

MAXIMAL STRENGTH TRAINING IN SPEED-STRENGTH SPORTS

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Translation by Dr. Michael Yessis.

For Special Strength Training in speed-strength sports, various exercises are used. This includes exercises with weights, isometric exercises, exercises in the shock regime of muscle work, jump exercises, and complex methods. They are all directed to perfection of the athlete's ability to display powerful concentrated efforts based on the development of maximum, explosive and high-speed strength and reactive ability of the muscles.

DEVELOPMENT OF MAXIMAL STRENGTH

Exercises with weights and isometric exercises are mainly used for development of maximal strength.

Exercises with loads

The repeat and repeat-serial methods are predominantly used.

The repeat method

This includes exercises with large (maximal, sub-maximal, and super-maximal) loads. The training effect of this method is directed mainly to the improvement of the central nervous system to:

- a. generate a powerful flow of motor impulses to the muscles;
- b. include a greater number of muscle fibers in the work effort; and
- c. increase the power of the energy acquisition mechanisms for the muscle contraction.

This method is characterized by a limited number of repetitions in one set and in the numbers of sets. For example:

1. Execute 2-3 repetitions with the weight at 90-95% of maximum.

In the session execute 2-4 sets with a rest pause of 4 to 6 minutes in between. Two regimes of muscle work can be used here. In one of them the movements are executed without relaxation of the muscles between repetitions, as for example in squats with the weighted barbell held on the shoulders for the entire set. In the other regime, after each squat, the bar is placed on the racks for a few seconds in order to instantly relax ("shake up") the muscles. Both regimes are effective for development of maximum strength, but the second one is better for improving the ability to display explosive strength and to relax the muscles.

2. Five sets are executed.
 1. with the weight at 90% of maximum - 3 repetitions;
 2. with the weight at 95% of maximum - 1 rep.
 3. with a weight of 97% - 1 rep;
 4. with the weight at 100% of max - 1 rep; and
 5. with the weight at 100% of maximum plus an added weight of 1-2 kgs.

The last set is not done if the athlete has a feeling that he will not be successful. The rest between sets is 3-4 minutes. The five sets are repeated 2-3 times [2-3 series] with a rest of 6-8 minutes in between the series.

3. Work is executed in an eccentric regime with the weight 120-130% of maximum for the given exercise. Four to five repetitions are done for 3 sets with the rest between sets, 3-4 minutes. The load is raised to the initial position with the help of partners.
4. The combination of eccentric and concentric regimes of muscle work in the barbell squat with the use of separate suspensions are now being made (Fig. 21). For example, the squat descent is executed with a weight of 120-140% of maximal. The athlete then rises up from a low squat after the suspensions (hook apparatus) touch the floor and are separated from the ends of the barbell.

When starting the bar is on the shoulders taken from special pillars adjusted to the needed height. After the suspended weights are removed the remaining weight, which is about 70-80% of maximal, is used for coming up from the squat very quickly. The bar is then once again put on the pillars and the athlete shakes the leg muscles. The partners at this time once again suspend the additional weights on the bar.

Two to three repetitions with compulsory relaxation and shaking of the muscles are executed for one set. In one series there are three sets with 4-6 minutes rest in between sets. There are a total of two to three series with a rest of 8-10 minutes in between series.

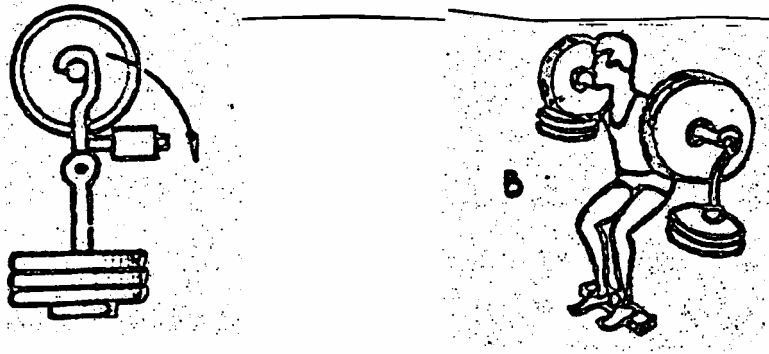


Figure 21: Special suspension device for using additional loads in the squat

In the examples mentioned above (and in the future) the optimum dosage of exercises for use in practice is indicated. The dosage depends on the number of muscle groups involved in the work. In conditions of total body work, as for example when doing the barbell squat, the dosage of exercises in regard to the number of sets should be less and the rest between them longer than when there is local work as for example, when doing the bench press.

The repeat-serial method

This method is different from the previous one according to the following factors. In this method the main training factor is not the amount of weight load but the duration of work (muscle tension) with sub-maximal weight. The training effect of this method is directed predominantly to activating the processes connected with functional adaptation and working hypertrophy (morphological specialization) of the muscles. This method is characterized by an increased volume of work at the expense of increased repetitions and sets. The movements are executed slowly and some of the sets are united in series, which are repeated for some time.

Two variants of the repeat-serial method, distinguished according to their primary emphasis on the training effect, are recommended. They include a moderate and considerable increase in muscle mass.

Variant 1

For development of maximal strength and a moderate increase in muscle mass, the resistance used is 70-90% of maximal. In this, it is necessary to be guided by the following rules:

1. The work should be very intense so that as much as possible, the optimal working condition of the athlete's body will be maintained for an extended period of time;
2. The strength work should not be executed as an addition to some other work as for example, perfection of sports technique, speed, or endurance. It should be an independent training session or a part of the main training;

3. It is necessary to maintain the rest pauses between sets and series very strictly. This is needed for sufficient restoration of the specific work capacity of the athlete; and
4. The rest between training workouts for development of maximum strength with large loads should be 2-3 days.

Examples:

1. The weight is 85-95% of maximum and there are 5-6 reps in one set. There are 2-3 sets in one series with a rest of 4-6 minutes in between each set. There are 2-3 series with a rest of 6-8 minutes in between.
2. A series with 3 sets is executed as follows:
 - a. with a weight of 80% of maximum - 10 reps;
 - b. with a weight of 90% of maximum - 5 reps; and
 - c. with a weight of 93-95% of maximum - 2 reps.

The rest pause between sets is 4-5 minutes. In one training session there are 2-3 series with a rest of 6-8 minutes between series.

3. Four sets with a rest of 5-6 minutes between sets:
 - a. in the first set the weight is 70% of maximum for 12 repetitions.
 - b. in the second set the weight is 80% of maximum for 10 reps.
 - c. in the third set the weight is 85% of maximum for 7 reps.
 - d. in the fourth set the weight is 90% of maximum for 5 reps.

There are two series done with a rest of 8-10 minutes in between.

4. Slow movements in the eccentric regime with the load at 75-80% of maximum are executed. The very lowest position is maintained for 2-3 seconds and then, with the greatest speed possible, the concentric move is executed. The exercise is repeated 2-3 times in 2-3 sets with rest pauses of 4-5 minutes in between sets. Two series with a rest of 6-8 minutes in between are performed.
5. In the static-dynamic regime of muscle work, the load is 70-80% of maximal. At the beginning, there is a gradual, 2-4 seconds of isometric tension build-up within the limits of 80-90% of the weight being used. After the hold, there is fast movement in a concentric regime. In one set there are 4-6 reps. In one training session there are 2-4 sets with a rest pause of

4-6 minutes in between. In all, there are two series with a rest of 6-8 minutes in between series.

Variant 2

This variant of the repeat-serial method produces a considerable increase in muscle mass. This method is based on the intensification of the body's metabolic processes. This variant involves an intense regime of muscle work based primarily on the glycolytic mechanism of energy production. When this mechanism is strongly involved, protein break down is especially strong. Their synthesis begins at rest and is expressed more strongly, the greater the quantity of protein broken down. The greater the quantity the stronger the synthesis. It is necessary to keep in mind that the activation of protein synthesis is developed very slowly and proceeds for about 48 to 72 hours after heavy work.

The main features of this method are expressed in the following:

1. The resistance is not the greatest, but is sufficient for the stimulation of significant muscle tension;
2. The work is executed for a long period of time and to total fatigue;
3. The rest pauses between sets are shortened to 1-2 minutes;
4. Muscle relaxation is not required between the repetitions in one set;
5. The work executed is local in character and involves one group of muscles for 2-3 sets. In one training session 2-3 muscle groups are involved.
6. The load on the muscle groups is alternated from session to session so that they receive at least 72 hours of rest

This variant of the repeat-serial method is good for promoting the development of maximal strength in slow movement conditions. However, it has little effectiveness in development of explosive strength and speed of movement. This is why it is best used with low volume at the beginning of a yearly cycle.

In order to increase the training effect of this method it is necessary to follow these rules:

1. Increase only one variable of the training load-weight or the number of repetitions;
2. Increase the number of reps and sets before increasing the weight;
3. Reduce the number of repetitions in accordance with increases in resistance or number of sets;
4. Reduce the rest pause between sets by small amounts.

Examples of this method include:

1. With the resistance at 75-85% of maximum, the movements are executed slowly to obvious fatigue. Do 10-12 reps for 2-3 sets with a rest of 2 minutes between sets.
2. With the resistance at 80% of max, do 3-5 sets of 8-10 reps with a rest of 2-3 minutes in between sets. If the fatigue is significant, the time of rest between sets is increased to 5 minutes.
3. With the weight between 84-95% of maximum, do 3-8 sets of 3-8 reps with the rest pauses between sets, 3-5 minutes. If the last repetition in the set cannot be executed because of fatigue, a partner assists in overcoming the resistance.
4. With the resistance between 85-90% of maximum the number of repetitions is optimal (to fatigue) and then two additional movements are done with the help of a partner. When the weight is lowered the partner does not assist. Two sets are executed with the rest pause depending upon the individual.
5. The same number of repetitions is executed in each set but with less resistance in each set. For example, 65 x 10, 60 x 10, 55 x 10, 50 x 10. The rest pause between sets is 1-2 minutes. This variant is useful for targeting the small muscle groups which fatigue quickly or when the rest pauses between sets are reduced.
6. Squat jumps on two parallel benches or on the floor with kettlebells, (24-36 kgs.) held in the hands (Fig. 22, B). In one set there are 8-10 jumps with sub-maximal effort. In one series with two sets, the rest between sets is 2 minutes. In 2-3 series the rest between series is 3-5 minutes.

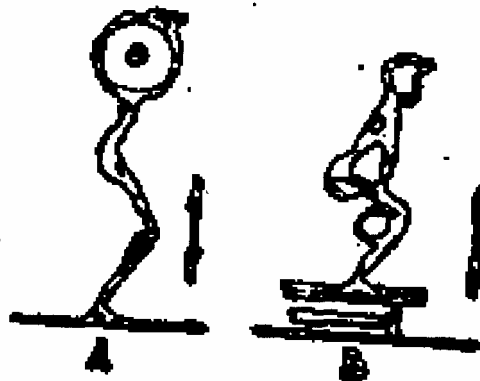


Figure 22: Squat jump with the bar on the shoulders (A) and with kettlebell in hands standing on 2 parallel exercise benches (B)