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RESPONSE TIME

Members of Pascack Valley PBA Local 206 collect items for emergency service workers and their families in Louisiana, Mississippi and Alabama. Relief efforts by law enforcement officers continue throughout New Jersey.

Practicing sets and reps

■ BY MATT BRZYCKI

Perhaps the two most frequently asked questions in the weight room are "How many sets should I do?" and "How many reps should I do?" Pose those questions to 10 different people and you're likely to get 10 different answers. But do you know what? They might all be correct.

How can that be possible? Well, let's take a closer look at the science behind sets and reps.

Matt Brzycki

HOW MANY SETS?

For many years, most people have done multiple-set training simply because that's what they've 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 strength with far fewer sets – and, thus, less volume of training – than had been thought.

Over the years, the notion of training with relatively few sets has received a good deal of support from research studies. In fact, the overwhelming majority of research indicates that single-set training is at least as effective as multiple-set training. A literature review by Dr. Ralph Carpinelli and Dr. Bob Otto of Adelphi University (New York) and later reviews by Carpinelli found 62 studies that compared different numbers of sets. Their research found 5 studies that showed multiple-set training was superior to single-set training and 57 that did not. In their initial review, the researchers concluded that "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, the basis for performing single-set training has powerful and compelling support in the scientific literature. Furthermore, it's important to note that numerous authorities have advocated single-set training for decades. For example, Dan Riley – who has more than 24 years of experience as a strength coach in the National Football League – offers this advice to his players: "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."

The fact of the matter is that in order for your muscles to increase in strength, they must experience an adequate level of fatigue. It really doesn't matter whether your muscles are fatigued in one set or several sets as long as you produce an adequate level of fatigue.

If doing one set of an exercise produces virtually the same results as several sets, then single-set training represents a more efficient method. After all, why perform several sets when you can obtain similar results from one set in a fraction of the time? There's one caveat, however: If a single set of an exercise is to be effective, the set must be done to muscular fatigue – that is, to the point where you cannot do any additional repetitions (in good form). Your muscles need to be thoroughly exhausted at the end of each exercise.

The notion of doing one set of an exercise with that level of effort often begs this question: "To avoid injury, shouldn't you do at least one warm-up set prior to a set that's taken to the point of muscular fatigue?" Understand that warm-up sets aren't necessarily needed for the muscles to receive a proper warm-up. From a physiological perspective, an adequate warm-up is one in which your core temperature is increased by one degree. If you do a relatively high number of repetitions and lift the weight in a deliberate, controlled fashion without any explosive or jerking movements, then you'll actually warm up as you perform the set.

Think about it: If you do a set of 10 repetitions with a speed of movement that's roughly six seconds per repetition, you'll have exercised your muscles for about one minute before you reach muscular fatigue. After one minute of exercising, there's little doubt that you'll be adequately warmed up and prepared – both physiologically and psychologically – to exercise to muscular fatigue.

Despite the enormous scientific and anecdotal support for single-set training, many people will still opt for multiple-set training. There's nothing wrong with that but if you have a preference for multiple-set training, you should be aware of several things. First of all, simply doing multiple sets doesn't guarantee that your workouts are effective. If the weights you use aren't demanding enough or your effort isn't great enough, then you will not produce sufficient muscular fatigue. Remember, a large amount of low-intensity work doesn't necessarily produce a meaningful amount of fatigue. So if you'd rather do multiple sets, make sure that you're challenging your muscles with sufficient demands.

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 adapt to the demands. 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, finally, multiple-set training is relatively inefficient in terms of time so it's undesirable for time-conscious individuals.

The point is this: More isn't always better. Keep your sets to the minimum amount that's needed to produce an adequate level of muscular fatigue. You should emphasize the quality of work that you do in the weight room rather than the quantity of work. Don't perform meaningless sets – make every set count.

HOW MANY REPS?

Determining an appropriate repetition range depends upon a number of factors and, even then, has some degree of variability. Understand first that strength training is an anaerobic activity that's characterized by short-term, high-intensity efforts. Therefore, the duration of a series of repetitions – a set – should be in the anaerobic domain. Efforts that last from a split second to several minutes are considered to be anaerobic (assuming, of course, that the level of effort is great enough to justify an anaerobic response).

Since intense efforts at the lower end of this time frame have a higher risk of

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injury and those at the upper end have a greater reliance on the aerobic pathways, narrowing the window of time to roughly 40 - 120 seconds represents a safe and effective range for strength training with higher durations assigned to larger muscles and lower durations to smaller ones. (Larger muscles – such as those in your hips and legs – should be trained for a slightly longer duration because of their greater size and work capacity.) Thus, time frames might be 90 - 120 seconds for a hip exercise, 60 - 90 seconds for a leg exercise and 40 - 70 for a torso exercise.

Be that as it may, doing sets for a specified amount of time can be tricky and tedious. But you can use the aforementioned time frames to formulate repetition ranges. Suppose that you prefer to use a speed of movement that's six seconds per repetition. Dividing six seconds into the time frames that have been noted yields the following repetition ranges: 15 - 20 for your hips, 10 - 15 for your legs and about 6 - 12 for your torso. (A minimum of 8 repetitions is recommended for torso exercises that have a short range of motion such as a shoulder shrug).

Remember, these ranges are based upon six-second repetitions. Different repetition speeds require different repetition ranges. Suppose that you prefer to use a speed of movement that's 10 seconds per repetition. Dividing 10 seconds into the time frames that were mentioned earlier results in the following repetition ranges: 9 - 12 for your hips, 6 - 9 for your legs and about 4 - 7 for your torso. (You're encouraged to experiment with different repetition speeds and vary them based upon your personal preferences.)

A final point: It's safer for some people to perform more repetitions than have been suggested in order to reduce orthopedic stress. Slightly higher repetition ranges are recommended for older adults (particularly those with hypertension) along with anyone doing rehabilitative training. For example, repetition ranges might be 20 - 25 for exercises involving the hips, 15 - 20 for the legs and 10 - 15 for the torso.

What about the notion that higher repetitions increase muscular definition and lower repetitions increase muscular size? In one study, there were no significant differences in muscular size (and strength) between a group who trained with sets of four repetitions and a group who trained with sets of 10 repetitions. In another study, there were no significant differences in muscular size between a group that trained with sets of 3 - 5 repetitions, a group that trained with sets of 13 - 15 repetitions and a group that trained with 23 - 25 repetitions. Whether your sets consist of low repetitions, high repetitions or intermediate repetitions, you'll develop according to your genetic (or inherited) potential – provided that you do your sets with similar levels of effort.

THE BOTTOM LINE

There's no exact answer to the questions "How many sets should I do?" and "How many reps should I do?" To a large degree, the answers are based upon personal preferences. Consider the information that has been discussed and choose the number of sets and reps that best meet your needs.

Matt Brzycki is the Coordinator of Recreational Fitness and Wellness at Princeton University. A former Marine Drill Instructor, he has authored, co-authored or edited 14 books on strength and fitness, including SWAT Fitness (available at www.operationaltactics.org).