

Is One Set Enough?

Within strength training circles, there's been quite a bit of debate over the years about this question: does one set per exercise bestow all the benefits that you can receive from strength training, or are multiple sets required? The cliché recommendation is to perform three sets of 10 repetitions for each exercise. "Three sets of ten" is spoken in the gym about as often as "this just in" is said in a news broadcast. This begs the question: where did "three sets of 10" come from?

In 1948, Army Drs. T.L. Delorme and Arthur Watkins conducted a strength training study for soldiers recovering from leg injuries [1]. The doctors chose three sets of 10 reps arbitrarily, since a previous study they performed involved seven sets of 10 reps per exercise and apparently they were looking for something more time efficient. The three sets featured two sets with lighter resistance and a third with a more challenging weight similar to what our clients train with at The Perfect Workout.

In 1962, a researcher named Richard Berger completed a strength training study with college-aged males that included comparing one versus three sets of 10 on the bench press [2]. The single set group gained 21.6% strength, whereas the three-set group gained 23% strength. The slight superiority in strength for the three-set routine gave birth to the belief that three sets are superior to one. Since then, the belief largely still exists. But what does modern research show?

Researchers at Adelphi University conducted a review of three meta-analyses discussing strength training protocols, including one that focused specifically on the single versus multiple set debate [3]. A meta-analysis is a research paper featuring a statistical process that combines the research from several independent studies to calculate one general effect attained by an action. In this case, the meta-analyses wanted to calculate exactly how much strength is gained by using one set versus multiple sets. The review contained 113 scientific references, including the studies that largely make up the basis for the three meta-analyses.

The researchers concluded that a greater volume of exercise is not required for optimal strength gain. Some of the discussed studies do show an advantage to performing multiple sets, but those studies have flaws. For example, a 12-week study at Arizona State University comparing one versus three sets of training on the leg press showed superior strength gains for multiple set training. However, the multiple set group had a lower baseline strength and interventions tend to work best for those who have the most room to improve.

On the other hand, a study involving athletes using one, two, or three sets per exercise found no difference in strength gained following 10 weeks of training. The meta-analysis focused on training volume included 16 controlled studies (studies that prove causation). According to the Adelphi researchers, only one of the 16 showed that multiple set routines are more effective for gaining strength.

The lack of difference between single and multiple sets does not just apply to strength. Men and women between 18 and 40 years old performed one or three sets of biceps curls for 12 weeks. At the end of the study, both groups gained muscle, but no association was found between the sets performed and amount of muscle gained.

Why does extra work not produce greater improvements with strength training? This is possibly due to the *corridor theory* of muscle physiology, which states that muscle fibers are recruited, starting with the type 1 fibers that are used for endurance. As demand increases, larger and stronger fibers are recruited to join the effort. Most importantly, in a maximum effort, such as a set that fatigues the muscles to the point of “muscle success,” the full spectrum of muscle fibers are recruited and used. Therefore, additional sets should only serve to repeat what was already done.

So, a large amount of research shows no advantage between multiple set vs. single set routines. Therefore, if a difference does exist, it’s likely small, such as the 1.4% difference found in the Berger study from 1962. If you’re like most, time is of the essence and investing extra hours to possibly gain a miniscule amount of extra strength or muscle is simply not worth it.

On the other hand, what is important for your routine? Train consistently, and fatigue your muscles to the point of “muscle success” on each exercise. Doing so will help you attain better health, functionality, and an improved physique without wasted time and effort.

References

1. DeLorme, T.L. & Watkins, A.L. (1948). Techniques of progressive resistance. *Archives of Internal Medicine*, 29, 263-73.
2. Berger, R. (1962). The effect of varied weight training programs on strength. *The Research Quarterly*, 33(2): 168-81.
3. Otto, R. M., & Carpinelli, R. N. (2006). A critical analysis of the single versus multiple set debate. *JEPonline*, 9(1), 32-57.