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High-Intensity Training: The Facts

by Matt Brzycki

High-Intensity Training, or simply HIT, is an approach to strength training used for decades by competitive athletes in virtually every sport and activity at the scholastic, collegiate, and professional levels. Despite its popularity, the principles behind HIT are often misunderstood by many in the strength and fitness community. This article is an attempt to clarify HIT concepts and eliminate the confusion.

History 101

After more than 22 years of tinkering and countless prototypes, Arthur Jones finally introduced and sold his first Nautilus™ resistance training machine in 1970. At roughly the same time, he also suggested guidelines for strength training that were quite 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 prescribed number of repetitions. Initially, he specified that no more than 3 sets of each exercise should be done. Jones also advocated various repetition schemes including as few as 6 and as many as 20, along with a reverse pyramid of 3 sets consisting of 10, 8, and 6 repetitions.

The term "High-Intensity Training" appears as early as 1973 in an article written by Jones. It's also mentioned in a 1975 article and several 1977 books authored by Ellington Darden, PhD, a Nautilus™ employee. (The acronym "HIT" became fashionable in 1988 with the publication of the HIT Newsletter.) The writings of Darden showcased Nautilus™ machines and recommended one set of 8–12 repetitions.

Because of the inextricable link between this set/rep guideline and Nautilus™, HIT has been characterized for more than a quarter of a century as "one set of 8-12 reps on a Nautilus™ machine." Besides being a gross oversimplification of HIT, this statement promotes 3 main misconceptions concerning sets, repetitions, and equipment.

Sets

Fact: HIT doesn't always involve one set of an exercise. It's necessary to understand that science has been unable to determine exactly how many sets of each exercise are necessary for individuals to achieve optimal increases in muscular size and strength. But the overwhelming majority of scientific evidence clearly points to the fact that single-set training is at least as effective as multiple-set training. An exhaustive literature review in 1998 performed by Drs. Ralph Carpinelli and Bob Otto of Adelphi University and later reviews by Carpinelli examined all studies that compared different numbers of sets (dating back to 1956). Collectively, their research found five

studies that showed multiple-set training was superior to single-set training and 56 that did not.

Many versions of HIT do indeed involve one set of each exercise, but there are some multiple-set applications (although the sets are generally of much lower volume than that used in traditional programs). For example, Ken Mannie, Strength and Conditioning Coach at Michigan State University and a proponent of HIT for nearly 25 years, prescribes a myriad of protocols for his athletes. Some routines call for 2, 3, and even 4 sets of the same exercise. Sometimes the sets are performed in succession, as in most traditional multiple-set protocols. At other times they are segmented into push/pull, pre-exhaust, or post-exhaust schemes.

According to Mannie, the number of sets performed for each exercise is determined by several factors including the available equipment, the emphasis of the workout (body segment or the particular lifts) or simply as a matter of personal preference. "For competitive lifters," he adds, "the fact that the congruent neuromuscular pathways must be fashioned for skill encoding makes multiple-sets a polestar variable."

Rather than dwell on the number of sets his athletes perform for each exercise, Mannie focuses on the total number of sets performed in a workout. In total-body workouts, MSU 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 1 to 4, the aggregate number of sets per workout remains the same. Also, Mannie pays close attention to balancing the workouts with adequate stimulation in a variety of movement planes for all of the anterior, posterior, medial, and lateral compartments.

Repetitions

Fact: HIT doesn't always use 8-12 repetitions per set. Chip Harrison, Strength and Conditioning Coach at Penn State University and another long-time advocate of HIT, frequently manipulates the repetition schemes of his athletes. Harrison notes, "It's common for our athletes to use varied loading schemes or repetition goals throughout the course of a season or over time in order to produce the desired training response. While we may invest a good bit of time using a repetition range of 8-12, it's just as likely that our repetition goal will be 4-6 or 15-20."

And consider Kim Wood, Strength and Conditioning Coach of the Cincinnati Bengals for more than 26 years. The dean of the NFL strength and conditioning coaches, Wood has been a proponent of HIT since the early 1970s. He keeps it basic, a target of 20 reps for the lower body, 10 for the upper torso.

Equipment

Fact: HIT doesn't always incorporate Nautilus™ machines (or any brand of machine, for that matter). In order to increase muscular size and strength, a muscle must be loaded with some form of resistance. The source of that resistance really doesn't matter. Mike Bradley, the Assistant Strength and Conditioning Coach at Stanford University and yet another long-time supporter of HIT, says, "The main factors that determine gains in size and strength are an athlete's genetics and level of effort, not the type of equipment that is used."

The truth is that HIT employs a wide variety of equipment modalities to load muscles including barbells, dumbbells, machines (selectorized and plate-loaded), stretch cords, sandbags, other human beings, and even the lifter's body weight (such as during dips and chins). With this in mind, Harrison recommends "a diverse and varied selection of exercises and choices of modality."

Remember, all equipment choices have advantages and disadvantages. Machines can vary resistance according to muscular needs, but they are expensive and usually require a separate machine for a separate function. Free weights are inexpensive and offer plenty of variety. As Bradley points out, "Many different exercises can be performed with free weights, but how does one 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 an athlete who competes on the field."

So it's best to stay open-minded when choosing equipment. As Ken Mannie advises, "Don't handcuff yourself to a set ideology or antiquated prejudices."

What HIT Is

So what *is* HIT? Since it was first popularized more than three decades ago, there have been endless interpretations, variations, and applications of HIT. The fact of the matter is that many strength and fitness professionals incorporate their own personal twists and perspectives.

Nevertheless, most versions of HIT do have several common 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 performed or the resistance used from one workout to the next. HIT doesn't include fast-speed movements or exercises. All repetitions are done with a controlled speed of movement so that momentum doesn't play a significant role in raising the resistance. Finally, HIT is usually fast-paced, involving a minimal amount of recovery time between exercises.

HIT can be effective for anyone, regardless of lifting experience or aspiration, as long as it encourages progressive overload and allows sufficient recovery. The past three decades have provided literally thousands of examples of individuals, male and female, from untrained beginners to highly trained athletes, as empirical evidence that HIT is extremely efficacious.

In summation, Chip Harrison states, "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."

Matt Brzycki has written more than 200 articles on strength and fitness that have appeared in more than 36 different publications. He is also the author of several books, including *A Practical Approach to Strength Training*, and the editor of *Maximize Your Training*, a 455-page book that features chapters written by more than 30 strength and fitness professionals.