



Strength Training for Elite Athletes

Part I of V: Bodybuilding and Maximal Weights Methods

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In this seminar I will cover the main methods of strength training, as follows: Bodybuilding, maximal weight, eccentric training, isometrics, electrostimulation, isokinetics, strength-endurance, and speed-strength.

Bodybuilding

Bodybuilding methods increase maximal strength through gains in muscle mass. Increasing muscle mass is like putting a bigger engine in your car. Here are five advantages of bodybuilding methods:

1. Allow beginners to learn strength training exercises rapidly.
2. Establish a foundation of strength in the general preparatory stage.
3. Safest strength training methods because only moderately-heavy loads are required.
4. Particularly useful when an athlete has to put on functional bodyweight.

5. Recommended for training small, synergistic and stabilizing muscles, such as those of the rotator cuff.



Bodybuilders use training methods that increase maximal strength and muscle mass. (This photo and lead photo by Miloš Šarčev)

Bodybuilding methods use submaximal loads representing 70-82 percent of the predicted maximum. Multiple sets of 6-12 repetitions are performed with rest intervals of 2-5 minutes between sets, as shown in Table 1.

Table 1: Loading Norms for Bodybuilding Methods

Reps	6-12
Sets per exercise	3-5
# of Exercises/Muscle Group	1-3
Percentage of Predicted Maximum	70-82%
Rest Intervals	3-5 min
Tempo of Execution	Moderate to Slow

To determine starting weights you would usually perform a 1-repetition maximum test, but it is unadvisable for bodybuilding method for the following reasons:

- Time costly
- High potential for injuries
- Requires a great deal of mental preparation
- It is a technique in itself as some people are better at expressing their maximum performance.

Instead of a 1-rep max test, “predict” maximums using the following procedure:

Give the athlete a weight that he or she can lift for 3-12 repetitions maximum (3-12 RM), then divide by the coefficient factor listed in Table 2 for the particular amount of repetitions the weight is lifted. Here is an example: Jack does a 7 RM on the bench press with 80 kilos. Since the coefficient for 7 RM is .80, divide 80 kilos by .80, which gives us a predicted maximum of 100 kilos.

Table 2: Predicting maximum absolute strength (1 RM) from maximum number of repetitions (Poliquin 1986).

Max Number of Repetitions	Percent of Maximum
1	100
2	94.3
3	90.6
4	88.1
5	85.6
6	83.1
7	80.7
8	78.6
9	76.5
10	74.4
11	72.3
12	70.3
13	68.8
14	67.5
15	66.2
16	65.0

17	63.8
18	62.7
19	61.6
20	60.6

To apply the overload principle in bodybuilding methods, the maximum amount of repetitions possible in a set should be performed. To maximize training gains, the training program should be changed once every two weeks in terms of reps, sets, speed of contraction, choice and starting position of the exercise.

Changing the exercises reduces boredom and monotony in strength training. For example, many exercises train the elbow flexors, such as Scott curls. Scott curls can be performed with the following options:

- various forms of barbells
- dumbbells, one or two arms at a time
- pulleys
- various grips: supinated, pronated, semi-pronated

Bodybuilding methods address the total overloading of the musculature. There are countless variations that could be applied to each method, but here are some used most frequently:

Forced Repetitions. At the end of a set, 2-3 additional repetitions are executed with the assistance of a training partner who provides just enough help to complete the concentric part of the movement. The eccentric part of the movement is performed unassisted, since one is normally 40-50 percent stronger eccentrically than concentrically.



Forced repetitions enable trainees to perform additional repetitions by having a training partner assist with the concentric portion of a lift. (Miloš Šarčev photo)

Negative Repetitions. At the end of a set of a few dynamic contractions to failure, 2-3 eccentric contractions are performed with a training partner helping the athlete in raising the resistance to the final position of the concentric range. A variation of this method calls for putting on additional resistance once concentric muscle failure has been achieved. Spotters add roughly 25 percent more weight to the barbell once concentric muscular failure is reached. In this manner, eccentric strength can be exhausted thoroughly. Additional resistance can also be provided manually by spotters.

Superset. A superset usually consists of performing one set each of the extensor/flexor pair of exercises, back-to-back, before taking a rest. For example, leg extensions that involve the quadriceps can be superseded with leg curls, stressing the antagonist muscle group, the hamstrings.

Pre-exhaustion. The pre-exhaustion principle is a variation of the superset technique. The muscle is first pre-fatigued by a single joint exercise. It is then further exhausted by performing a two-joint exercise involving the same muscle group, plus additional muscle groups. Let's use the pectorals as an example.

Pre-exhaust the pectorals with an isolation exercise such as the pec dec; without rest, perform a two-joint compound exercise that also works the pecs, such as dips. After the pec dec exercise, the triceps muscles that were not involved in the first exercise will enable the pre-exhausted pectorals to reach a higher level of muscle failure. Table 3 provides a breakdown of the single-joint (isolation) and multiple-joint (compound) exercises for various muscle groups.

Table 3: Single-joint and multiple-joint exercises to be used in pre-exhaustion cycles.

Muscle	Single Joint Exercise	Multiple Joint Exercise
Quadriceps	leg extension	leg press, front squat, back squat
Hamstrings	leg curls	hyperextensions, good mornings, deadlifts, and pulls
Pectorals	flyes, cable crossovers, pec dec	Presses (bench incline, decline), dips
Latissimus	pullovers	chin-ups, pull-ups, pulldowns, rows
Biceps	any form of curls	same as latissimus
Triceps	triceps pressdown, French press, triceps extensions	dips and all presses



With pre-exhaustion, a single-joint exercise for a muscle is followed by a multi-joint exercise using that same muscle. An example would be dumbbell flyes (top) followed by bench presses (below). (Miloš Šarčev photos)

Super Slow Reps. There are various advantages to executing repetitions in a slow and uniform way when seeking increases in maximal strength. Weight trainers, even though well-intended, often perform repetitions too rapidly. The great amount of momentum generated by too rapid movements prevents the neuro-muscular system from receiving the duration and quality of stimulus needed for optimal results.

Super Slow reps slow down the repetitions so that each one takes between 4-10 seconds to complete. Better results are obtained when no more than 60 seconds of work per set is performed, 80 seconds being the ultimate duration of the stimulus per set.

With Super Slow, the speed of contraction is maintained as constant as possible. One can expect the last concentric phase of a set to exceed the projected time of rising and the resistance, since fatigue will be setting in. High intensity, slow speed training has been associated with increased levels of glycogen, CP, ATP, and various anaerobic metabolism enzymes; training at high speeds does not bring about these changes significantly. Here are three variations of Super Slow:

1. Using 70 percent of your best 1RM, perform 4-5 repetitions. Take 10 seconds to perform the concentric phase and 4 seconds to perform the eccentric phase.
2. Use a weight representing 70 percent of your 1RM. or your best performance for a set of 12 repetitions. Perform 6 repetitions, taking 5 seconds for every concentric and every eccentric of the lift.
3. For compound exercises (i.e., exercises using more than one joint such as dips, pulls and chins), take up to 30 seconds to raise and lower the resistance, but perform only 1 repetition per set.

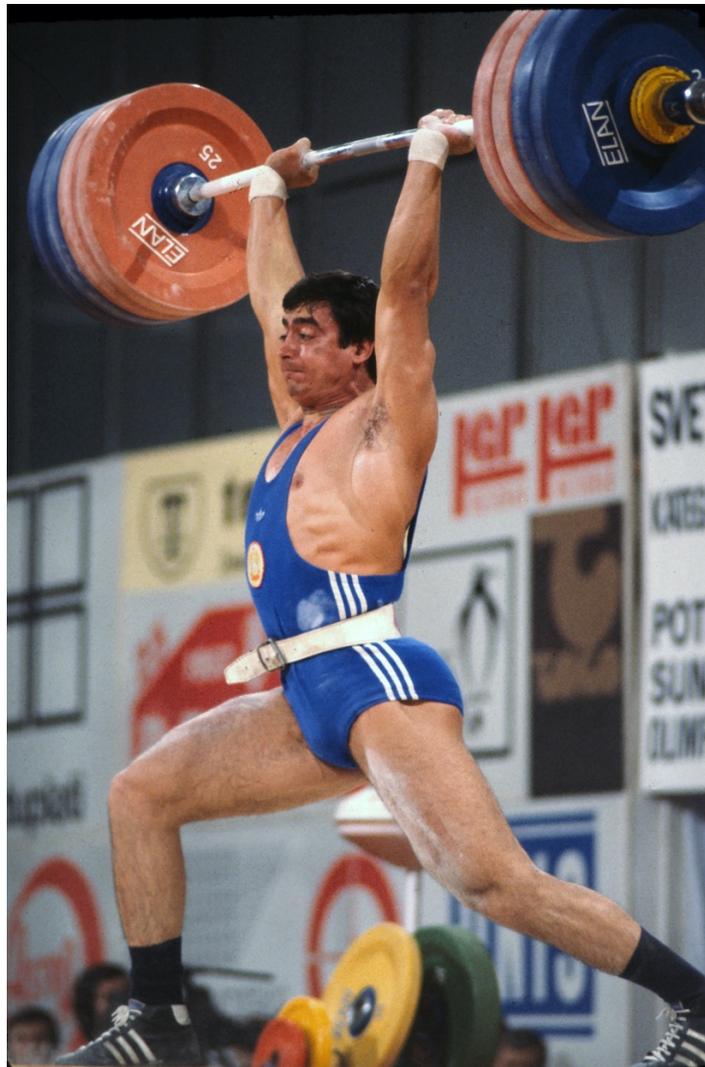
Maximal Weight Methods

Because of the risk of injury, maximal weights methods should not be performed until 1-2 years of general strength are completed.

Maximal weights methods use very heavy weights that result in not only adaptation of the muscle, but also the nervous system. They are characterized by high loads performed for low repetitions and a high number of sets, interspaced with long rest intervals.

Here are three characteristics of the maximal weights methods:

1. Produces high increases in strength through enhanced motor unit activation (i.e., increase in number and firing frequency of motor units). (Hakkinen and Komi, 1983; Komi et al., 1978, Moritani & de Vries, 1979; Sale et al. 1983).
2. Highly specific to the neural output seen in sports requiring maximal expression of force, such as in throwing, jumping, and the sprinting events.
3. Produces minimal increases in muscle mass. This characteristic is of utmost importance in sports where relative strength is crucial for optimal performance, such as gymnastics, combative sports, and the jumping events.



Maximal weights methods increase strength with minimal increases in muscle mass. (Bruce Klemens photo)

Various loading patterns have been developed for the maximal weight methods. One of the most successful variants is the so-called wave-like loading, which makes full use of a particular neuromuscular response.

When an athlete performs a set of resistive exercise with high loads necessitating great neuromuscular output, there is an increase in the contractile force and speed after a 5-10-minute rest interval. Lifting weights in the 90-100 percent range has an activation effect (post-tetanic facilitation) on the neuromuscular response. This is evidenced by heightened force and speed of muscular contraction in the subsequent sets performed with 80-90 percent of maximal weights. In other words, when a set with a load representing 90-100 percent of maximum is performed, a heavier weight can be used for subsequent sub-maximal sets. For example, instead of using 80 kilos for a set of 7 RM, 82.5 kilos can be used.

As you can see in the following examples, the intensity progresses in a wave-like pattern; hence, the term “wave-loading.” However, this enhanced neural response will not go on forever; usually, no more than 2-3 waves are performed.

Kulesza Method (1985)

Warm-up: 40 x 2-3 x 3-5, 60 x 3

[Translated: 40% of 1 RM x 2-3 sets x 3-5 reps, 60% of 1 RM x 3 reps]

Training: 70 x 3, 80 x 3, 90 x 3, 95 x 2, 100 x 1, 85-90 x 3-5 x 2-3

Bulgarian Method (Spassov, 1985)

Warm up: 50 x 2 x 3, 60 x 2, 70 x 1, 80 x 1, 90 x 1

Training: 100 x 3 x 1, 85-90 x 3 x 2-3, 90 x 1, 100 x 3, 85-90 x 3 x 2-3, 90 x 1, 100 x 1, 85 x 3 x 3

The nervous system takes 4-5 times longer to recover between sets than do the energy stores. As such, the nervous system benefits of maximal weights methods can be negated if the rest intervals are too short. Because maximal weights methods require work at very high intensities, they should be alternated with periods of higher volume and lower intensity.

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