. The four are available at all major bookstores or through Cardinal Publishers Group (800-296-0481).*



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