



Introduction to High-Intensity Strength Training

Wayne L. Westcott, Ph.D.

New participants typically make excellent progress over the course of several months when following well-designed strength training programs. However, at some point, most people experience strength plateaus that can lead to discouragement and discontinuation of their strength workouts.

In many cases, these individuals have time constraints that restrict them to relatively brief strength training sessions (e.g., 30 to 40 minutes). They are therefore not in a position to perform more exercises for each muscle group or to complete more sets of each exercise. Other training options, such as changing the strength exercises, may not be possible due to facility/equipment limitations.

An attractive alternative that provides a safe, effective and time-efficient workout for advanced exercisers is known as high-intensity strength training. High-intensity training sessions typically involve 10 to 15 strength exercises, and take about 20 to 30 minutes for completion depending on the techniques utilized.

Principles of High-Intensity Strength Training

The basic objective of high-intensity training is to make each exercise set more demanding to stimulate greater muscle/strength development. There are two basic training principles for achieving this objective, namely, extending the exercise repetition and extending the exercise set.

Extending the Exercise Repetition

You can increase the muscle training stimulus by extending each exercise repetition through slower movement speed. Typically known as super-slow® training, this technique requires 14-second repetitions, with 10 seconds for each concentric muscle action (lifting phase) and 4 seconds for each eccentric muscle action (lowering phase). To reach muscle fatigue within the anaerobic energy system (less than 90 seconds), super-slow® training is limited to 4 to 6 repetitions which produce 56 to 84 seconds of high and continuous muscle tension.

Due to the reduced role of momentum, weightloads must be initially decreased by 10 to 20 percent to permit proper performance of the exercise. As you become accustomed to the slower movement speed, the resistance will increase and so will your muscle strength. Our research has shown significantly greater strength gains with super-slow® training compared to standard training.

In two separate studies with almost 150 new participants, the slow-speed training groups using 14-second repetitions experienced 50 percent more strength development than the standard-speed training groups using 7-second repetitions (4). Table 1 presents the beginning and ending strength scores for the subjects in both studies.

Smaller studies with advanced trainees have produced similar results, indicating that slow-speed training is also effective for breaking through performance plateaus. For example, recent research with 12 well-conditioned exercisers revealed significant improvements in both bodyweight and weightstack exercises after just 6 weeks of slow-speed training. As shown in table 2, these subjects increased their average exercise resistance by 11 pounds. They also performed 1.3 more chin-ups and 3.0 more bar-dips after slow-speed training, even though they did not practice these exercises during the study period.

Extending the Exercise Set

You can also increase the muscle training stimulus by extending each exercise set. The two most common means for achieving this objective are known as breakdown training and assisted training. Both of these high-intensity techniques reduce the resistance at the end of the exercise set, permitting a few post-fatigue repetitions to stimulate more enduring muscle fibers.

For example, if you perform 10 leg extensions to temporary muscle failure with 75 percent of your maximum resistance, you stimulate about 25 percent of your quadriceps muscle fibers. However, if at this point you quickly reduce the resistance by 10 to 20 percent you can complete a few additional repetitions (typically 2 to 4 post-fatigue reps) and stimulate a larger percentage of your quadriceps muscle fibers (approximately 30 to 35 percent). The extended set enables you to experience progressive levels of muscle failure thereby increasing muscle activation and enhancing strength development.

Breakdown Training

As indicated above, breakdown training typically uses a resistance that you can perform for 8 to 12 repetitions. Upon reaching momentary muscle failure, you immediately decrease the resistance by 10 to 20 percent and complete as many additional repetitions as possible.

We recently examined the effects of breakdown training on strength development in beginning exercisers (1). All 45 subjects performed standard strength training (1 set of 8 to 12 repetitions) for the first month of the study. During the second month, half of the participants continued to do standard training while half did breakdown training. As presented in table 3, standard training produced an 18-pound strength gain while breakdown training produced a 25-pound strength increase. The beginning exercisers who performed breakdown training experienced 40 percent more strength development.

A later study with 11 well-trained men and women indicated that breakdown training is also productive for more advanced participants. Following 6 weeks of breakdown training, these subjects increased their average exercise resistance by 14 pounds (see table 4). In addition, they performed 1.5 more chin-ups and 2.5 more bar-dips after breakdown training, even though they did not practice these bodyweight exercises during the study period.

Assisted Training

Like breakdown training, assisted training enables you to complete a few additional repetitions with reduced resistance when you reach temporary muscle failure. However, instead of changing the weightload, an assistant actually helps you lift the resistance on 2 to 4 post-fatigue repetitions. Because muscles are about 40 percent

stronger in eccentric actions than concentric actions, you do not receive assistance with the lowering movements.

We also studied the effects of assisted training on strength development in beginning exercisers (2). All 42 subjects performed standard strength training (1 set of 8 to 12 repetitions) for the first four weeks of the study. During the second four weeks, half of the participants continued to do standard training while half did assisted training. As shown in table 5, standard training elicited a 20-pound gain in strength while assisted training elicited a 29-pound increase in strength. The new participants who did assisted training attained 45 percent greater strength development.

A follow-up study produced excellent results with 15 previously trained subjects. These well-conditioned exercisers increased their average exercise resistance by 11 pounds (see Table 6). They also performed 1.4 more chin-ups and 4.5 more bar-dips after assisted training, even though they did not practice these bodyweight exercises during the study period.

Combined High-Intensity Training Program

In one study, 48 advanced subjects trained twice a week (Monday and Fridays) for 6 weeks, incorporating different high-intensity techniques on different days (3). As illustrated in Table 7, these exercisers improved their overall strength by 17.8 pounds, added 2.5 pounds of muscle and lost 3.3 pounds of fat. We have had our best results with combined high-intensity training protocols, perhaps because the variety of training techniques enhances both physiological and psychological responsiveness.

Summary

High-intensity strength training is designed to stimulate greater muscle/strength development by means of more demanding exercise sets. A procedure for extending each exercise repetition is known as super-slow® training. Techniques for extending each exercise set include breakdown training and assisted training. All of these protocols have proven effective for increasing muscle strength at a faster rate than standard training. High-intensity strength training is also time-efficient, typically requiring 20 to 30 minute workouts, 2 days per week. Results from a 6-week study incorporating all of these high-intensity training techniques revealed an 18-pound increase in overall strength, a 2.5-pound muscle gain and a 3.3-pound fat loss.

High-intensity strength training appears to be a safe and productive means for accelerating muscle development and overcoming strength plateaus. These techniques should prove to be some of the most useful and practical tools in your strength training toolbox.

Table 1 Changes in muscle strength for standard-speed and slow-speed training with beginning participants (147 subjects).

Study	Beginning Strength	Ending Strength	Strength Gain
One: Standard Speed	45.2 lbs.	62.7 lbs.	+17.5 lbs.
One: Slow-Speed	44.7 lbs.	71.2 lbs.	+26.5 lbs.*
Two: Standard Speed	57.7 lbs.	74.0 lbs.	+16.3 lbs.
Two: Slow-Speed	54.9 lbs.	78.9 lbs.	+24.0 lbs.*

*Both studies showed 50 percent greater strength gains with slow-speed training.

Table 2 Effects of slow-speed strength training on advanced participants (12 subjects).

6-Week Training Program	Mean Performance Improvement
Bodyweight Chin-Ups	+1.3 reps
Bodyweight Bar-Dips reps	+3.0
Lateral Raise Weightload	+11.0 lbs.

Table 3 Comparison of standard and breakdown training with beginning participants (45 subjects).

8-Week Training Program	Mean Weightload Increase
Standard Training	+18 lbs.
Breakdown Training	+25 lbs.

Table 4 Effects of breakdown training on advanced participants (11 subjects).

6-Week Training Program	Mean Performance Improvement
Bodyweight Chin-Ups	+1.5 reps
Bodyweight Bar-Dips	+2.5 reps
Lateral Raise Weightload	+13.9 lbs.

Table 5 Comparison of standard and assisted training with beginning participants
(42 subjects).

8-Week Training Program	Mean Weightload Increase
Standard Training	+20 lbs.
Assisted Training	+29 lbs.

Table 6 Effects of assisted training on advanced participants (15 subjects).

5-Week Training Program	Mean Performance Improvement
Bodyweight Chin-Ups	+1.4 reps
Bodyweight Bar-Dips	+4.5 reps
Lateral Raise Weightload	+10.6 lbs.

Table 7 Effects of combined high-intensity strength training techniques on advanced participants (48 subjects).

6-Week Training Program	Mean Strength and Body Composition Changes
Exercise Weightloads	+17.8 lbs.
Lean (Muscle) Weight	+2.5 lbs.
Fat Weight	-3.3 lbs.

References

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3. Westcott, W. and S. Ramsden. 2001. *Specialized Strength Training*, Monterey, CA: Exercise Science Publishers.
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