WEIGHT TRAINING

How Many Sets?

By Matt Brzycki

For many years, most people have done multiple-set training simply because that is what they have read or been told to do. The roots of this advice can be traced back to the time when virtually every authority in strength training came from the ranks of the professional strongmen, competitive weightlifters and, to a lesser degree, bodybuilders. In the early 1970s, the notion was advanced that people could improve their muscular strength (and size) with far fewer sets - and, thus, less volume of training - than had been traditionally thought. The debate concerning the ideal number of sets has been raging ever since.

THE SCIENTIFIC PERSPECTIVE

Know this: Science has been unable to determine how many sets of each exercise are necessary to produce optimal increases in muscular strength (and size). But the overwhelming majority of scientific evidence indicates that single-set training is at least as effective as multiple-set training. An exhaustive literature review in 1998 by Drs. Ralph Carpinelli and Robert Otto of Adelphi University (New York) and later reviews by Dr. Carpinelli examined all studies that compared different numbers of sets (dating back to 1956). Collectively, their research found 5 studies that showed multiple-set training was superior to single-set training and 57 that did not. Two of the five studies that concluded multiple-set training was superior to single-set training involved only one exercise. One of these studies was done in 1962 and used only the bench press; the other study only reported data from the barbell squat. (Curiously, there were five other exercises used in the latter study but no data were reported for them.)

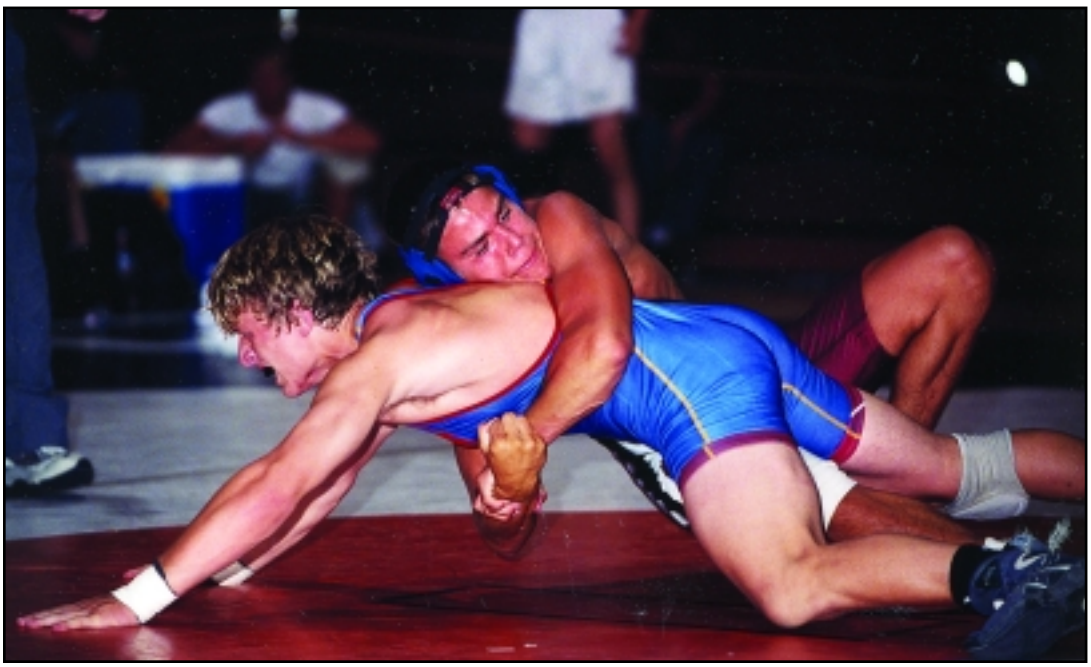
THE EMPIRICAL PERSPECTIVE

So, the basis for performing single-set training - or a relatively low number of sets - has powerful and compelling support in the scientific literature. But is single-set training actually done in the "real world"? More importantly, can "experienced" or "trained" athletes obtain the same results from single-set training as they can from multiple-set training? The answer to both questions is "yes." The fact of the matter is that single-set training has been popular since the early 1970s. And to quote Drs. Carpinelli and Otto: "There is no evidence to suggest that the response to single or multiple sets in trained athletes would differ from that in untrained individuals." Indeed, numerous authorities advocate single-set training including the strength coaches for many collegiate and professional teams. Dan Riley - a veteran strength coach with more than 20 years of experience in the National Football League and another 8 at the collegiate level (Penn State and Army) - notes, "Your goal must be to perform as few sets as possible while stimulating maximum gains. If performed properly, only one set is needed to generate maximum gains. In our standard routines, one set of each exercise is performed."

OVERLOAD: THE KEY

In order for your muscles to increase in strength (and size), they must experience an adequate level of fatigue. It is just that simple. It really does not matter whether your muscles are fatigued in one set or several sets - as long as you produce a sufficient level of fatigue.

Despite the overwhelming scientific and empirical evidence pointing to the effectiveness single-set training, the notion is often met with some degree of skepticism. Having been inundated with information suggesting that "more is better," athletes have difficulty believing that they can increase their muscular size and strength from workouts involving one set of each exercise. Single-set training can indeed be quite productive and very economical in terms



2003 National Cadet Duals. Jason Brew from Michigan works a gut wrench for a turn against Jeff Warusz from Pennsylvania in the Greco-Roman Championship Dual Match. Brew won the match 7-3 and Pennsylvania won the Greco championships 38-27. Photo by Dean Vande Berg.

of time. However, you simply cannot lift any random resistance and stop at a predetermined number of repetitions. In order for this type of training to be effective, each exercise in your workout must be done to the point of muscular fatigue.

How is an adequate level of fatigue produced in one set? Let's say that you are to perform a set of the tricep extension with 60 pounds. In order to overcome inertia and provide impetus to the 60 pounds of resistance, your triceps must exert slightly more than 60 pounds of force. The weight will not move if you apply a force that is less than or equal to 60 pounds. During the first repetition, only a small percentage of your available muscle fibers is being worked - just enough to move the weight. As you perform each repetition, some 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 continues until the last repetition, when you finally reach muscular fatigue. At this point, your available muscle fibers cannot collectively produce enough force to raise the weight. During this final repetition, the cumulative effect of each preceding repetition has fatigued your triceps thereby providing a very sufficient - and efficient - stimulus for muscular growth.

By performing one set with maximal effort, you have done the equivalent of a few sub-maximal sets . . . but in a shorter amount of time. So one set of an exercise performed in a high-intensity fashion is just as productive as doing multiple sets . . . and obviously more efficient in terms of time.

Remember, too, that a set done in a subsequent workout must be made progressively more challenging by performing more repetitions or increasing the resistance. Suppose, for example, that you did one set of 10 repetitions with 60 pounds in the tricep extension during today's workout. You tried an 11th repetition but were unable to do it. In your next workout, you would again use 60 pounds but try to improve on the 10 repetitions that you did today. Or if your target number of repetitions was 10, you should increase the resistance for your next workout. (Incidentally, when you increase the resistance, your muscles will respond better to smaller improvements – about 5% or less.)

SINGLE VERSUS MULTIPLE SETS

If doing one set of an exercise produces virtually the same results as several sets, then single-set training represents a more efficient means of strength training. After all, why perform several sets when you can obtain similar results from one set in a fraction of the time?

This is not to say that multiple-set training cannot be done. If performed properly, multiple-set training can certainly be effective in overloading your muscles. Multiple-set training has been used successfully by an enormous number of individuals for decades.

If you have a preference for multiple-set training, you should be aware of several things. First of all, simply doing multiple sets does not guarantee that you have overloaded your muscles. If the weights you use are not demanding enough then you will not produce sufficient muscular fatigue and your workout will not be as effective as possible. Remember, a large amount of low-intensity work does not necessarily produce an overload. So if you would rather do multiple sets, make sure that you are challenging your muscles with a progressive overload. In addition, keep in mind that performing too many sets (or too many exercises) can create a situation in which the demands on your muscles have surpassed your ability to recover. If this happens, your muscle tissue will be broken down in such an extreme manner that your body is unable to regenerate muscle tissue (essentially the resynthesis of myofibrillar proteins). Also, doing too many sets (or too many exercises) can significantly increase your risk of incurring an overuse injury such as tendinitis and bursitis. And as was indicated earlier, multiple-set training is relatively inefficient in terms of time so it is undesirable for time-conscious individuals. If you are like most athletes, time is a precious commodity - most of you simply do not have much free time. The point is this: Keep your sets to the minimum amount that is needed to produce an adequate level of muscular fatigue.

To recap: Single-set training can be just as effective as multiple-set training. But again, if a single set of an exercise is to be productive, the set must be done with an appropriate level of intensity - that is, to the point of muscular fatigue. Your muscles should be thoroughly exhausted at the end of each exercise.

MEANINGFUL SETS

You should emphasize the *quality* of work done in the weight room rather than the *quantity* of work. Do not perform meaningless sets in the weight room - make sure that every set is productive and purposeful. The most efficient program is one that produces the *maximal* possible results in the *minimal* amount of time.

Matt Brzycki has been involved in the strength and conditioning of collegiate wrestlers for more than 20 years. Since 1986, he has authored more than 70 articles for *Wrestling USA Magazine*. Reprints of 42 of these articles have been updated and adapted into two books (Wrestling Strength: The Competitive Edge and Wrestling Strength: Prepare to Win). A third book in this series (Wrestling Strength: Dare to Excel) will contain reprints of another 21 articles and be published in the spring of 2004. All books are available through Cardinal Publishers Group (800-296-0481).