AMERICA'S FITNESS MAGAZINE

Nautilus

Why One Set
WORKS!

The New Case for
NO MEAT

7 Ways To
BEAT PAIN

Mind Games for
PEAK PERFORMANCES

How To Reset
YOUR BIOLOGICAL CLOCK

The Rap Sheet on **FAT**

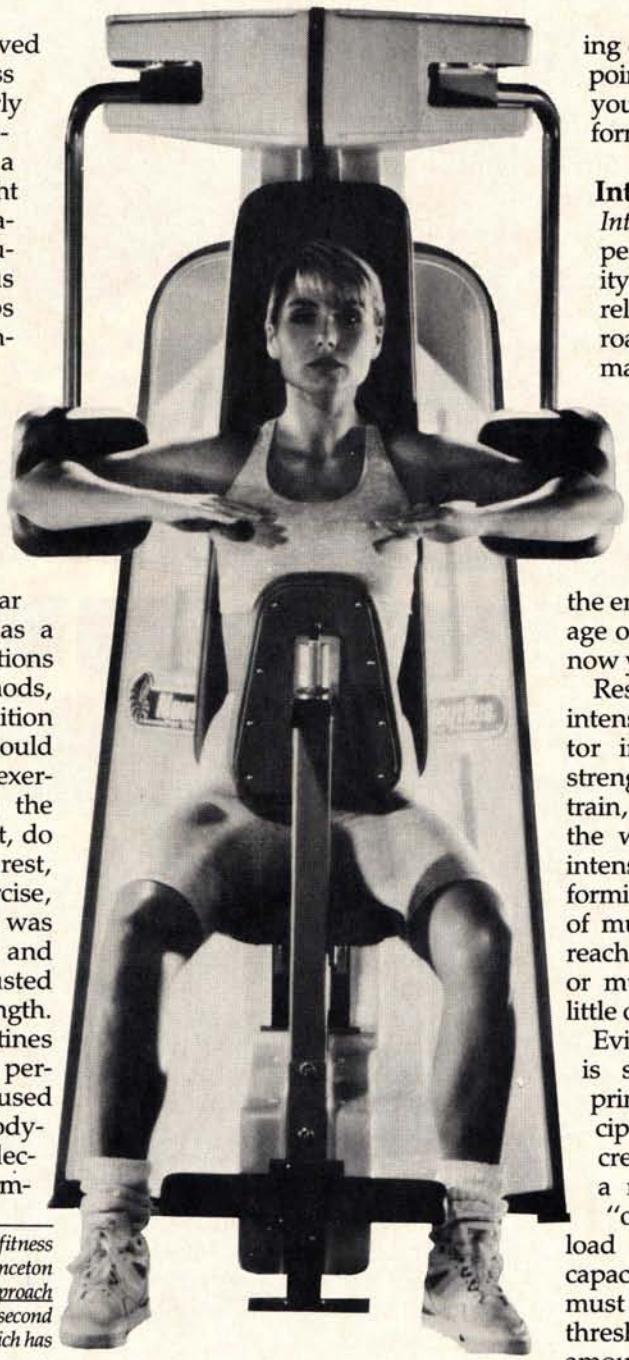
$2.50
CANADA $2.95

32
0 71486 01878 0

Is One Set Enough?

BY MATT BRZYCKI

Don't be misled. More isn't necessarily better when it comes to sets



When Nautilus arrived on the fitness scene in the early 1970s, the equipment was accompanied by a comprehensive protocol for weight training. Much of this information caused the fitness community to rethink their previous beliefs about exercise. Perhaps the most striking advice concerned the volume of weight training that was needed for optimal gains. Nautilus proposed that only one set of each exercise was necessary to improve muscular size and functional strength—provided that the set was taken to "momentary muscular failure." This was described as a point where no further repetitions were possible. In earlier methods, which were based more on tradition than anything else, a person would perform multiple sets of each exercise (i.e., more than one) in the following manner: do a set, rest, do second set of the same exercise, rest, do another set of the same exercise, rest, and so on. The rest period was generally several minutes long and allowed the momentarily exhausted muscles time to recover their strength.

Traditional multiple set routines were—and still are—effective if performed properly. They've been used successfully by competitive bodybuilders and weightlifters for decades. The question is: Can performing one set of each exercise to the point of muscular exhaustion give you the same results as performing several sets?

Matt Brzycki is the strength coach, health fitness coordinator, and Nautilus director at Princeton University. His books are A Practical Approach to Strength Training, which is in its second edition, and Conditioning for Basketball, which has just been released.

Intensity Defined

Intensity has been defined as "a percentage of momentary ability." In other words, intensity relates to the degree of the "inroads," or amount of fatigue, made into muscle at any given instant. When your muscles are fresh at the beginning of an exercise, your percentage of momentary ability is high and your intensity (or effort) is obviously low. When your muscles are fatigued at the end of an exercise, your percentage of momentary ability is low but now your intensity is high.

Research suggests that level of intensity is the most important factor in determining results from strength training—the *harder* you train, the *better* your response. In the weight room, a high level of intensity is characterized by performing each exercise to the point of muscular exhaustion. Failure to reach a minimum level of intensity, or muscular fatigue, will result in little or no strength gains.

Evidence for this "threshold" is suggested by the "overload principle." Essentially, this principle states that in order to increase muscular size and strength, a muscle must be stressed, or "overloaded," with a workload that is beyond its present capacity. Your intensity of effort must be great enough to exceed this threshold level so that a sufficient amount of muscular fatigue or over-

(Please turn to page 43)

(Continued from page 30)

load is produced. Given proper nourishment and an adequate amount of recovery between workouts, a muscle will adapt to these demands by increasing in size and strength. The extent to which this occurs then becomes a function of your inherited characteristics (i.e., muscle length, predominant muscle fiber type, etc.).

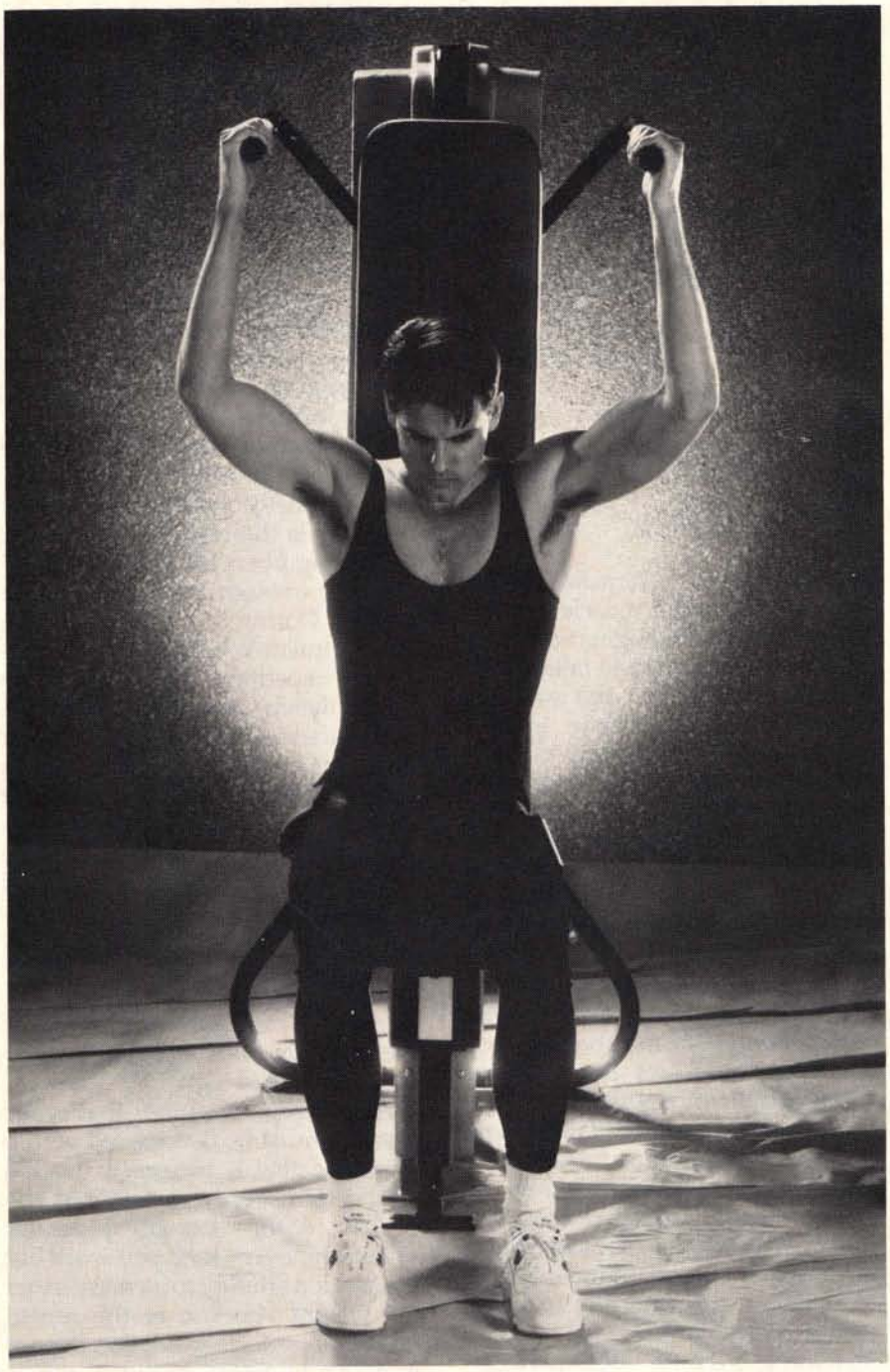
Time and Intensity

More isn't necessarily better when it comes to strength training. It's important to understand that an inverse relationship exists between time and intensity: as the time or length of an activity increases, your level of intensity decreases. Stated otherwise, you cannot train at a high level of intensity for long periods of time.

For example, suppose you had to sprint as fast as you possibly could for as long as you could. If you're like most people, you'd be able to run about 440 yards at an all-out speed before stopping due to total exhaustion. Your level of effort was extremely high but your time of activity was quite low. On the other hand, imagine that you were to run that same distance in three minutes. In this case, your level of intensity was rather low and your duration of activity was high.

The fact is that you can exercise for a short period of time with a high level of intensity or a long period of time with a low level of intensity. However, you cannot possibly train at a high level of intensity for a long period of time. In order to train at a reasonably high level of intensity, you must train for a relatively brief period of time. So, increasing the number of sets or exercises that you do will add to your training time and actually lower your intensity level.

The duration of a strength workout depends on several factors, such as the size of the facility, the amount of equipment, and the number of people using the equipment. Generally speaking, however, you should be able to complete a productive workout in less than one hour. Under normal circumstances, if you are spending much more than an hour in the weight room then you are probably not training with a desirable level of intensity.



The Torso Arm machine is a pulldown exercise.

Why one hour? Your body prefers to use carbohydrates, which are stored as glycogen in the muscle and glucose in the liver and bloodstream, as its primary fuel during intense exercise. After one hour of intense activity, your body exhausts these carbohydrate stores and goes after a secondary source of energy: proteins. The problem is that proteins are necessary for you to resynthesize muscle tissue. When you break down proteins for fuel, you're creating a situation much like that found in cases of starvation.

Muscular Overload

Remember, for a muscle to increase in size and strength it must be fatigued or overloaded. It's that simple. It really doesn't matter whether you fatigue your muscles in one set or several sets as long as your muscles experience a sufficient level of exhaustion. When performing multiple sets, the cumulative effect

Every time you work out you should attempt to increase either the weight you use or the repetitions you perform.

of *each successive set* makes deeper inroads into your muscle thereby creating muscular fatigue; when performing a single-set-to-failure, the cumulative effect of *each successive repetition* makes deeper inroads into your muscle thereby creating muscular fatigue. In fact, numerous research studies have shown that there are no significant differences when performing one, two, or three sets of an exercise provided, of course, that one set is done with an appropriate level of intensity (i.e., to the point of muscular failure). Truly, one set done with a *maximal* level of effort is the metabolic equivalent of several sets done with a *submaximal* level of effort.

Both a single-set-to-failure and multiple sets produce muscular fatigue. However, multiple sets do not necessarily guarantee that your muscles received a sufficient level of muscular fatigue. Indeed, a large amount of low-intensity exercise will do very little in the way of increasing strength. But, performing one set of an exercise to the point where you cannot do any more repetitions *always* achieves a desirable level of muscular exhaustion.

How is this accomplished in only one set? Well, suppose that you are to perform a set of leg extensions with 100 pounds. In order to overcome inertia and provide impetus to the 100 pounds of resistance, your quadriceps must exert slightly more than 100 pounds of force. The weight will not move if you apply a force less than or equal to 100 pounds. During the first repetition, your intensity is low. At this point, only a small percentage of your available muscle fibers is being used —just enough to move the weight.

As you perform each repetition, intensity increases progressively and you make deeper inroads into your muscle. Some of your muscle fibers will fatigue and will no longer be able to keep up with the increasing metabolic demands. Fresh fibers are simultaneously recruited to assist the fatigued fibers in generating ample force.

This process continues until the last repetition when muscular failure is finally reached and your intensity is the highest. Now, your remaining fibers cannot collectively produce enough force to raise the weight. During this final repetition, the cumulative effect of each preceding repetition has fatigued the muscle thereby providing a sufficient—and efficient—stimulus for muscular growth. One set of each exercise can indeed produce striking results, but each set must be done with a maximal effort. Your muscles should be completely fatigued at the end of each exercise.

It should be noted that your first few reps are the *least* productive because your intensity is low. On the other hand, your very last rep is the *most* productive because your intensity is very high.

Also keep in mind that your muscles must be overloaded with a workload that is increased steadily and systematically throughout the course of the strength program. Therefore, every time you work out you should attempt to increase either the weight you use or the repetitions you perform in relation to your previous workout. In effect, this is a "progressive overload."

Quality vs Quantity

Everything you do in the weight room should have a purpose. If you're like most people, time is a precious commodity. Because of this, the *quality* of work done in the weight room should be emphasized rather than the *quantity* of work. Don't do meaningless sets in the weight room. Make every single exercise count. Remember, the most efficient program is one that produces the maximum possible results in the least amount of time. After all, why perform several sets of an exercise when you can obtain similar results from one set in a fraction of the time?

As such, multiple sets are relatively inefficient in terms of time and, therefore, are unnecessary. Another problem with multiple sets is that they are frequently carried to a ridiculous extreme and often become nothing more than manual labor. Performing too many sets—or too many exercises—can actually become counterproductive by creating a catabolic training effect that retards muscular growth. When you are in a catabolic state, your muscles are broken down in such an extreme manner that your body is unable to regenerate muscle tissue. This results in a *loss* of size and strength.

Also keep in mind that performing too many sets or too many exercises will significantly increase your risk of an overuse injury, such as tendinitis, due to repetitive muscular trauma.

Don't be misled by the brevity or simplicity of a program that calls for one set of each exercise done with a high level of intensity. When performed correctly, an exercise performed with a high level of intensity can be very productive and quite effective. In fact, University of Toledo Strength Coach Ken Mannie has stated that exercising with a high level of intensity is "the most productive, most efficient and without a doubt, the most demanding form of strength training known to man." If you've ever performed an exercise to the point of muscular failure you'd quickly realize that Coach Mannie wasn't kidding! Don't forget, *a submaximal effort will yield submaximal results.*

Tried and Proven

When the idea of single set training was initially introduced, it managed to raise a few eyebrows. As the years went by, however, performing one set of an exercise became as much a trademark of Nautilus as its legendary cam. Much has changed in the industry since the first Nautilus machine ushered in the fitness boom twenty years ago, but the original Nautilus training concepts calling for safe and efficient strength training remain as productive and sensible as ever.